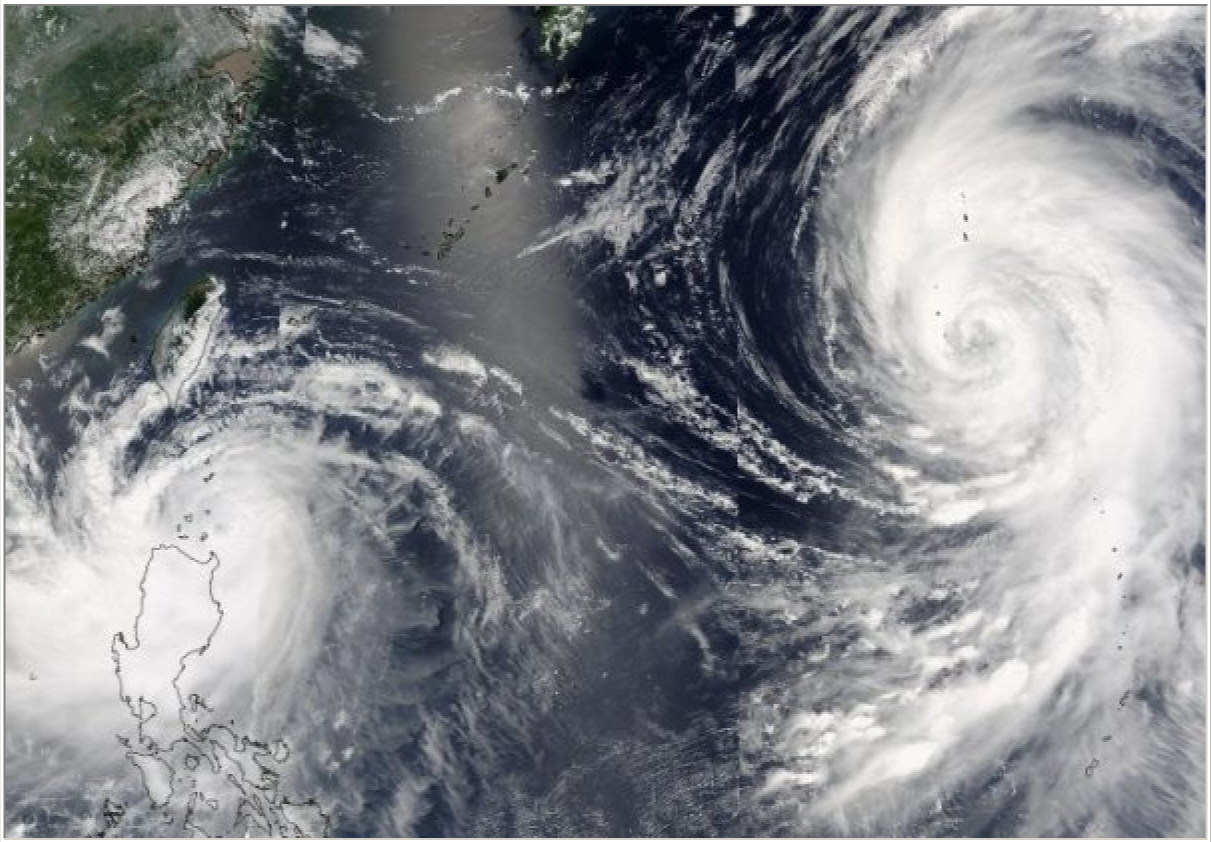
2004

Annual Tropical Cyclone Report

U.S. Naval Pacific Meteorology and Oceanography Center/ Joint Typhoon Warning Center

Pearl Harbor, Hawaii



Composite MODIS true color image of Typhoons 10W (Mindulle) and 11W (Tingting) in the Northwest Pacific Ocean taken on 30 June, 2004. Image courtesy of MODIS Rapid Response Team, NASA Goddard Space Flight Center.

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EDITOR'S NOTE

Based on the limited feedback received for the new ATCR format introduced in 2003, very few changes have been made for 2004. PDF versions of each storm page are still available on each storm page, however, a full PDF version will be created once the entire ATCR is complete and posted for those needing a document with page numbers. You can download Adobe Acrobat Reader, free of charge, from the Adobe website.

To use the ATCR, expanding menus indicated by plus (+) and minus (-) signs in the frame on the left side of the screen permit easy navigation. Simply click any (+) sign to open a menu another level.

Feedback is much appreciated and significant feedback may help shape this product in future years. You can email the editor, using this link. Editor ATCR

Special thanks to SSgt Menebroker, who provided many of the storm images used for the storms and AC1 Zopolos for the storm track graphics.

LT Y. O. Pitts, USN

Editor, 2004 ATCR

1. SUMMARY OF WESTERN NORTH PACIFIC AND NORTH INDIAN OCEAN TROPICAL CYCLONES

1.1 WESTERN NORTH PACIFIC OCEAN TROPICAL CYCLONES

Tropical cyclone genesis regions compared to the 15-year average are shown in Figure 1-1. This year's tropical cyclones are listed in Table 1-1. Table 1-2 shows the monthly distribution of tropical cyclones for each year since 1959 and Table 1-3 shows the monthly average occurrence of tropical storms separated into: (1) typhoons only; and (2) tropical storms and typhoons. A summary of this year's Tropical Cyclone Formation Alerts is shown in Table 1-4. The annual number of tropical cyclones of tropical storm strength and higher appear in Figure 1-2, while the number of super typhoons are shown in Figure 1-3. Composites of the tropical cyclone best tracks for the western North Pacific appear following Figure 1-3.

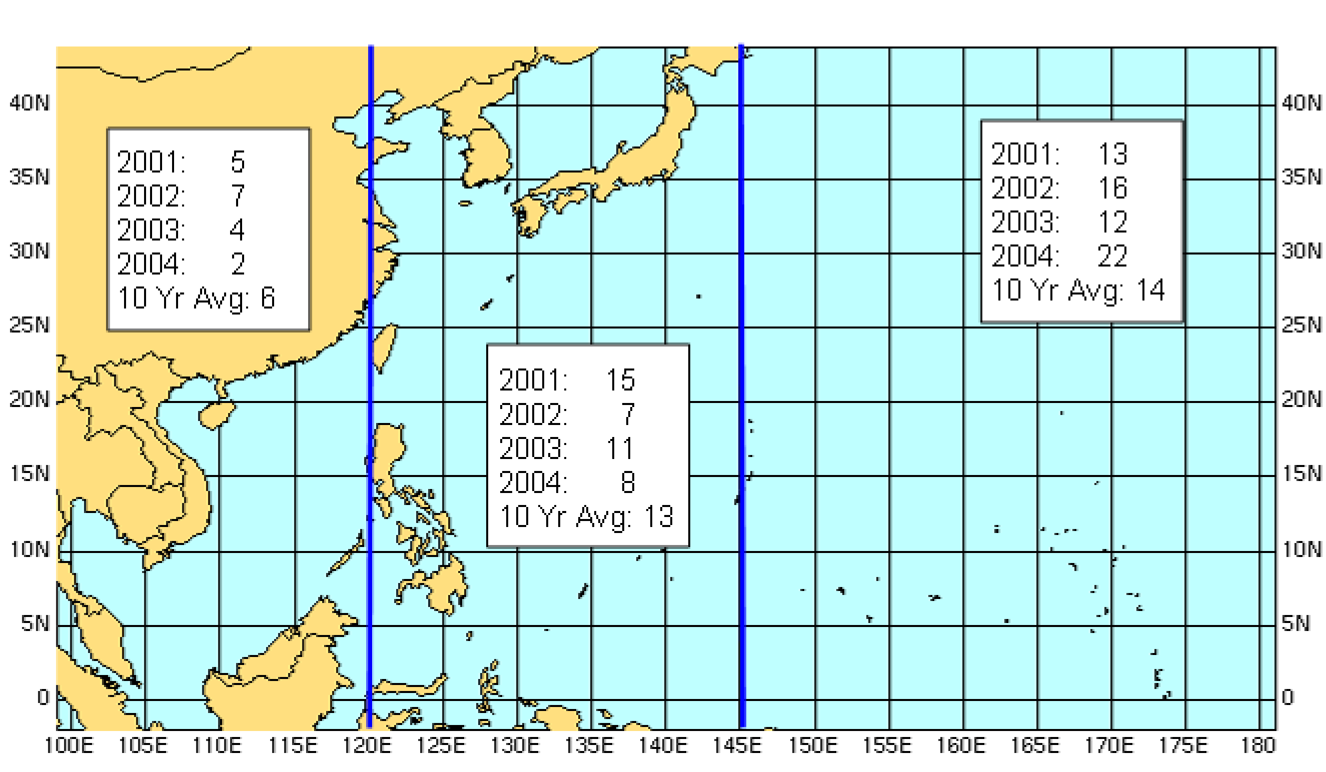


Figure 1-1. Comparison of the number of tropical cyclones that developed within 3 designated areas for 2001 through 2004 and the 10-year average.

Table 1-1 WESTERN NORTH PACIFIC SIGNIFICANT TROPICAL CYCLONES FOR 2004 (01 JAN 2004 - 31 DEC 2004)

TC	NAME *	PERIOD	WARNINGS ISSUED	EST MAX SFC WINDS KTS (M/SEC)	MSLP (MB)**
TS 01W	-	11FEB-16FEB	19	45 (22.5)	991
TS 02W	-	16MAR-22MAR	24	45 (22.5)	991
TY 03W	Sudal	04APR-15APR	48	130 (65)	910
STY 04W	Nida	13MAY-21MAY	32	140 (70)	898
TS 05W	-	15MAY-17MAY	8	35 (17.5)	997
TY 06W	Omais	16MAY-22May	26	65 (32.5)	976
TY 07W	Conson	04JUN-11JUN	27	85 (42.5)	958
TY 08W	Chanthu	07JUN-23JUN	18	75 (37.5)	968
STY 09W	Dianmu	13JUN-21JUN	36	150 (75)	885
TY 10W	Mindulle	22JUN-04JUL	45	125 (62.5)	916
TY 11W	Tingting	25JUN-03JUL	34	80 (40)	963
TS 12W	Kompasu	13JUL-16JUL	14	45 (22.5)	991
TY 13W	Namtheun	25JUL-01AUG	30	115 (57.5)	927
TY 14W	Meranti	03AUG-08AUG	19	90 (45)	954
TD 15W	Malou	04AUG-05AUG	6	30 (15)	1000
TY 16W	Rananim	07AUG-12AUG	21	90 (45)	954
TS 17W	Malakas	10AUG-12AUG	7	35 (17.5)	997
TY 18W	Megi	13AUG-19AUG	23	65 (32.5)	976
STY 19W	Chaba	18AUG-31AUG	51	155 (77.5)	879
TY 20W	Aere	19AUG-26AUG	29	65 (32.5)	976
TS 21W	-	26AUG-28AUG	9	35 (17.5)	997
STY 22W	Songda	27AUG-07SEP	46	130 (65)	910
TS 23W	Sarika	04SEP-07SEP	13	60 (30)	980
TD 24W	Haima	12SEP-13SEP	5	30 (15)	1000
TY 25W	Meari	20SEP-29SEP	40	120 (60)	922
STY 26W	Ma-on	04OCT-09OCT	24	140 (70)	898
TY 27W	Tokage	12OCT-20OCT	34	120 (60)	922
TY 28W	Nock-ten	12OCT-26OCT	49	110 (55)	933
TY 29W	Muifa	14NOV-26NOV	49	85 (42.5)	958
TY 30W	Nanmadol	28NOV-03DEC	21	125 (62.6)	916
TS 31W	Talas	10DEC-19DEC	39	40 (20)	994
TS 32W	Noru	17DEC-21DEC	15	55 (27.5)	984
		Total#	***861***		

* As Designated by RSMC Tokyo or CPHC

** MSLP Converted from estimated maximum surface winds using Atkinson/Holliday wind-pressure relationship

Table 1-2 DISTRIBUTION OF WESTERN NORTH PACIFIC TROPICAL CYCLONES FOR 1959 - 2004

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
1959	0	1	1	1	0	1	3	8	9	3	2	2	31
	0 0 0	0 1 0	0 1 0	1 0 0	0 0 0	0 0 1	1 1 1	5 1 2	4 2 3	2 1 0	2 0 0	2 0 0	17 7 7
1960	1	0	1	1	1	3	3	9	5	4	1	1	30
	0 0 1	0 0 0	0 0 1	1 0 0	0 1 0	2 1 0	2 1 0	8 1 0	0 4 1	4 0 0	1 0 0	1 0 0	19 8 3
1961	1	1	1	1	4	6	5	7	6	7	2	1	42
	0 1 0	0 1 0	1 0 0	0 1 0	2 1 1	1 1 4	3 2 0	3 1 3	5 1 0	3 2 2	1 0 1	1 0 0	20 11 11
1962	0	1	0	1	3	0	8	8	7	5	4	2	39
	0 0 0	0 1 0	0 0 0	1 0 0	2 0 1	0 0 0	5 1 2	7 0 1	3 1 3	3 1 1	3 0 1	0 2 0	24 6 9
1963	0	0	1	1	0	4	5	4	4	6	0	3	28
	0 0 0	0 0 0	0 0 1	1 0 0	0 0 0	3 1 0	3 1 1	3 0 1	2 2 0	5 1 0	0 0 0	2 1 0	19 6 3
1964	0	0	0	0	3	2	8	8	8	7	6	2	44
	0 0 0	0 0 0	0 0 0	0 0 0	2 0 1	2 0 0	6 1 1	3 5 0	5 2 1	3 3 1	4 2 0	1 0 1	26 13 5
1965	2	2	1	1	2	4	6	7	9	3	2	1	40
	1 1 0	0 2 0	0 1 0	1 0 0	1 0 1	3 1 0	4 1 1	3 2 2	5 3 1	2 0 1	1 1 0	0 1 0	21 13 6
1966	0	0	0	1	2	1	4	9	10	4	5	2	38
	0 0 0	0 0 0	0 0 0	1 0 0	2 0 0	1 0 0	3 1 0	5 3 1	5 3 2	1 1 2	1 2 2	1 0 1	20 10 8
1967	1	0	2	1	1	1	8	10	8	4	4	1	41
	0 1 0	0 0 0	1 1 0	1 0 0	0 1 0	1 0 0	3 3 2	3 4 3	5 3 0	2 1 1	4 0 0	0 1 0	20 15 6
1968	0	1	0	1	0	4	3	8	4	6	4	0	31
	0 0 0	0 0 1	0 0 0	1 0 0	0 0 0	2 0 2	1 2 0	3 4 1	4 0 0	5 1 0	4 0 0	0 0 0	20 7 4
1969	1	0	1	1	0	0	3	3	6	5	2	1	23
	1 0 0	0 0 0	0 1 0	1 0 0	0 0 0	0 0 0	2 1 0	2 1 0	2 0 4	4 1 0	1 1 0	0 1 0	13 6 4
1970	0	1	0	0	0	2	3	7	4	6	4	0	27
	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	1 1 0	0 2 1	4 2 1	2 2 0	3 2 1	1 3 0	0 0 0	12 12 3
1971	1	0	1	2	5	2	8	5	7	4	2	0	37
	0 1 0	0 0 0	0 1 0	2 0 0	2 3 0	2 0 0	6 2 0	3 1 1	5 1 1	3 1 0	1 1 0	0 0 0	24 11 2
1972	1	0	1	0	0	4	5	5	6	5	2	3	32
	1 0 0	0 0 0	0 0 1	0 0 0	0 0 0	2 2 0	4 1 0	3 2 0	4 1 1	4 1 0	2 0 0	2 1 0	22 8 2
1973	0	0	0	0	0	0	7	6	3	4	3	0	23
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	4 3 0	2 3 1	2 0 1	4 0 0	0 3 0	0 0 0	12 9 2
1974	1	0	1	1	1	4	5	7	5	4	4	2	35
	0 1 0	0 0 0	0 1 0	0 1 0	1 0 0	1 2 1	2 3 0	2 3 2	3 2 0	4 0 0	2 2 0	0 2 0	15 17 3
1975	1	0	0	1	0	0	1	6	5	6	3	2	25
	1 0 0	0 0 0	0 0 0	0 0 1	0 0 0	0 0 0	0 1 0	4 1 1	4 1 0	3 2 1	2 1 0	0 2 0	14 6 5
1976	1	1	0	2	2	2	4	4	5	0	2	2	25
	1 0 0	0 1 0	0 0 0	1 1 0	2 0 0	2 0 0	2 2 0	1 3 0	4 1 0	0 0 0	1 1 0	0 2 0	14 11 0
1977	0	0	1	0	1	1	4	2	5	4	2	1	21

	0 0 0	0 0 0	0 1 0	0 0 0	0 0 1	0 1 0	3 0 1	0 2 0	2 3 0	3 1 0	2 0 0	1 0 0	11 8 2
1978	1	0	0	1	0	3	4	8	4	7	4	0	32
	0 1 0	0 0 0	0 0 0	1 0 0	0 0 0	0 3 0	3 1 0	3 4 1	3 1 0	4 1 2	1 2 1	0 0 0	15 13 4
1979	1	0	1	1	2	0	5	4	6	3	2	3	28
	1 0 0	0 0 0	1 0 0	1 0 0	0 1 1	0 0 0	2 2 1	2 0 2	3 3 0	2 1 0	1 1 0	1 1 1	14 9 5
1980	0	0	1	1	4	1	5	3	7	4	1	1	28
	0 0 0	0 0 0	0 0 1	0 1 0	2 2 0	0 1 0	3 1 1	2 0 1	5 1 1	2 2 0	1 0 0	0 1 0	15 9 4
1981	0	0	1	1	1	2	5	8	4	2	3	2	29
	0 0 0	0 0 0	1 0 0	0 1 0	0 1 0	2 0 0	2 3 0	2 5 1	4 0 0	1 1 0	2 1 0	2 0 0	16 12 1
1982	0	0	3	0	1	3	4	5	6	4	1	1	28
	0 0 0	0 0 0	2 1 0	0 0 0	1 0 0	1 2 0	2 2 0	5 0 0	3 2 1	3 0 1	1 0 0	1 0 0	19 7 2
1983	0	0	0	0	0	1	3	6	3	5	5	2	25
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	3 0 0	2 3 1	1 1 1	3 2 0	3 2 0	0 2 0	12 11 2
1984	0	0	0	0	0	2	5	7	4	8	3	1	30
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	4 1 0	2 3 2	1 3 0	5 2 1	3 0 0	1 0 0	16 11 3
1985	2	0	0	0	1	3	1	7	5	5	1	2	27
	0 2 0	0 0 0	0 0 0	0 0 0	1 0 0	2 0 1	1 0 0	5 2 0	3 2 0	4 1 0	0 1 0	1 1 0	17 9 1
1986	0	1	0	1	2	2	2	5	2	5	4	3	27
	0 0 0	1 0 0	0 0 0	1 0 0	1 1 0	1 1 0	2 0 0	4 1 0	2 0 0	3 2 0	2 2 0	2 1 0	19 8 0
1987	1	0	0	1	0	2	4	4	7	2	3	1	25
	1 0 0	0 0 0	0 0 0	0 1 0	0 0 0	1 1 0	4 0 0	3 1 0	5 1 1	2 0 0	1 2 0	1 0 0	18 6 1
1988	1	0	0	0	1	3	2	5	8	4	2	1	27
	1 0 0	0 0 0	0 0 0	0 0 0	1 0 0	1 1 1	1 1 0	2 3 0	2 6 0	4 0 0	2 0 0	0 1 0	14 12 1
1989	1	0	0	1	2	2	6	8	4	6	3	2	35
	0 1 0	0 0 0	0 0 0	1 0 0	2 0 0	1 1 0	2 3 1	3 3 2	2 2 0	6 0 0	3 0 0	1 0 1	21 10 4
1990	1	0	0	1	2	4	4	5	5	5	4	1	32
	1 0 0	0 0 0	0 0 0	0 1 0	1 1 0	2 1 1	2 2 0	5 0 0	4 1 0	2 3 0	3 1 0	1 0 0	21 10 1
1991	0	0	2	1	1	1	4	8	6	3	6	0	32
	0 0 0	0 0 0	1 1 0	0 1 0	1 0 0	1 0 0	4 0 0	3 3 2	4 2 0	3 0 0	3 3 0	0 0 0	20 10 2
1992	1	1	0	0	0	3	4	8	5	6	5	0	33
	1 0 0	0 1 0	0 0 0	0 0 0	0 0 0	2 1 0	2 2 0	4 4 0	4 1 0	5 1 0	3 1 1	0 0 0	21 11 1
1993	0	0	2	2	1	2	5	8	5	6	4	3	38
	0 0 0	0 0 0	0 1 1	0 0 2	0 1 0	1 0 1	3 2 0	6 1 1	4 1 0	3 2 1	1 1 2	3 0 0	21 9 8
1994	1	0	1	0	2	2	9	9	8	7	0	2	41
	0 0 1	0 0 0	1 0 0	0 0 0	1 0 1	0 2 0	3 4 2	6 3 0	4 4 0	5 1 1	0 0 0	1 1 0	21 15 5
1995	1	0	0	0	1	2	3	7	7	8	2	3	34
	0 0 1	0 0 0	0 0 0	0 0 0	0 1 0	0 2 0	2 1 0	4 2 1	4 1 2	5 1 2	0 2 0	0 1 2	15 11 8
1996	1	1	0	2	2	0	7	10	7	5	6	3	43
	0 0 1	0 0 1	0 0 0	0 1 1	1 1 0	0 0 0	6 1 0	4 3 3	6 1 0	2 1 2	1 3 2	1 1 1	21 12 10
1997	1	0	0	2	3	3	4	8	4	6	1	1	33
	0 1 0	0 0 0	0 0 0	1 1 0	1 2 0	3 0 0	3 1 0	6 1 1	3 1 0	4 1 1	1 0 0	1 0 0	23 8 2
1998	0	0	0	0	0	0	3	3	8	6	3	4	27
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 2	2 1 0	4 1 3	2 1 3	0 3 0	1 1 2	9 8 10
1999	1	1	0	3	0	1	5	9	6	2	3	3	34
	0 1 0	0 1 0	0 0 0	2 1 0	0 0 0	1 0 0	1 1 3	4 2 3	2 4 0	1 1 0	1 1 1	0 0 3	12 12 10

2000	0	0	0	0	4	0	8	9	6	3	3	1	34
	0 0 0	0 0 0	0 0 0	0 0 0	1 1 2	0 0 0	2 3 3	4 3 2	4 1 1	2 1 0	1 1 1	1 0 0	15 10 9
2001	0	1	0	1	1	2	6	7	5	3	3	4	33
	0 0 0	0 0 1	0 0 0	0 0 1	0 1 0	2 0 0	4 1 1	3 3 1	5 0 0	3 0 0	1 2 0	2 2 0	20 9 4
2002	1	1	1	1	2	3	6	8	3	5	1	1	33
	0 1 0	1 0 0	0 0 1	0 0 1	1 0 1	3 0 0	3 2 1	4 3 1	1 2 0	3 0 2	1 0 0	1 0 0	18 8 7
2003	1	0	0	1	3	2	2	5	3	6	3	1	27
	0 1 0	0 0 0	0 0 0	1 0 0	1 1 1	1 1 0	2 0 0	4 1 0	3 0 0	2 1 3	3 0 0	0 1 0	17 6 4
2004	0	1	1	1	3	5	2	9	3	3	2	2	32
	0 0 0	0 1 0	0 1 0	1 0 0	2 1 0	5 0 0	1 1 0	6 2 1	1 1 1	3 0 0	2 0 0	0 2 0	21 9 2
(1959-2004)													
MEAN	0.6	0.3	0.5	0.8	1.4	2.1	4.6	6.7	5.6	4.7	2.9	1.6	31.7
CASES	26	15	25	38	63	95	211	308	257	216	132	74	1459

The criteria used in TABLE 12 are as follows:

1) If a tropical cyclone was first warned on during the last two days of a particular month and continued into the next month for longer than two days, then that system was attributed to the second month.

2) If a tropical cyclone was warned on prior to the last two days of a month, it was attributed to the first month, regardless of how long the system lasted.

3) If a tropical cyclone began on the last day of the month and ended on the first day of the next month, that system was attributed to the first month. However, if a tropical cyclone began on the last day of the month and continued into the next month for only two days, then it was attributed to the second month.

Table 1-2 Legend:		
Total month/year		
GTE 64 knots (Typhoon)	35 to 63 knots (Tropical Storm)	LTE 34 knots (Tropical Depression)

TABLE 1-3 WESTERN NORTH PACIFIC TROPICAL CYCLONES

TYPHOONS (1945-1958)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
MEAN	0.4	0.1	0.3	0.4	0.7	1.1	2	2.9	3.2	2.4	2	0.9	24.4
CASES	5	1	4	5	10	15	28	41	45	34	28	12	228

TYPHOONS (1959-2004)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
MEAN	0.2	0.1	0.2	0.4	0.7	1.2	2.6	3.5	3.3	3.1	1.6	0.7	17.7
CASES	10	3	8	18	31	53	119	157	150	141	72	33	795

TROPICAL STORMS AND TYPHOONS (1945-1958)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
MEAN	0.4	0.1	0.5	0.5	0.8	1.6	2.9	4	4.2	3.3	2.7	1.2	22.2
CASES	6	2	7	8	11	22	44	60	64	49	41	18	332

TROPICAL STORMS AND TYPHOONS (1959-2004)													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
MEAN	0.5	0.2	0.4	0.6	1.0	1.6	3.8	5.1	4.7	3.8	2.4	1.2	26.4
CASES	21	9	17	29	47	73	175	234	215	175	112	54	1215

TABLE 1-4 TROPICAL CYCLONE FORMATION ALERTS FOR THE WESTERN NORTH PACIFIC OCEAN FOR 1976-2004

YEAR	INITIAL TCFAS	TROPICAL CYCLONES WITH TCFAS	TOTAL TROPICAL CYCLONES	PROBABILITY OF TCFA WITHOUT WARNING*	PROBABILITY OF TCFA BEFORE WARNING
1976	34	25	25	26%	100%
1977	26	20	21	23%	95%
1978	32	27	32	16%	84%
1979	27	23	28	15%	82%
1980	37	28	28	24%	100%
1981	29	28	29	3%	96%
1982	36	26	28	28%	93%
1983	31	25	25	19%	100%
1984	37	30	30	19%	100%
1985	39	26	27	33%	96%
1986	38	27	27	29%	100%
1987	31	24	25	23%	96%
1988	33	26	27	21%	96%
1989	51	32	35	37%	91%
1990	33	30	31	9%	97%
1991	37	29	31	22%	94%
1992	36	32	32	11%	100%
1993	50	35	38	30%	92%
1994	50	40	40	20%	100%
1995	54	33	35	39%	94%
1996	41	39	43	5%	91%
1997	36	30	33	17%	91%
1998	38	18	27	53%	67%
1999	39	29	33	26%	88%
2000	40	31	34	23%	91%
2001	34	28	33	18%	82%
2002	39	31	33	21%	94%
2003	31	27	27	1%	100%
2004	35	32	32	9%	100%
(1976-2004)					
MEAN:	37.0	28.7	30.7	21.38%	93.45%

TOTALS:	1074	831	889		
* Percentage of initial TCFAs not followed by warnings.					

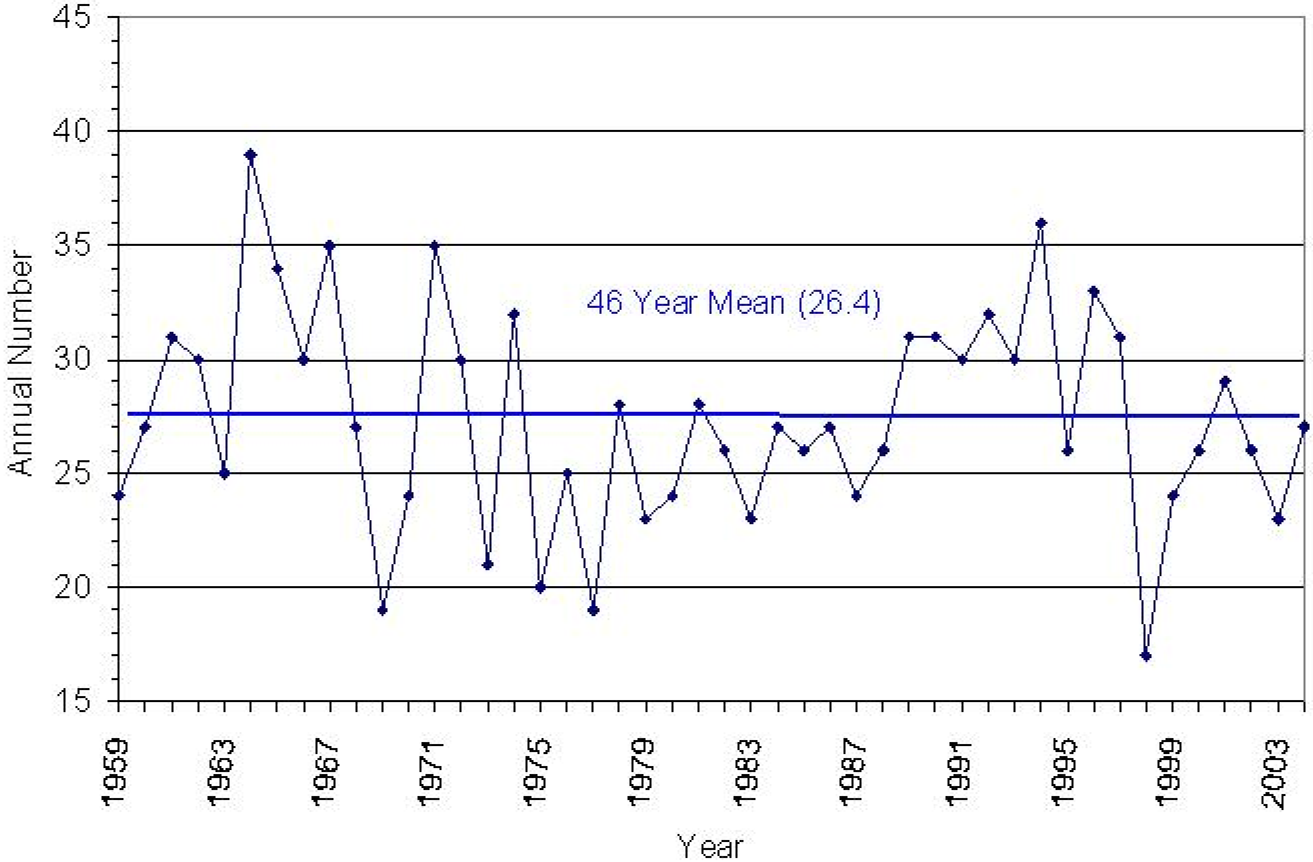


Figure 1-2. Tropical cyclones of tropical storm or greater intensity in the western North Pacific (1959-2004).

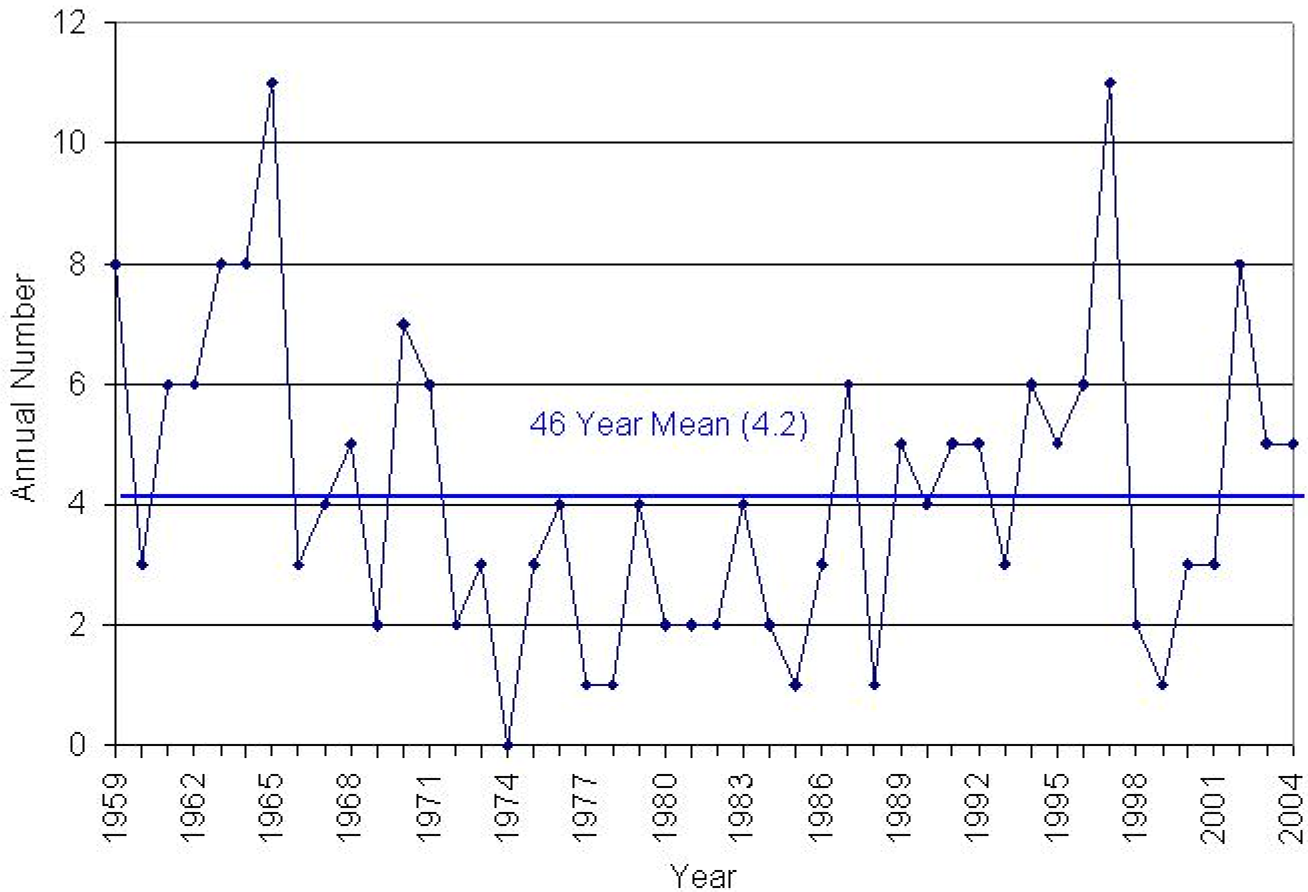


Figure 1-3. Number of western North Pacific super typhoons (1959-2004).

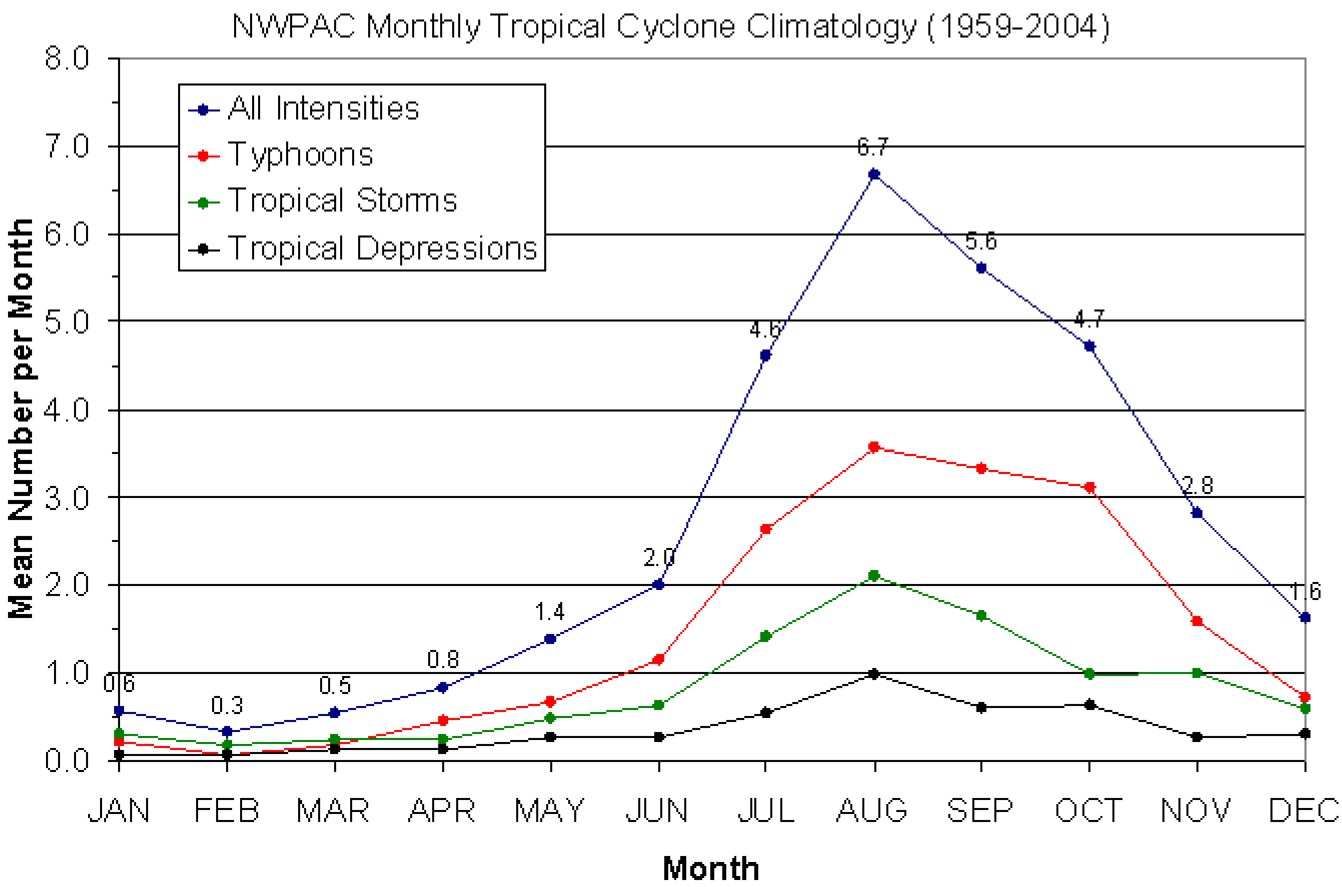
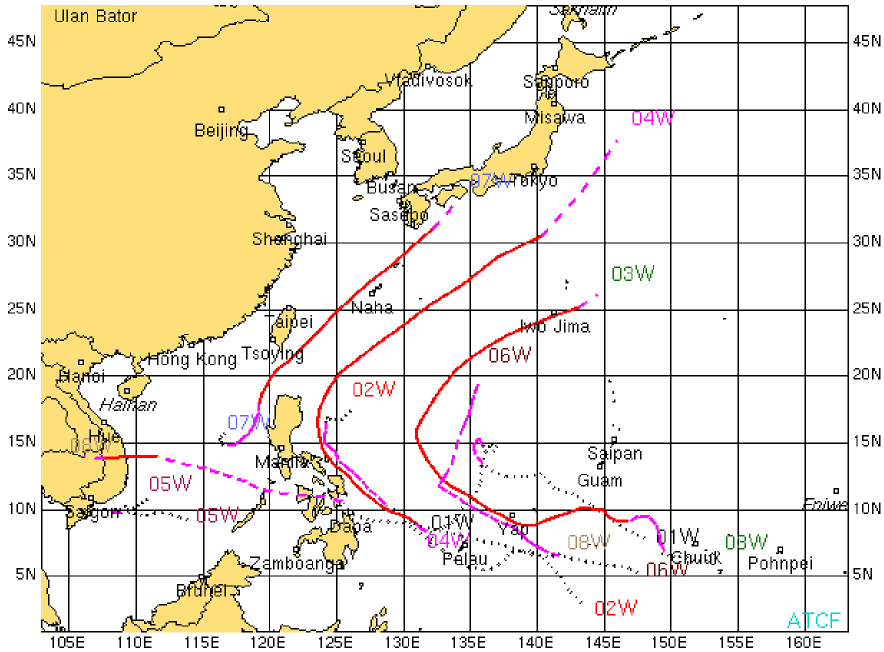


Figure 1-4. Average monthly tropical cyclones of all strengths (1959-2004).

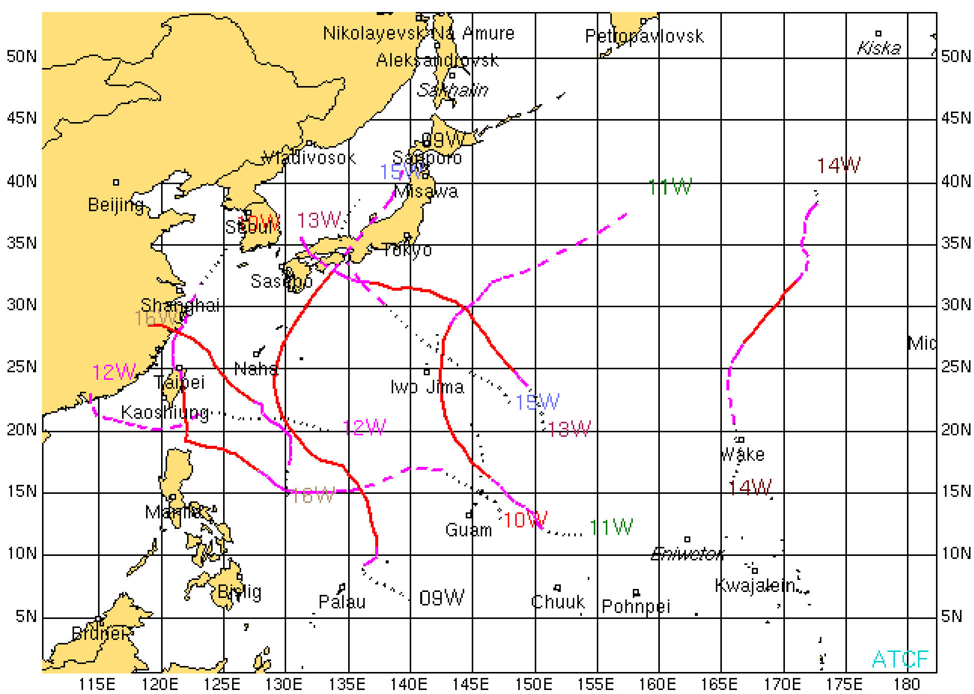
NORTHWEST PACIFIC TROPICAL CYCLONES 09 FEB 04 - 13 JUN 04



01W	TS	NONAME	09 FEB – 20 FEB
02W	TS	NONAME	13 MAR – 23 MAR
03W	ST	SUDAL	31 MAR – 15 APR
04W	ST	NIDA	13 MAY – 21 MAY
05W	TS	NONAME	13 MAY – 21 MAY
06W	TY	OMAIS	14 MAY – 22 MAY
07W	TY	CONSON	28 MAY – 11 JUN
08W	TY	CHANTHU	05 JUN – 13 JUN

MAXIMUM SUSTAINED SURFACE WIND
- ——64KT (33M/SEC) OR GREATER
- – –34 TO 63KT (18 TO 32M/SEC)
- ····33KT (17M/SEC) OR LESS

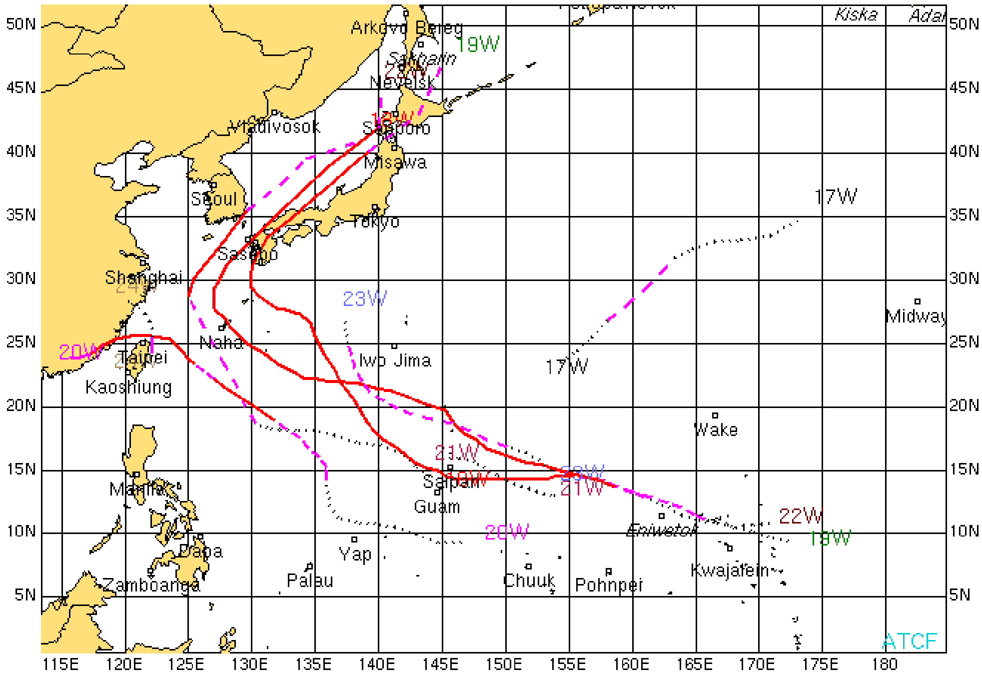
NORTHWEST PACIFIC TROPICAL CYCLONES 11 JUN 04 - 13 AUG 04



09W	ST	DIANMU	11 JUN – 21 JUN
10W	TY	MINDULLE	19 JUN – 04 JUL
11W	TY	TINGTING	22 JUN – 03 JUL
12W	TS	KOMPASU	10 JUL – 16 JUL
13W	TY	NAMTHEUN	23 JUL – 01 AUG
14W	TY	MERANTI	02 AUG – 08 AUG
15W	TD	MALOU	30 JUL – 05 AUG
16W	TY	RANANIM	07 AUG – 13 AUG

MAXIMUM SUSTAINED SURFACE WIND
- ——64KT (33M/SEC) OR GREATER
- – –34 TO 63KT (18 TO 32M/SEC)
- ····33KT (17M/SEC) OR LESS

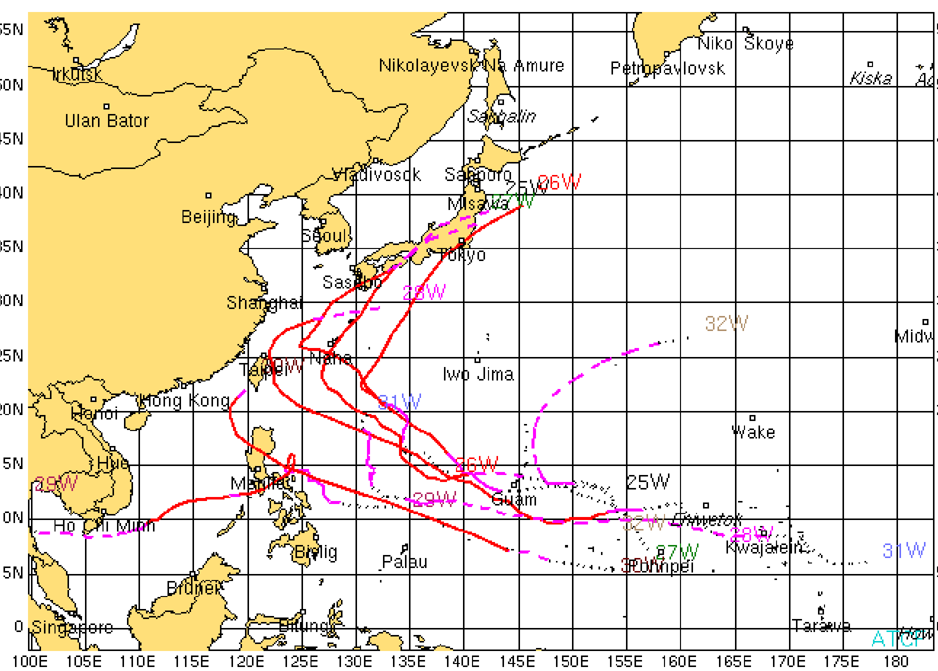
NORTHWEST PACIFIC TROPICAL CYCLONES 10 AUG 04 - 13 SEP 04



17W	TS MALAKAS	10 AUG - 12 AUG
18W	TY MEGI	12 AUG - 19 AUG
19W	ST CHABA	17 AUG - 31 AUG
20W	TY AERE	13 AUG - 26 AUG
21W	TS NONAME	24 AUG - 28 AUG
22W	TY SONGDA	26 AUG - 07 SEP
23W	TS SARIKA	03 SEP - 07 SEP
24W	TS HAIMA	10 SEP - 13 SEP

MAXIMUM SUSTAINED SURFACE WIND
64KT (33M/SEC) OR GREATER
34 TO 63KT (18 TO 32M/SEC)
33KT (17M/SEC) OR LESS

NORTHWEST PACIFIC TROPICAL CYCLONES 17 SEP 04 - 21 DEC 04



25W	TY MEARI	17 SEP - 29 SEP
26W	ST MA-ON	28 SEP - 09 OCT
27W	TY TOKAGE	09 OCT - 20 OCT
28W	TY NOCK-TEN	13 OCT - 26 OCT
29W	TY MUIFA	11 NOV - 26 NOV
30W	ST NANMADOL	28 NOV - 03 DEC
31W	TS TALAS	08 DEC - 19 DEC
32W	TS NORU	16 DEC - 21 DEC

MAXIMUM SUSTAINED SURFACE WIND
64KT (33M/SEC) OR GREATER
34 TO 63KT (18 TO 32M/SEC)
33KT (17M/SEC) OR LESS

1.2 NORTH INDIAN OCEAN TROPICAL CYCLONES

Tropical cyclone genesis regions are compared to the overall 10-year average in Figure 1-5.This year's North Indian Ocean tropical cyclones are listed in Table 1-5. The monthly distribution of tropical cyclones for each year since 1975 is shown in Table 1-6. Composites of the tropical cyclone best tracks for the Northern Indian Ocean appear following Table 1-6.

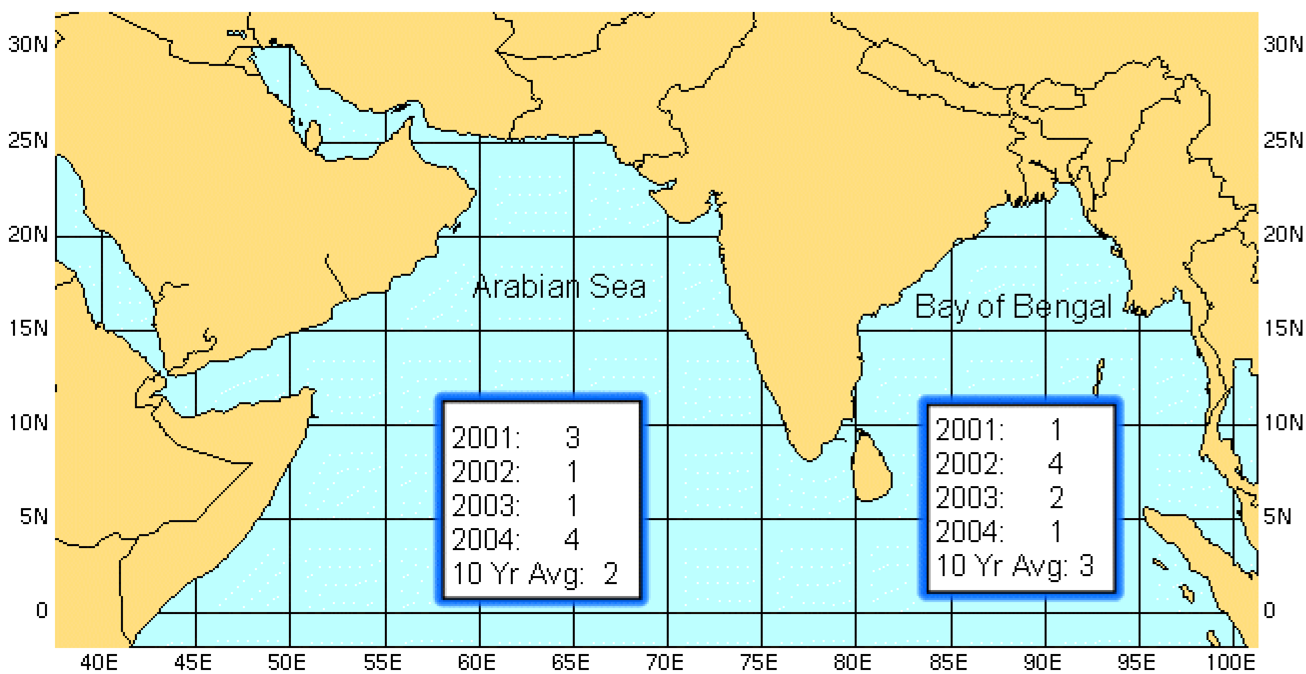


Figure 1-5. Comparison of the number of tropical cyclones that developed in Bay of Bengal and Arabian Sea for 2000 through 2004 and the 25-year average.

Table 1-5 NORTH INDIAN OCEAN SIGNIFICANT TROPICAL CYCLONES FOR 2004 (01 JAN 2004 - 31 DEC 2004)

TC	NAME	PERIOD	WARNINGS ISSUED	EST MAX SFC WINDS KTS (M/SEC)	MSLP (MB)*
01A	-	05May-10May	21	45 (22.5)	991
02B	-	17May-19May	6	60 (30)	980
03A	-	01Oct-03Oct	4	40 (20)	994
04A	-	04Oct-07Oct	13	40 (20)	994
05A	AGNI	28Nov-03Dec	14	65 (32.5)	976

		JTWC Total	58		
*MSLP Converted from estimated maximum surface winds using Atkinson/Holliday wind-pressure relationship					

Table 1-6 DISTRIBUTION OF NORTHERN INDIAN OCEAN TROPICAL CYCLONES FOR 1975 - 2004

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
1975	1	0	0	0	2	0	0	0	0	1	2	0	6
	0 1 0	0 0 0	0 0 0	0 0 0	2 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 2 0	0 0 0	3 3 0
1976	0	0	0	1	0	1	0	0	1	1	0	1	5
	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0	0 1 0	0 0 0	0 0 0	0 1 0	0 1 0	0 0 0	0 1 0	0 5 0
1977	0	0	0	0	1	1	0	0	0	1	0	2	5
	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0	1 1 0	1 4 0
1978	0	0	0	0	1	0	0	0	0	1	2	0	4
	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	2 0 0	0 0 0	2 2 0
1979	0	0	0	0	1	1	0	0	2	1	2	0	7
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 1 0	0 0 0	0 0 0	0 1 1	0 1 0	0 1 1	0 0 0	1 4 2
1980	0	0	0	0	0	0	0	0	0	0	1	1	2
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0	0 2 0
1981	0	0	0	0	0	0	0	0	1	0	1	1	3
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0	1 0 0	1 0 0	2 1 0
1982	0	0	0	0	1	1	0	0	0	2	1	0	5
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 2 0	1 0 0	0 0 0	2 3 0
1983	0	0	0	0	0	0	0	1	0	1	1	0	3
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0	0 1 0	0 1 0	0 0 0	0 3 0
1984	0	0	0	0	1	0	0	0	0	1	2	0	4
	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	2 0 0	0 0 0	2 2 0
1985	0	0	0	0	2	0	0	0	0	2	1	1	6
	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 1 0	0 1 0	0 6 0
1986	1	0	0	0	0	0	0	0	0	0	2	0	3
	0 1 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 0 0	0 3 0
1987	0	1	0	0	0	2	0	0	0	2	1	2	8
	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 2 0	0 0 0	0 0 0	0 0 0	0 2 0	0 1 0	0 2 0	0 8 0
1988	0	0	0	0	0	1	0	0	0	1	2	1	5
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 1 0	1 1 0	0 1 0	1 4 0
1989	0	0	0	0	1	1	0	0	0	0	1	0	3
	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	1 2 0
1990	0	0	0	1	1	0	0	0	0	0	1	1	4
	0 0 0	0 0 0	0 0 0	0 0 1	1 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 1	0 1 0	1 1 2

1991	1	0	0	1	0	1	0	0	0	0	1	0	4
	0 1 0	0 0 0	0 0 0	1 0 0	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	2 2 0
1992	0	0	0	0	1	2	1	0	1	3	3	2	13
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 2 0	0 1 0	0 0 0	0 0 1	0 2 1	2 1 0	0 2 0	3 8 2
1993	0	0	0	0	0	0	0	0	0	0	2	0	2
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	2 0 0	0 0 0	2 0 0
1994	0	0	1	1	0	1	0	0	0	1	1	0	5
	0 0 0	0 0 0	0 1 0	1 0 0	0 0 0	0 1 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0	0 0 0	1 4 0
1995	0	0	0	0	0	0	0	0	1	1	2	0	4
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0	2 0 0	0 0 0	2 2 0
1996	0	0	0	0	1	3	0	0	0	2	2	0	8
	0 0 0	0 0 0	0 0 0	0 0 0	0 1 0	1 2 0	0 0 0	0 0 0	0 0 0	1 1 0	2 0 0	0 0 0	4 4 0
1997	0	0	0	0	1	0	0	0	1	1	1	0	4
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 1 0	0 1 0	0 0 0	2 2 0
1998	0	0	0	0	2	1	0	0	1	1	2	1	8
	0 0 0	0 0 0	0 0 0	0 0 0	1 1 0	1 0 0	0 0 0	0 0 0	0 1 0	0 1 0	2 0 0	1 0 0	5 3 0
1999	0	1	0	0	1	1	0	0	0	2	0	0	5
	0 0 0	0 1 0	0 0 0	0 0 0	1 0 0	0 1 0	0 0 0	0 0 0	0 0 0	2 0 0	0 0 0	0 0 0	3 2 0
2000	0	0	0	0	0	0	0	0	0	2	1	1	4
	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	1 0 0	0 1 0	1 3 0
2001	0	0	0	0	1	0	0	0	1	1	1	0	4
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	0 1 0	0 1 0	0 0 1	0 0 0	1 2 1
2002	0	0	0	0	2	0	0	0	0	0	2	1	5
	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 1 0	0 5 0
2003	0	0	0	0	1	0	0	0	0	0	1	1	3
	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	1 0 0	0 1 0	2 1 0
2004	0	0	0	0	2	0	0	0	0	2	1	0	5
	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	0 0 0	0 0 0	0 0 0	0 0 0	0 2 0	1 0 0	0 0 0	1 4 0
(1975-2004)													
MEAN	0.1	0.1	0	0.1	0.7	0.6	0	0	0.3	1.0	1.3	0.5	5
CASES	3	2	1	4	23	17	1	1	9	30	40	16	147

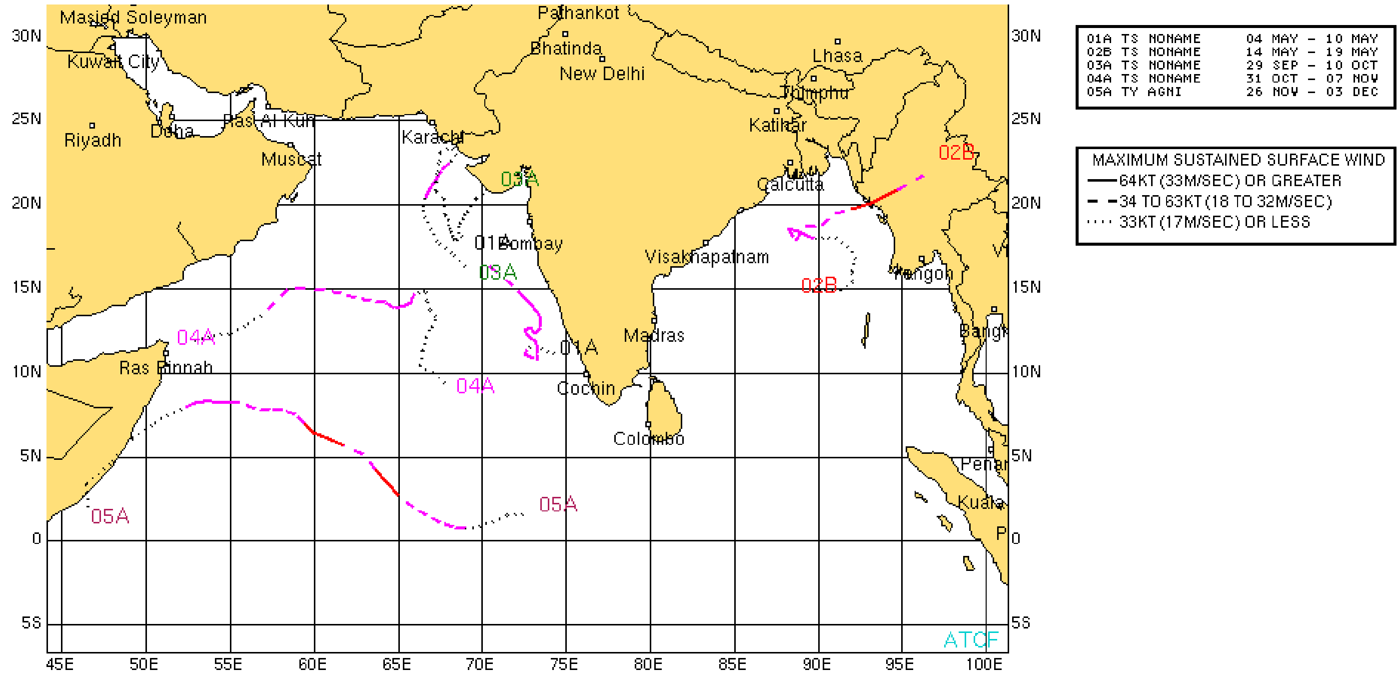
The criteria used in TABLE 1-6 are as follows:

1) If a tropical cyclone was first warned on during the last two days of a particular month and continued into the next month for longer than two days, then that system was attributed to the second month.

2) If a tropical cyclone was warned on prior to the last two days of a month, it was attributed to the first month, regardless of how long the system lasted.

3) If a tropical cyclone began on the last day of the month and ended on the first day of the next month, that system was attributed to the first month. However, if a tropical cyclone began on the last day of the month and continued into the next month for only two days, then it was attributed to the second month.

NORTH INDIAN OCEAN TROPICAL CYCLONES 04 MAY 04 - 03 DEC 04



Tropical Storm (TS) 01W

First Poor : 2000Z 09 Feb 04
First Fair : 1300Z 11 Feb 04
First TCFA : 1500Z 11Feb 04
First Warning : 1800Z 11 Feb 04
Last Warning : 0600Z 16 Feb 04, Dissipated over water
Max Intensity : 40 kts, gusts to 50 kts
Landfall : None
Total Warnings : 19
Remarks:
1) Tropical Storm (TS) 01W formed approximately 230 nm west of Chuuk and initially tracked northwestward along the southwest periphery of the subtropical ridge. The cyclone then began to slow and loop 300 nm north-northwest of Yap while attaining peak intensity of 40 kts on 13 Feb. The primary steering regime then shifted to the ridge centered over the Philippines and the cyclone began tracking southwest late on 15 Feb while accelerating. TS 01W then became vertically sheared and began dissipating approximately 200 nm north of Palau on 16 Feb.
2) No damage reports were received for this system.

Statistics for JTWC on TS 01W																				
	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04021018		7.8N	148.0E	15																
04021100		8.2N	147.2E	15																
04021106		8.8N	146.2E	20																
04021112		9.6N	145.1E	20																
04021118	1	10.4N	144.0E	25	21	74	131	197	188	269			0	0	10	20	20	15		
04021200	2	11.1N	142.7E	25	18	30	92	81	56	307			0	0	10	15	20	15		
04021206	3	11.6N	141.3E	30	26	48	96	80	133	307	517	794	5	10	15	10	20	20	20	15
04021212	4	12.7N	140.3E	30	18	81	71	12	128	316			0	5	5	10	15	15		
04021218	5	12.4N	138.9E	30	36	84	92	155	259	337			0	5	0	0	0	0		
04021300	6	12.4N	137.6E	30	13	60	144	256	367	437			0	0	0	0	-5	0		
04021306	7	12.8N	136.7E	30	11	74	184	268	403	435			0	-10	-5	0	-5	0		
04021312	8	13.4N	135.9E	35	11	101	212	345	437	484			-5	-5	0	-5	0	0		
04021318	9	14.1N	135.4E	40	5	72	205	283	308	515	529		0	15	25	20	15	5	-5	
04021400	10	14.8N	135.2E	35	6	114	209	279	329	504			5	15	15	15	10	-5		
04021406	11	15.3N	135.6E	35	11	142	205	222	389	502	509		10	15	10	10	10	0	-5	
04021412	12	14.8N	135.9E	30	60	74	139	193	299	329	395		15	10	10	10	5	5	0	
04021418	13	14.7N	136.3E	30	13	37	23	109	144	147			0	-5	0	-5	-5	-5		
04021500	14	14.9N	136.6E	30	11	38	19	75	93	167			0	0	0	-5	-5	0		
04021506	15	14.8N	137.0E	30	0	42	44	67	105	193			0	5	0	0	0	0		
04021512	16	14.5N	136.8E	25	17	39	96	116	131	218			5	5	5	0	0	0		

04021518	17	14.3N	136.1E	25	31	109	169	201	224	289			5	0	0	0	0	-5		
04021600	18	13.3N	135.8E	25	21	86	132	188	228	304			5	0	0	0	0	0		
04021606	19	11.9N	135.7E	25	16	51	126						0	-5	-5					
04021612		10.8N	135.2E	25																
04021618		10.2N	134.4E	25																
04021700		9.6N	134.1E	25																
04021706		9.3N	133.9E	25																
04021712		9.1N	133.7E	25																
04021718		9.0N	133.5E	25																
04021800		8.9N	133.3E	25																
04021806		8.8N	133.1E	25																
04021812		8.7N	132.9E	25																
04021818		8.6N	132.7E	25																
04021900		8.5N	132.5E	20																
04021906		8.5N	132.3E	20																
			AVERAGE		19	71	126	174	235	337	487	794	3	6	6	7	8	5	8	15
			BIAS										2	3	5	5	5	3	3	15
			# CASES		19	19	19	18	18	18	4	1	19	19	19	18	18	18	4	1

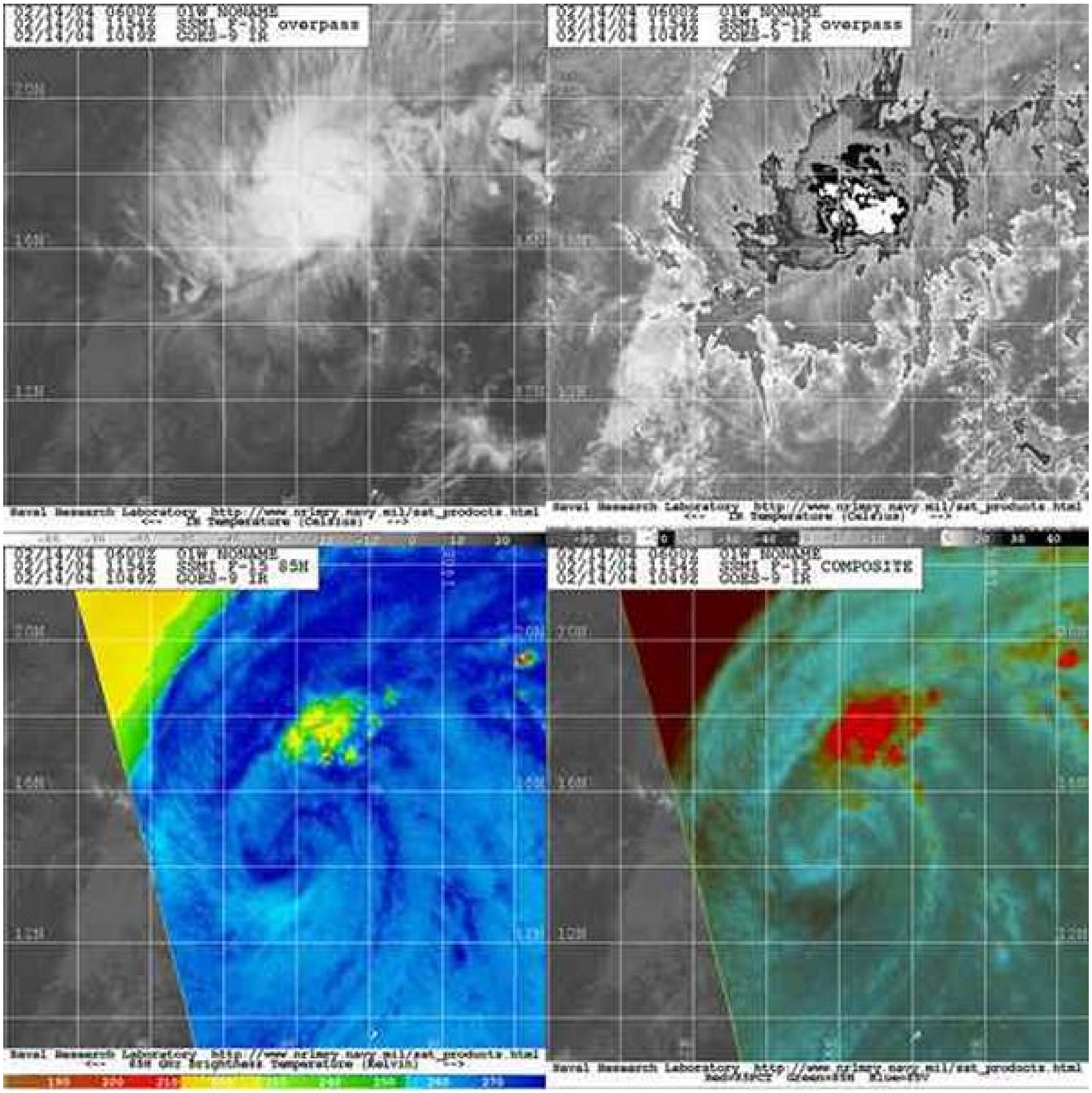
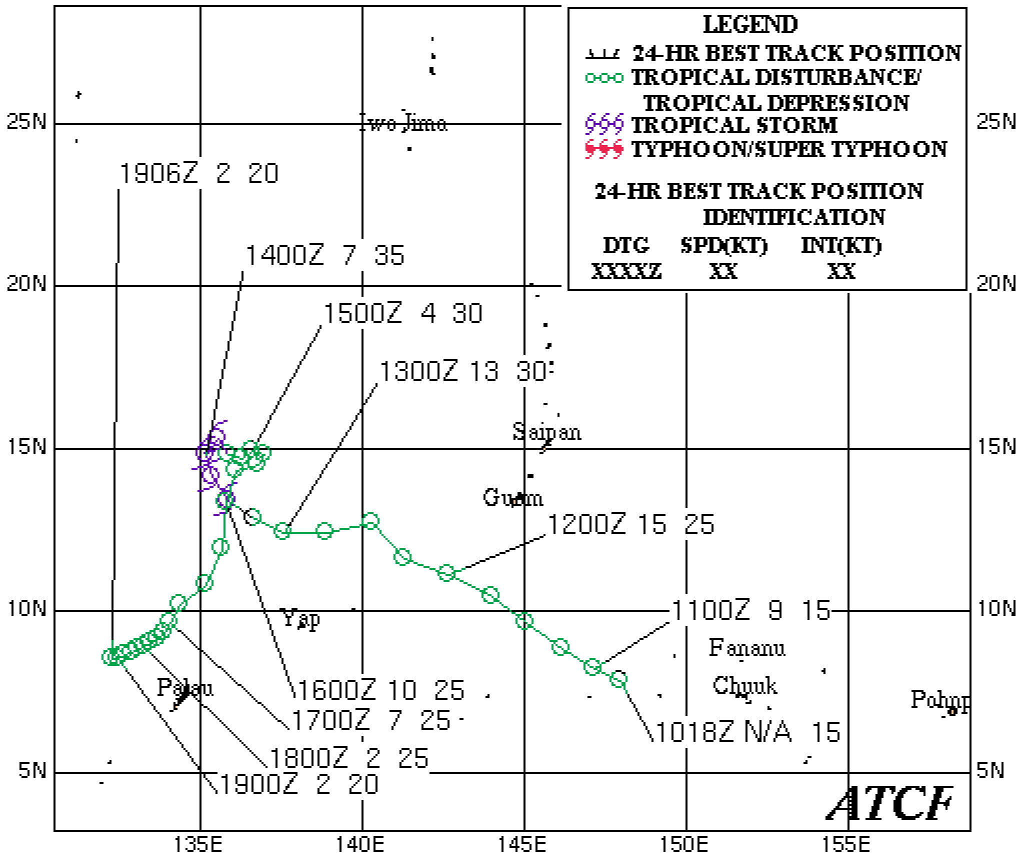
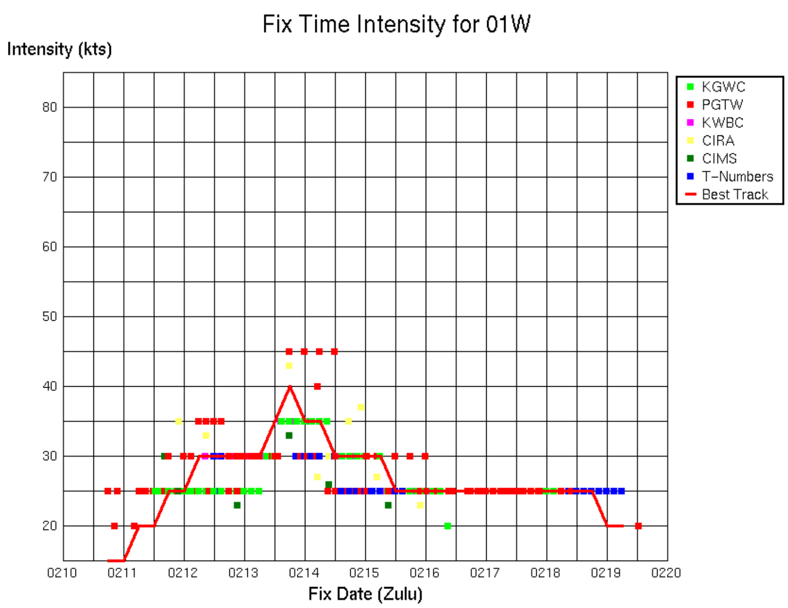


Figure 1-01W-1. 14/1154Z February 2004 Mulit-Sensor images of TS 01W, fully exposed Low-Level circulation center to the South of associated convection with a max intensity of 45kts.

TROPICAL STORM 01W
10-19 FEB 2004





Tropical Storm (TS) 02W

First Poor : 1130Z 14 Mar 04
First Fair : 1400Z 14 Mar 04
First TCFA : 0900Z 16 Mar 04
First Warning : 1200Z 16 Mar 04
Last Warning : 0600Z 22 Mar 04, Dissipated over water
Max Intensity : 45 kts, gusts to 55 kts
Landfall : None
Total Warnings : 24
Remarks:
1) Tropical Storm (TS) 02W formed approximately 460 nm southeast of the island of Yap and initially moved northwestward towards a weakness in the subropical ridge. As the weakness developed, TS 02W began moving more poleward in the Philippine Sea east of Luzon while reaching maximum intensity of 45 kts. The cyclone then transitioned to a more northeastward track as it crested the subtropical ridge and began to encounter high vertical shear produced by the mid-latitude westerlies. The deep convection then became decoupled and the fully exposed low level circulation center drifted off to the northeast and dissipated.
2) No damage reports were received for this cyclone.

Statistics for JTWC on TS 02W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04031400		3.0N	143.3E	20																
04031406		4.0N	142.3E	20																
04031412		5.2N	141.5E	20																
04031418		5.9N	140.9E	20																
04031500		6.5N	140.2E	20																
04031506		6.9N	139.5E	20																
04031512		7.0N	138.7E	25																
04031518		6.9N	138.2E	25																
04031600		6.6N	137.9E	25																
04031606		6.3N	137.6E	25																
04031612	1	5.9N	137.1E	30	26	80	92	68	42	71			0	5	15	30	35	45		
04031618	2	5.6N	136.6E	30	148	196	198	182	169	222	263	328	5	15	30	40	25	10	5	15
04031700	3	5.5N	135.9E	30	13	13	31	76	118	188	252	361	5	15	30	35	35	10	5	15
04031706	4	5.7N	134.9E	30	8	38	95	118	108	152			0	10	15	10	15	20		
04031712	5	6.2N	133.9E	30	5	40	87	109	114	169			0	10	10	10	15	20		
04031718	6	7.0N	132.9E	25	34	80	121	120	125	187			0	5	0	5	10	10		
04031800	7	7.8N	131.7E	25	16	54	79	99	123	201			0	0	0	5	10	5		
04031806	8	8.7N	130.6E	25	5	42	80	126	151	228			0	-5	0	0	0	0		
04031812	9	9.6N	129.7E	30	26	37	95	135	181	287			0	5	0	0	-5	-5		
04031818	10	10.4N	128.6E	35	34	56	94	104	134	188	199		0	10	10	0	0	0	10	
04031900	11	11.0N	128.0E	35	42	59	101	115	128	175	201		0	5	0	-5	-10	0	5	
04031906	12	11.6N	127.4E	35	25	30	32	51	57	40	241		0	0	5	10	10	15	10	

04031912	13	12.2N	126.8E	35	8	30	59	72	96	21	263		0	0	5	5	10	15	10	
04031918	14	12.7N	126.3E	35	46	59	78	73	55	79			0	0	5	5	15	15		
04032000	15	13.2N	125.7E	35	11	17	13	6	21	152			0	5	10	10	15	15		
04032006	16	13.7N	125.1E	35	23	17	17	42	99	242			0	5	10	15	15	15		
04032012	17	14.3N	124.9E	35	13	17	43	57	198	420			0	0	5	20	15	15		
04032018	18	14.7N	124.5E	35	8	13	24	44	127				10	15	25	20	10			
04032100	19	15.0N	124.1E	35	17	58	55	109	194				10	10	20	15	15			
04032106	20	15.5N	124.0E	35	6	35	72	167	352				5	10	10	10	10			
04032112	21	16.0N	124.2E	35	31	120	275	472	717				0	5	5	5	5			
04032118	22	16.5N	124.2E	30	86	179	343	560					0	0	-5	0				
04032200	23	16.9N	124.2E	25	16	50	98						0	-5	-5					
04032206	24	16.8N	124.5E	25	18	84	128						0	0	0					
04032212		16.7N	124.9E	25																
04032218		16.7N	125.3E	25																
04032300		17.0N	125.6E	20																
04032306		17.3N	126.0E	20																
04032312		17.9N	126.1E	20																
			AVERAGE		28	59	96	132	158	178	237	344	1	6	9	12	13	13	8	15
			BIAS										1	5	8	11	12	12	8	15
			# CASES		24	24	24	22	21	17	6	2	24	24	24	22	21	17	6	2

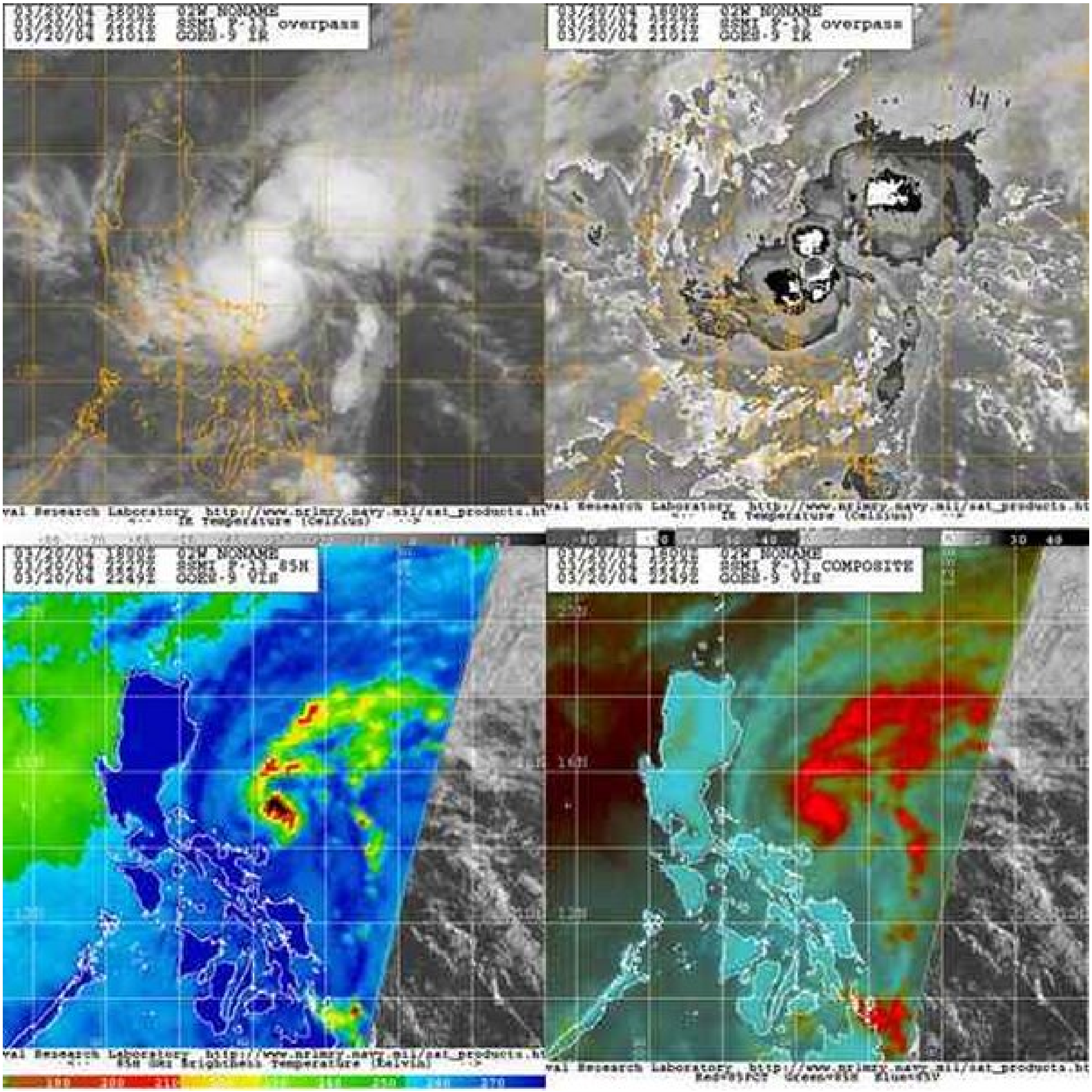
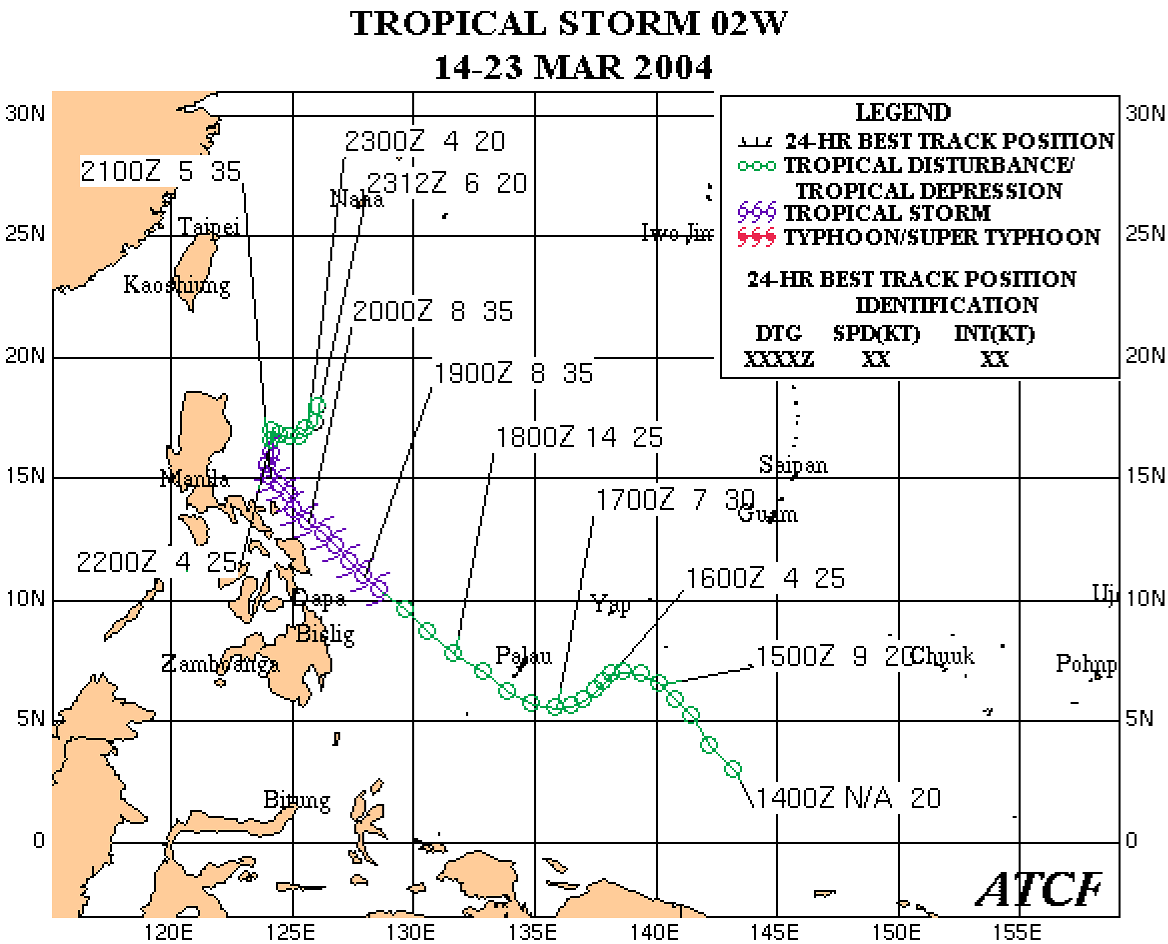
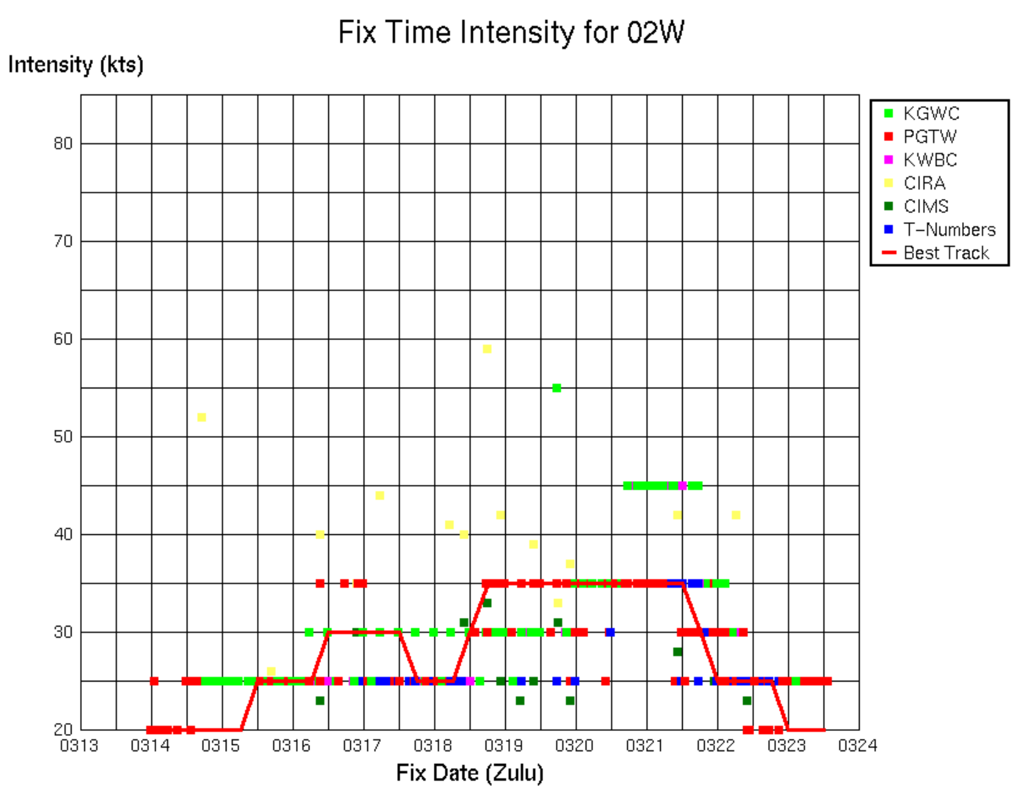


Figure 1-02W-1. 202227Z March 2004 Multi-Sensor satellite images of TS 02W, Low-Level circulation center is partially exposed to the west of deep convection and located just East of the Phillipine coastline with a peak intensity of 45kts.



TROPICAL STORM 02W
14-23 MAR 2004
LEGEND
24-HR BEST TRACK POSITION
TROPICAL DISTURBANCE/ TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON/SUPER TYPHOON
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
2300Z 4 20
2312Z 6 20
2100Z 5 35
2000Z 8 35
1900Z 8 35
1800Z 14 25
1700Z 7 30
2200Z 4 25
1600Z 4 25
1500Z 9 20
1400Z N/A 20
Naha
Taipei
Kaoshiung
Iwo Jim
Saipan
Manila
Guam
Dapa
Yap
Bislig
Zamboanga
Palau
Chuuk
Pohnp
Bitung
30N
25N
20N
15N
10N
5N
0
120E
125E
130E
135E
140E
145E
150E
155E
ATCF



Fix Time Intensity for 02W
Intensity (kts)
80
70
60
50
40
30
20
0313
0314
0315
0316
0317
0318
0319
0320
0321
0322
0323
0324
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
T-Numbers
Best Track

Super Typhoon (STY) 03W (Sudal)

First Poor : 0600Z 28 Mar 04

First Fair : 0000Z 02 Apr 04

First TCFA : 0300Z 02 Apr 04

First Warning : 0000Z 04 Apr 04

Last Warning : 1800Z 15 Apr 04, Extra-tropical

Max Intensity : 130 kts, gusts to 160 kts

Landfall : None

Total Warnings : 48

Remarks:

1) Super Typhoon (STY) 03W formed approximately 100 nm east-southeast of Chuuk under the influnce of a low to mid-level ridge centered to the north. As the developing cyclone became more organized, it began to track westward along the southern periphery of the steering ridge. The cyclone exhibited an erratic stairstep track pattern from the 05 to 09 Apr as the strength and western extent of the steering ridge fluctuated. Additionally, the cyclone continued to intensify in an environment of weak vertical wind shear and good poleward outflow. The cyclone began to track northwestward along the southwestern periphery of the steering ridge on 08 Apr and then around 0000z 09 Apr the 110 kt cyclone passed 25 nm to the south of Yap atoll. After passing Yap, STY 03W continued to intensify reaching a maximum intensity of 130 kts on 10 Apr when concentric eyewalls were noted in microwave imagery. This intensity was maintained for 12 hours as the cyclone approached the subtropical ridge axis. As the system crested the axis of the sub-tropical ridge it began to track northeastward and interact with the mid-latitude westerlies and the baroclinic zone south and east of Japan. STY 03W began to undergo extratropical transition and weaken on 15 Apr due to increased vertical wind shear, decreased outflow, and cooler sea surface temperatures. The cyclone also began to accelerate northeastward and passed within 10 nm of Iwo Jima between 0600Z and 1200Z on 15 Apr. Subsequently, the cyclone became extra-tropical and the final warning was issued at 1800Z on 15 Apr.

2) STY 03W passed 25 nm to the south of Yap atoll on 09 Apr, causing significant damage to agriculture and to 90% of the buildings on the island. Additionally, one fatality, one injury, and 1,500 homeless were reported. The cyclone also passed within 10 nm of Iwo Jima, Japan, but no damages were reported.

Statistics for JTWC on STY 03W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
4040200		6.9N	153.6E	25																
4040206		6.7N	153.2E	25																
4040212		6.5N	152.9E	25																
4040218		6.3N	152.6E	25																
4040300		6.1N	152.2E	25																
4040306		6.1N	151.7E	25																
4040312		6.3N	151.2E	25																

4040318		6.4N	150.7E	25																
4040400	1	6.4N	150.3E	30	5	8	36	92	67	101			0	0	5	0	0	0		
4040406	2	6.5N	149.8E	30	11	31	72	88	96	165			0	5	5	10	10	0		
4040412	3	6.9N	149.5E	35	21	8	55	56	92	189	242	276	0	5	5	5	0	-5	-15	-5
4040418	4	7.4N	149.2E	35	0	68	82	85	129	202	215	209	0	-5	5	0	-5	-10	-15	-20
4040500	5	8.1N	149.1E	40	13	42	30	65	86	160	182	160	0	-5	-5	-10	-5	-15	-15	-25
4040506	6	8.9N	148.9E	50	5	24	59	53	101	186	206	243	5	15	10	5	0	-15	-5	-15
4040512	7	9.4N	148.3E	55	8	54	60	48	106	189	206	235	0	0	0	5	0	-15	-10	-5
4040518	8	9.5N	147.6E	55	11	74	48	63	109	158	134	124	0	0	0	-10	-10	-15	-20	-5
4040600	9	9.1N	146.9E	65	18	31	22	60	102	121	70	107	-5	-5	-5	-5	-10	-10	-20	5
4040606	10	9.1N	146.1E	65	8	40	12	54	96	111	89	119	5	0	-5	0	-10	5	-5	15
4040612	11	9.4N	145.4E	75	31	19	51	102	142	161	161	196	-5	0	-5	-5	-10	0	5	20
4040618	12	10.0N	144.9E	75	23	21	65	114	144	163	206	214	0	-5	-5	-15	-5	-5	10	15
4040700	13	10.1N	144.1E	80	11	60	110	159	176	192	213	222	0	0	-5	-15	0	-10	10	15
4040706	14	10.1N	143.1E	90	0	72	126	150	162	172	201	228	0	5	-5	10	15	0	20	10
4040712	15	9.7N	142.2E	90	5	19	73	114	109	115	107	153	0	0	-5	5	5	5	25	0
4040718	16	9.4N	141.3E	95	0	35	68	86	102	157	177	213	-5	-15	-5	5	-5	10	0	-15
4040800	17	9.2N	140.6E	100	6	51	75	93	102	137	196	303	0	-5	5	5	-5	10	-5	-25
4040806	18	8.9N	139.9E	115	0	8	22	31	48	105	100	186	-10	0	5	-5	-5	15	10	-20
4040812	19	8.8N	139.1E	115	0	21	6	18	59	102	46	131	-5	5	5	-5	10	25	10	-10
4040818	20	9.0N	138.4E	110	13	31	24	27	53	86	143	165	0	5	-5	-5	15	5	-15	-25
4040900	21	9.2N	138.0E	110	8	36	48	74	93	188	302	295	0	0	-10	5	10	0	-20	-15
4040906	22	9.6N	137.2E	110	6	13	37	66	72	72	126	162	0	-10	-10	10	15	15	-10	-15
4040912	23	10.0N	136.5E	115	8	22	43	64	77	79	62	130	-5	-15	0	10	20	5	-5	-20
4040918	24	10.4N	135.8E	125	8	8	24	29	30	19	89	109	0	0	20	25	25	15	-5	-5
4041000	25	10.9N	135.1E	130	5	13	17	27	35	21	114	132	0	15	25	30	25	10	0	-10
4041006	26	11.4N	134.3E	130	13	19	17	21	26	76	186	312	0	20	25	30	30	0	-10	-5
4041012	27	11.8N	133.5E	120	5	19	21	17	6	51	123	177	10	15	25	25	5	-15	-20	5
4041018	28	12.4N	132.7E	115	5	6	6	38	59	90	96	136	15	15	20	15	0	-20	-15	15
4041100	29	13.2N	132.2E	115	0	0	0	13	48	60	138		15	25	20	5	-10	-20	-20	
4041106	30	13.7N	131.7E	115	5	13	13	38	57	49	294		5	5	0	-10	-35	-35	-20	
4041112	31	14.3N	131.4E	110	8	17	26	54	66	16	224		0	-15	-30	-40	-45	-50	-15	
4041118	32	14.8N	131.2E	115	5	21	38	62	62	81	235		-5	-15	-30	-45	-45	-45	-5	
4041200	33	15.3N	131.0E	115	8	13	36	48	36	65			-10	-20	-30	-35	-40	-40		
4041206	34	15.8N	130.9E	115	8	29	25	18	25	66			0	-15	-25	-25	-30	-15		
4041212	35	16.3N	131.1E	120	0	13	8	13	38	87			5	0	-5	-15	-25	0		
4041218	36	16.7N	131.3E	120	0	19	46	65	85	66			0	-5	0	-15	-20	10		
4041300	37	17.2N	131.6E	120	8	26	59	101	147				0	5	0	-15	-10			
4041306	38	17.8N	132.0E	125	8	90	152	162	130				-5	5	0	-5	5			
4041312	39	18.6N	132.5E	115	0	6	34	24	55				5	5	-5	-5	15			
4041318	40	19.5N	133.1E	115	5	11	45	101	150				0	0	-5	-5	15			
4041400	41	20.5N	133.9E	105	0	21	66	144					0	-10	-15	0				
4041406	42	21.4N	135.1E	105	0	25	69	124					0	0	0	20				
4041412	43	22.3N	136.4E	100	5	30	54						5	10	35					
4041418	44	23.1N	137.8E	90	12	53	93						10	20	40					

4041500	45	23.8N	139.4E	85	22	36							5	20						
4041506	46	24.4N	141.0E	70	22	84							-5	15						
4041512	47	25.2N	143.1E	55	8								0							
4041518	48	26.1N	144.5E	40	84								10							
			AVERAGE		10	30	47	68	84	113	163	190	3	8	11	12	14	13	12	13
			BIAS										1	2	1	-2	-3	-6	-6	-5
			# CASES		48	46	44	42	40	36	30	26	48	46	44	42	40	36	30	26

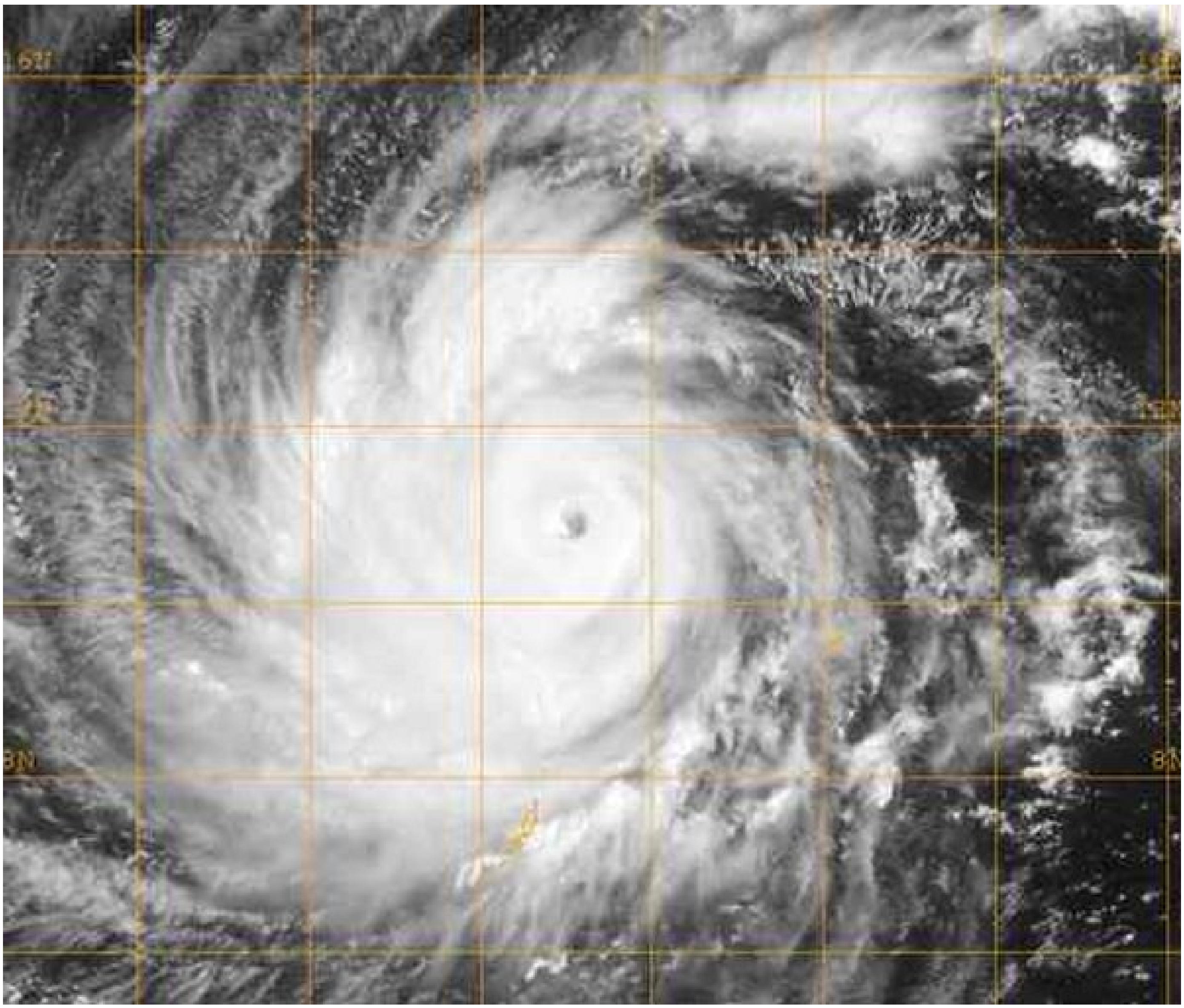


Figure 1-03W-1. 100102Z April 2004 Goes-9 visible imagery of STY 03W (Sudal), located approximately 200 nm North of Palau with a peak intensity of 130kts.

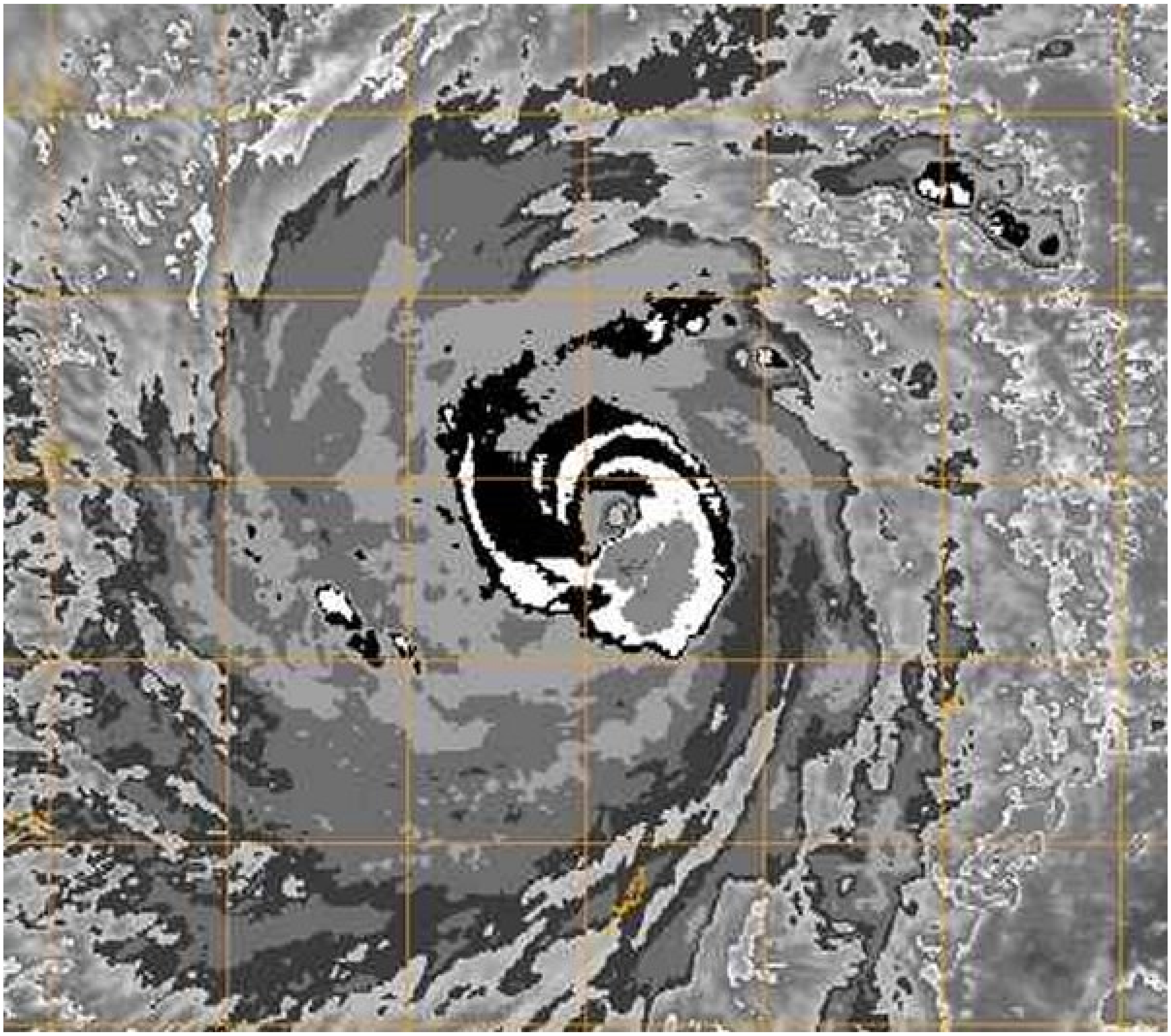


Figure 1-03W-2. 100706Z April 2004 TRMM Goes-9 BD image of STY 03W (Sudal), revealing a pinhole eye with a peak intensity of 130kts.

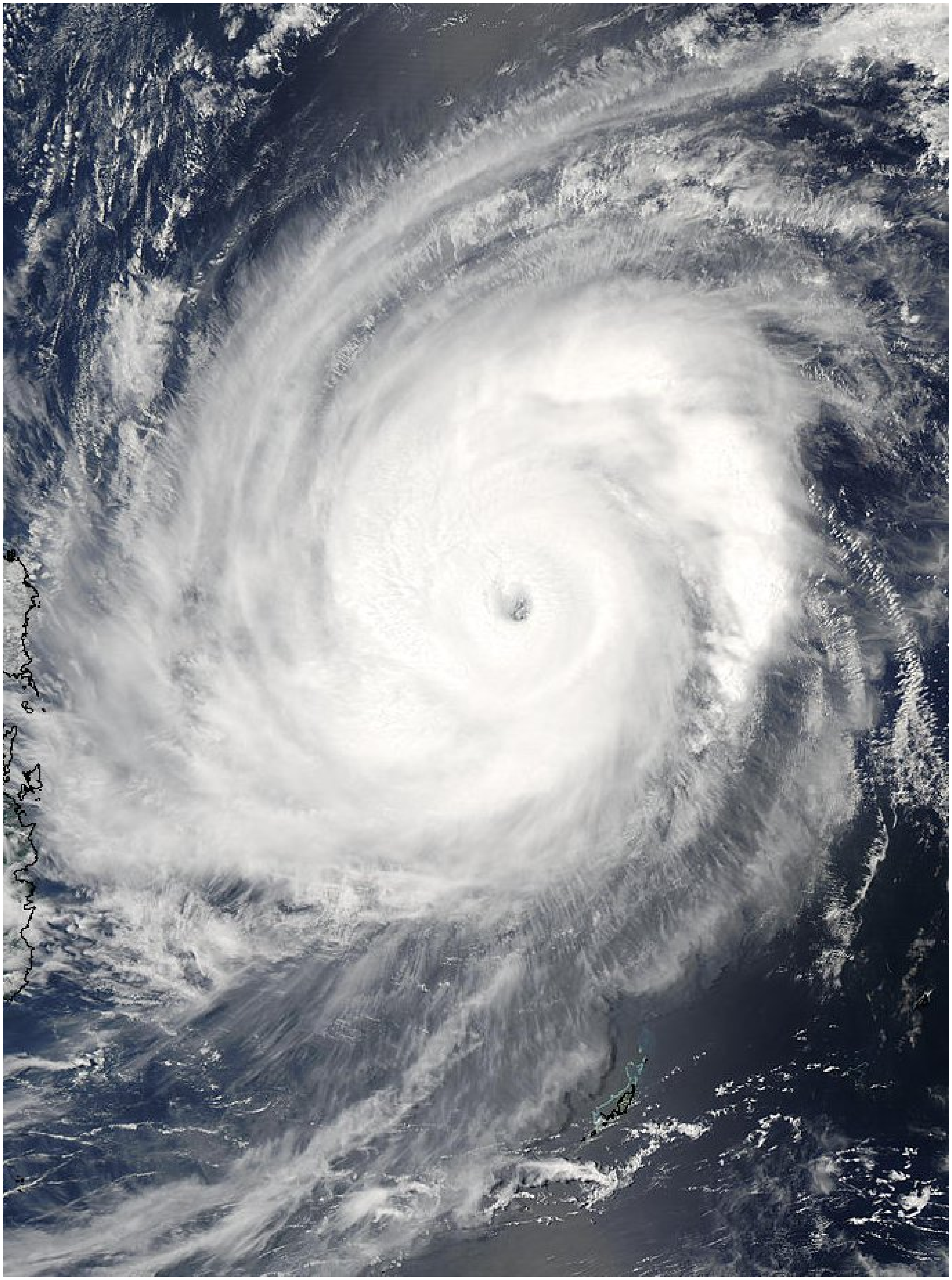


Figure 1-03W-3. 110425Z April 2004 MODIS true-color image of STY 03W (Sudal), located 400 nm east of the Philippines with an intensity of 130 knots.

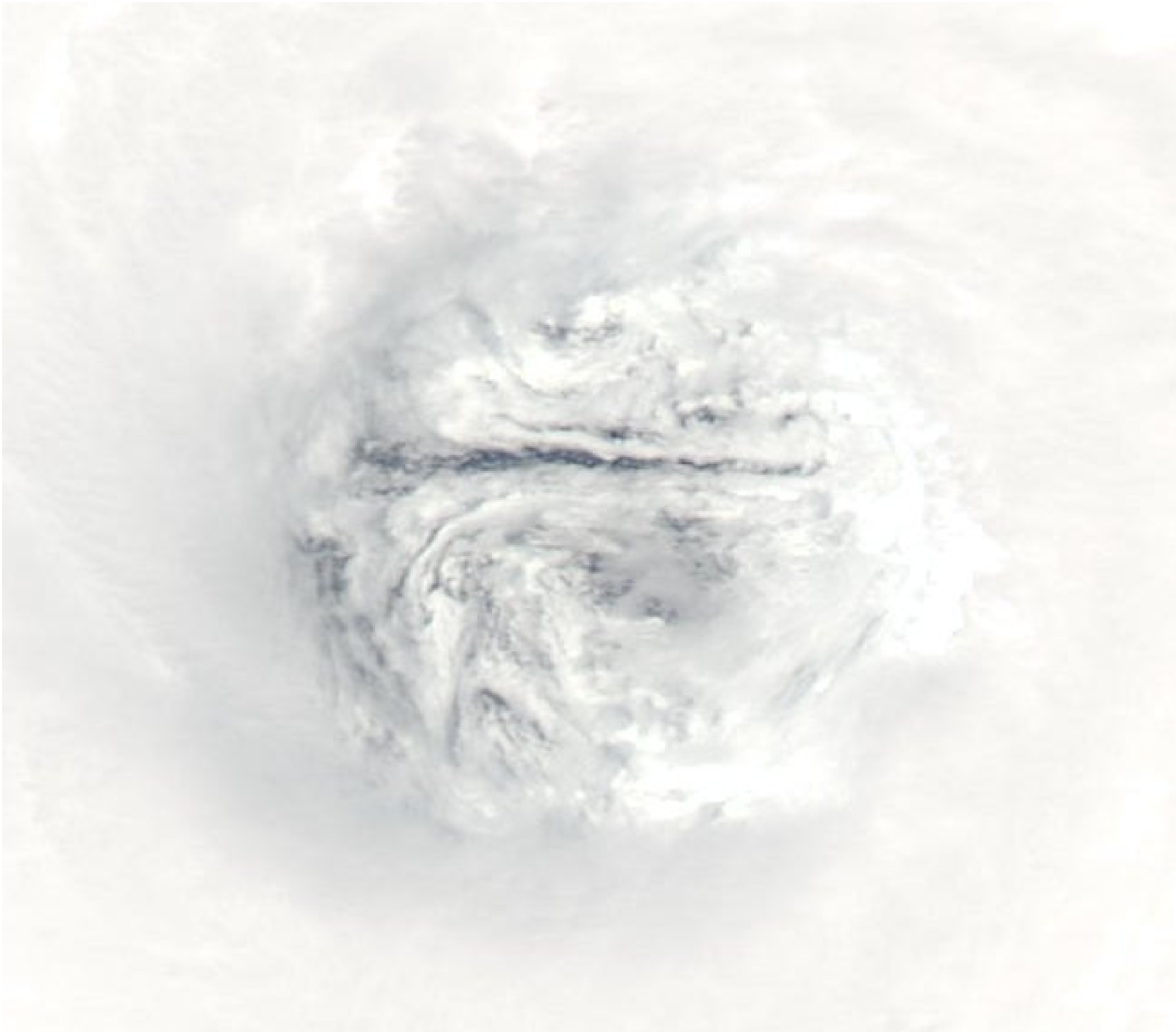
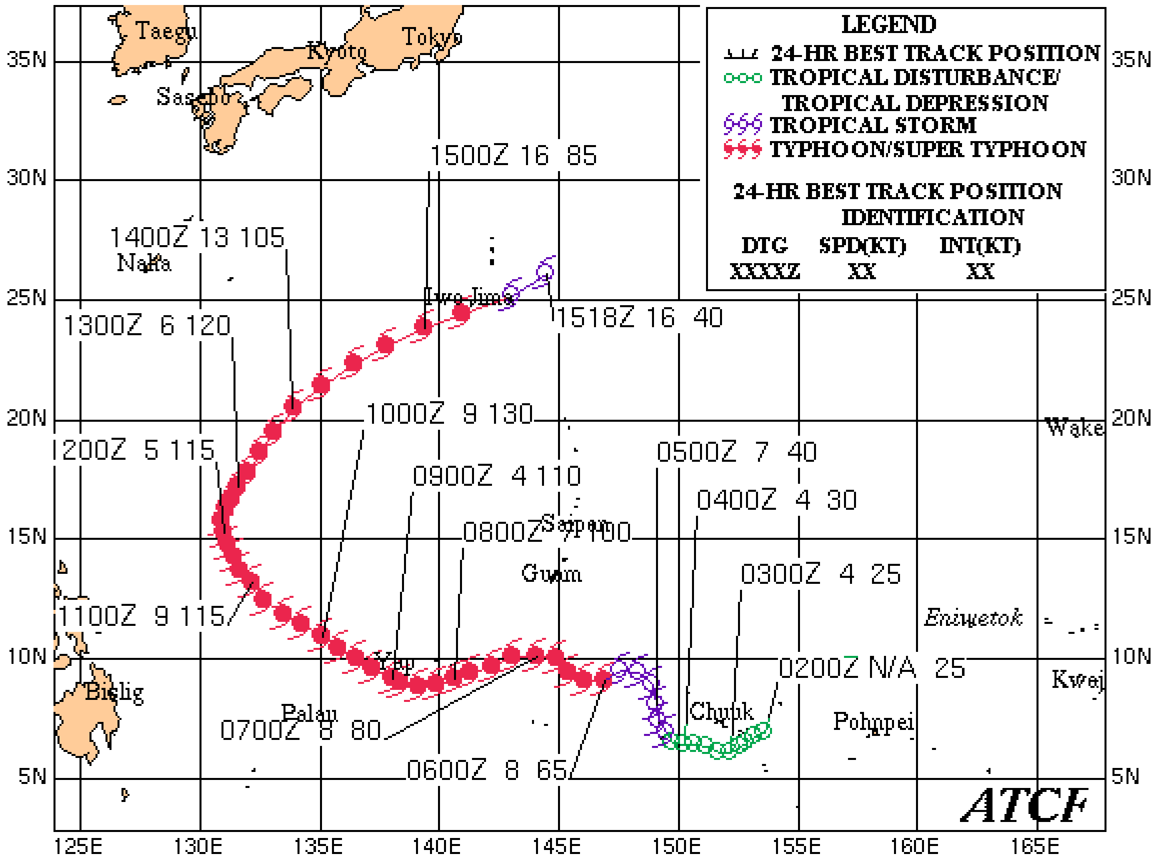
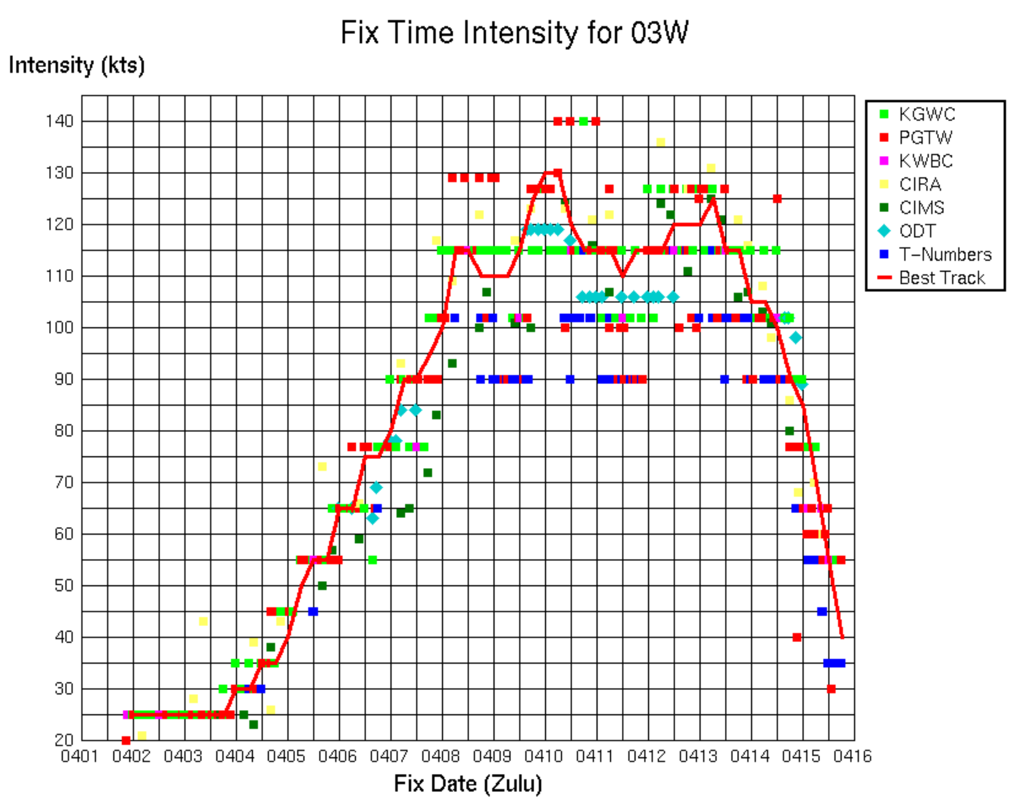


Figure 1-03W-4. 130415Z April 2004 MODIS true-color image of eye detail in STY 03W (Sudal) at 250m resolution, located 560 nm south-southeast of the Okinawa with an intensity of 120 knots.

SUPER TYPHOON 03W (SUDAL)
02-15 APR 2004





Super Typhoon (STY) 04W (Nida)

First Poor : 0000Z 12 May 04

First Fair : 0600Z 13 May 04

First TCFA : 1200Z 13 May 04

First Warning : 1200Z 13 May 04

Last Warning : 0600Z 21 May 04, Extra-tropical

Max Intensity : 140 kts, gusts to 170 kts

Landfall : None

Total Warnings : 32

Remarks:

1) Super Typhoon (STY) 04W formed as a tropical depression approximately 95 nm west northwest of Palau. The cyclone quickly intensified to 50 kts within 12 hours and reached typhoon strength by 14 May at 1200Z. Between 15 May at 1200Z and 16 May at 0600Z, a second rapid intensification phase occurred as the intensity increased from 90 kts to 140 kts due to enhanced poleward outflow caused by an upper level trough situated to the north and sustained equatorial outflow. STY 04W remained at super typhoon strength as it tracked along the east coast of the Philippines and until 18 May at 1200Z when a gradual decrease in intensity began as the cyclone passed poleward of the ridge axis and encountered increased vertical wind shear. By 20 May at 1800Z, an approaching shortwave trough in the mid-latitude westerlies weakened the subtropical ridge and the cyclone began extratropical transition. The cyclone accelerated to a maximum of 44 kts by 21 May at 0000Z and completed transition to an extratropical low at 0600Z. STY 04W followed a climotological recurvature track starting near Palau and around the western periphery of the sub-tropical steering ridge becoming extra-tropical east of Japan.

2) Reports from the Phillipines indicate crop and infrastructure damage was estimated at $1.3 million, including 700 destroyed homes and 31 casualties or missing persons reported. Nearly 11,000 people were displaced from their homes, and 15,000 others were stranded as ferry services between Luzon and the central islands were suspended.

Statistics for JTWC on STY 04W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04051300		7.3N	131.8E	15																
04051306		7.5N	132.0E	20																
04051312	1	7.8N	132.2E	25	71	99	115	126	119	138			0	-10	-25	-35	-35	-80		
04051318	2	8.2N	132.1E	30	6	19	51	91	139	179			-5	-20	-30	-45	-50	-80		
04051400	3	8.4N	131.7E	45	11	24	63	114	159	185	174	172	5	0	-5	-5	-25	-35	-30	-20
04051406	4	8.6N	131.3E	55	6	30	72	126	159	182	177	183	5	10	5	0	-20	-30	-20	-5
04051412	5	8.9N	131.0E	65	0	25	81	126	159	190	192	169	0	0	0	-20	-40	-30	-20	-10
04051418	6	9.3N	130.5E	70	5	48	94	126	131	142	221	317	0	-10	-10	-25	-30	-25	-30	-25
04051500	7	9.5N	129.9E	80	6	49	96	139	134	96	259	357	0	0	-15	-30	-20	-25	-20	-15
04051506	8	9.8N	129.1E	90	13	47	98	109	134	140	313	469	0	-5	-15	-25	-10	-25	-15	-10
04051512	9	10.2N	128.4E	90	5	51	71	91	106	143	425	643	0	-15	-30	-10	-10	-25	-20	-15
04051518	10	10.7N	127.8E	100	5	21	31	60	90	154	334	283	0	-15	-20	-10	-10	-20	-15	0
04051600	11	11.2N	127.0E	115	18	31	74	83	117	343	476	528	0	-15	0	5	-15	-5	-15	-5
04051606	12	11.9N	126.4E	125	5	26	64	85	117	191	394	328	5	-5	10	15	5	0	-5	15
04051612	13	12.6N	125.7E	140	6	38	63	80	120	160	249		0	15	20	15	10	5	5	
04051618	14	13.4N	124.8E	140	5	45	79	142	204	273	311		0	10	5	5	-5	-15	10	
04051700	15	13.9N	124.3E	130	13	48	72	119	152	184	246		0	5	5	-10	-5	-5	-5	
04051706	16	14.6N	123.9E	130	8	30	43	54	79	120	138		5	15	10	5	10	5	10	
04051712	17	15.4N	123.7E	125	11	8	31	45	85	118			10	10	5	10	10	10		
04051718	18	16.1N	123.6E	125	0	11	8	18	49	209			5	5	5	10	10	20		
04051800	19	16.9N	123.6E	125	8	8	8	56	92	297			5	5	10	10	10	10		
04051806	20	17.6N	123.7E	125	5	8	28	77	140	327			5	5	10	10	10	20		
04051812	21	18.3N	124.0E	120	16	13	57	99	179				5	10	10	15	10			
04051818	22	19.2N	124.5E	115	8	25	68	115	198				0	5	5	10	15			
04051900	23	20.2N	125.2E	105	0	51	76	140	205				0	0	-5	-5	0			
04051906	24	21.3N	126.6E	100	12	51	87	172	216				0	-5	-5	5	5			
04051912	25	22.5N	128.1E	95	8	37	98	166					-5	-5	-5	0				
04051918	26	23.8N	129.9E	90	11	38	133	126					-5	0	10	10				
04052000	27	25.3N	131.8E	80	16	60	115						0	0	5					
04052006	28	26.9N	134.4E	75	11	63	131						5	15	15					
04052012	29	28.9N	137.0E	70	31	113							10	15						
04052018	30	30.5N	140.3E	55	7	145							5	5						
04052100	31	33.8N	143.3E	55	24								0							
04052106	32	37.7N	146.0E	45	24								0							
			AVERAGE		12	42	72	103	137	189	279	345	3	8	11	13	15	24	16	12
			BIAS										2	1	-1	-4	-8	-17	-12	-9
			# CASES		32	30	28	26	24	20	14	10	32	30	28	26	24	20	14	10

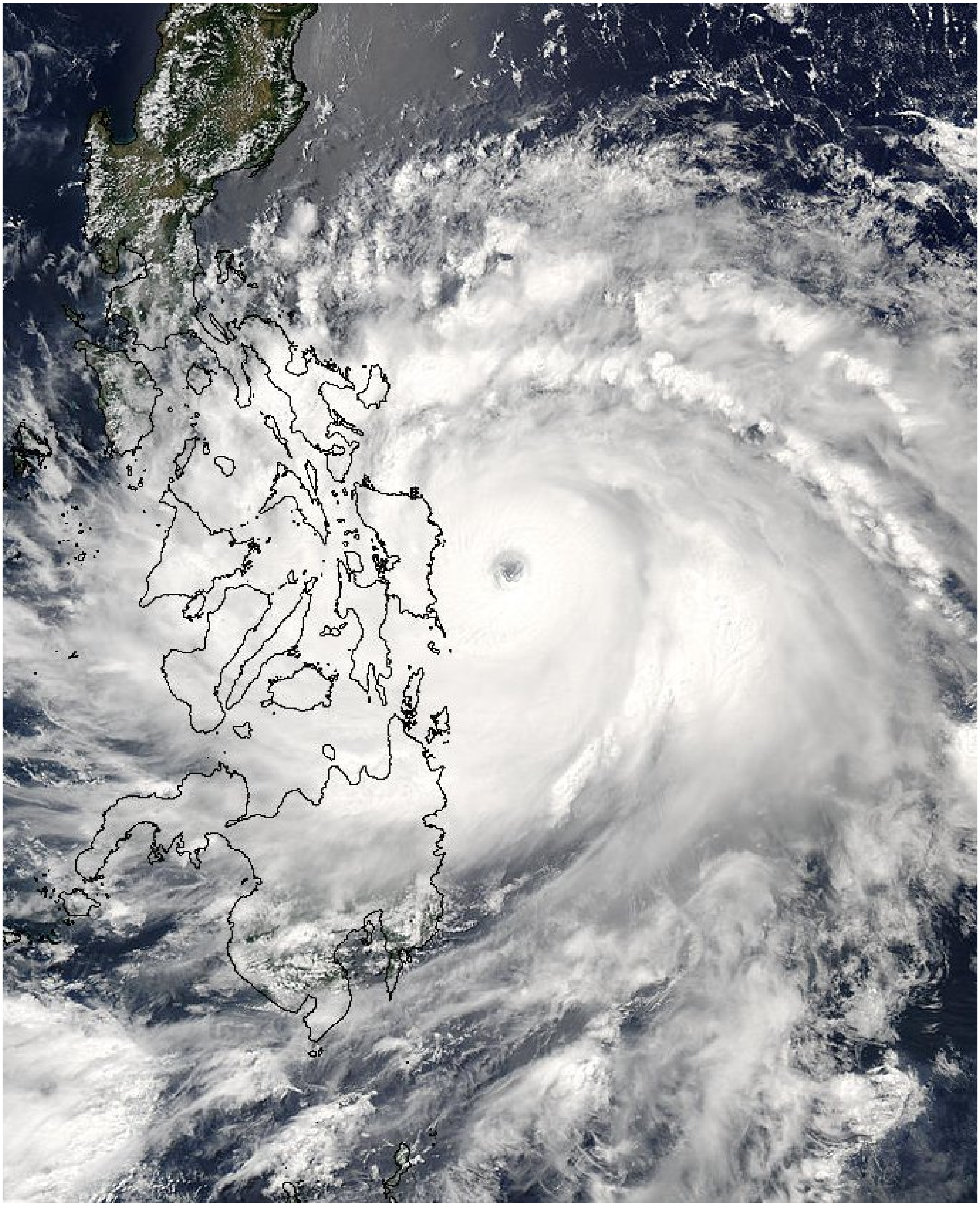


Figure 1-04W-1. 160500Z May 2004 MODIS true-color image of STY 04W (Nida), located just east of the Philippines coast with an intensity of 140 knots.

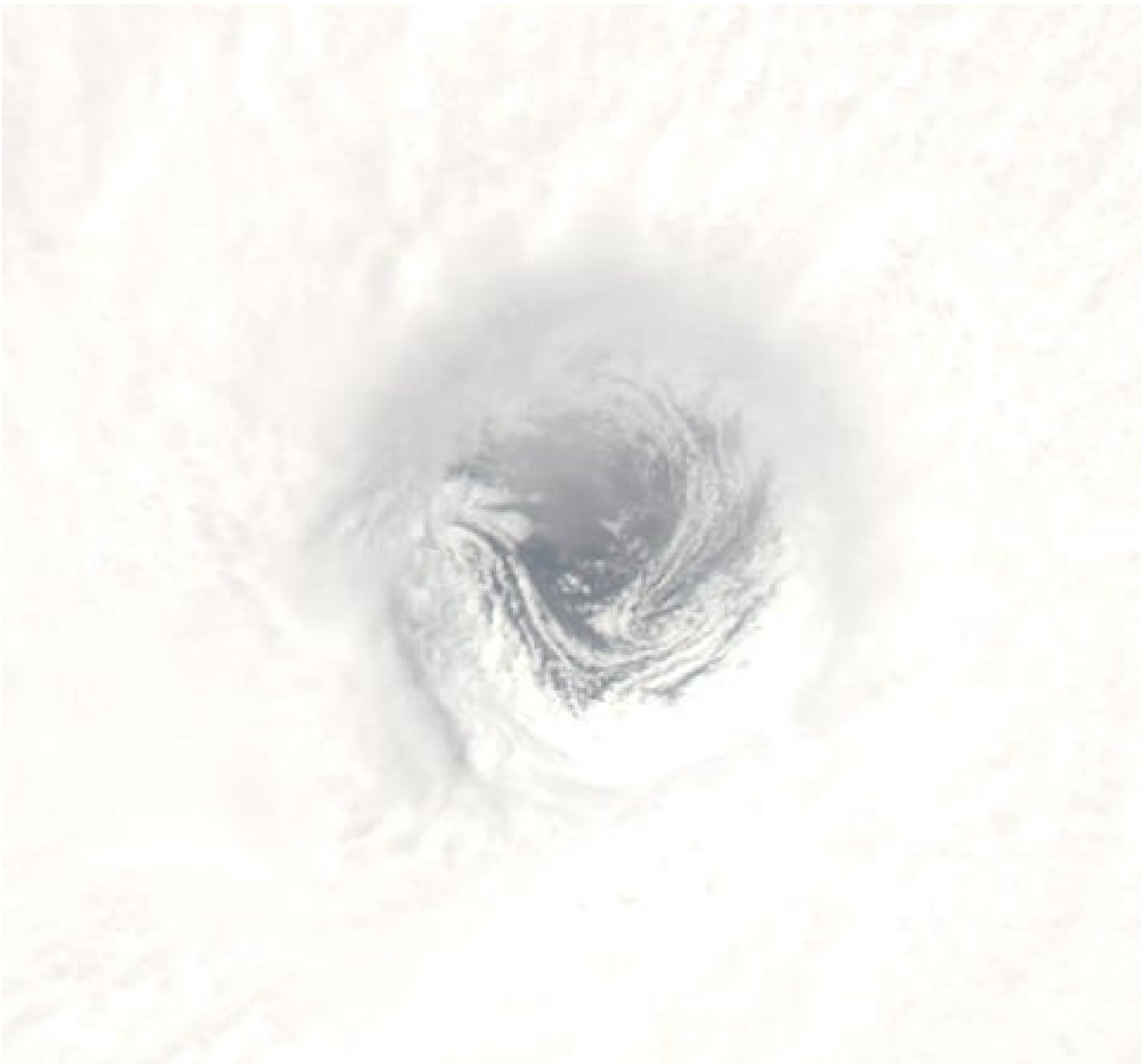


Figure 1-04W-2. 160500Z May 2004 MODIS true-color image depicting eye detail in STY 04W (Nida), located just east of the Philippines coast with an intensity of 140 knots. Resolution of image is 250m.

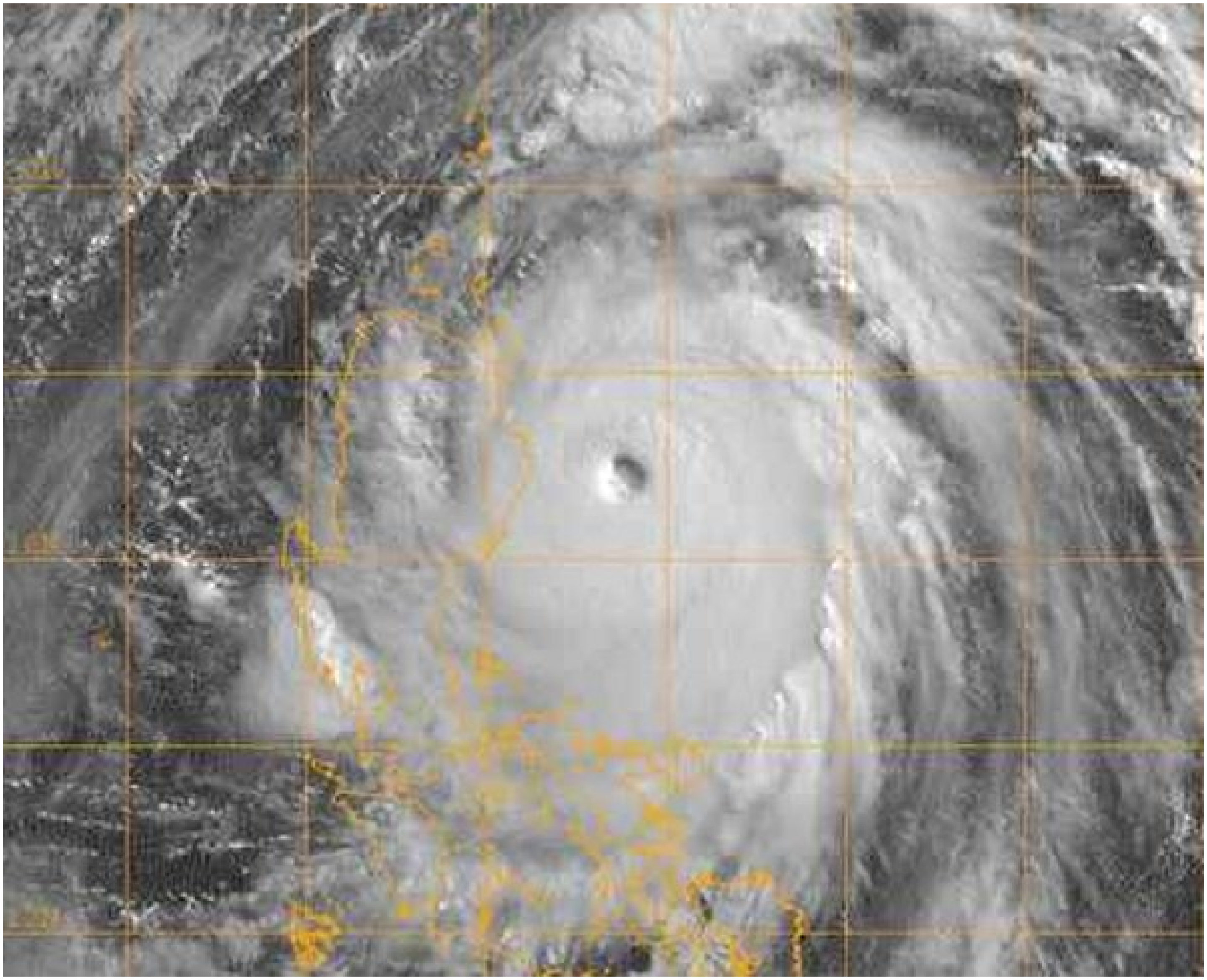


Figure 1-04W-3. 172249Z May 2004 Goes-9 Visible Imagery of STY 04W (NIDA), revealing a symmetrical eye off the east coast of Luzon with a peak intensity of 130kts.

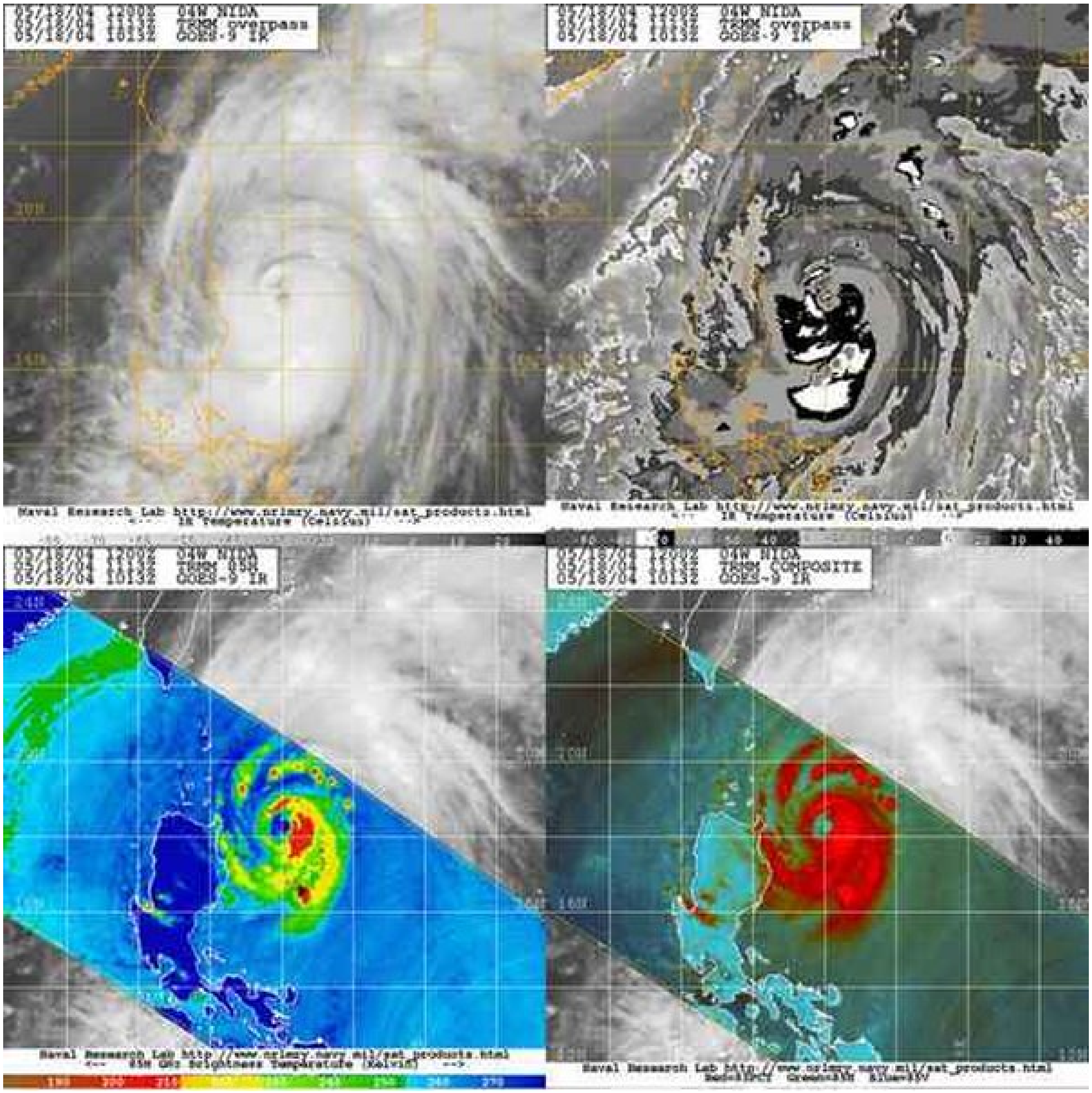
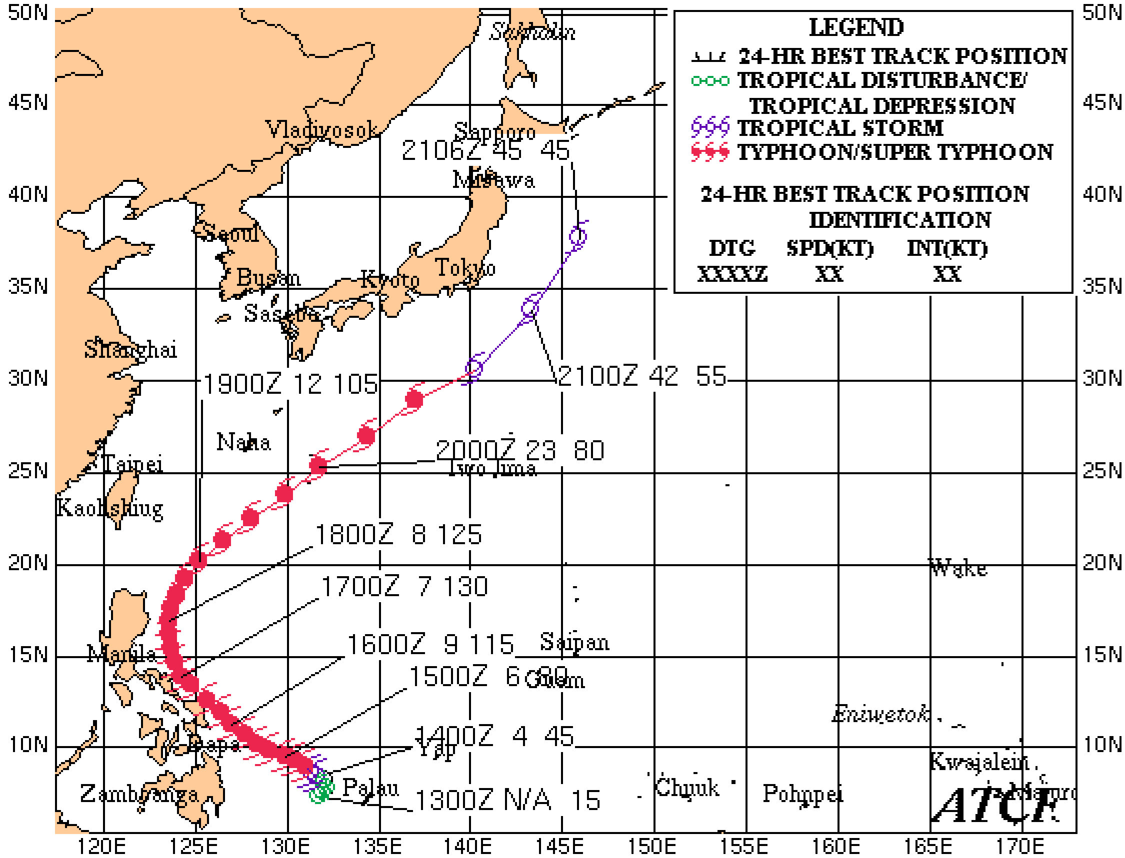
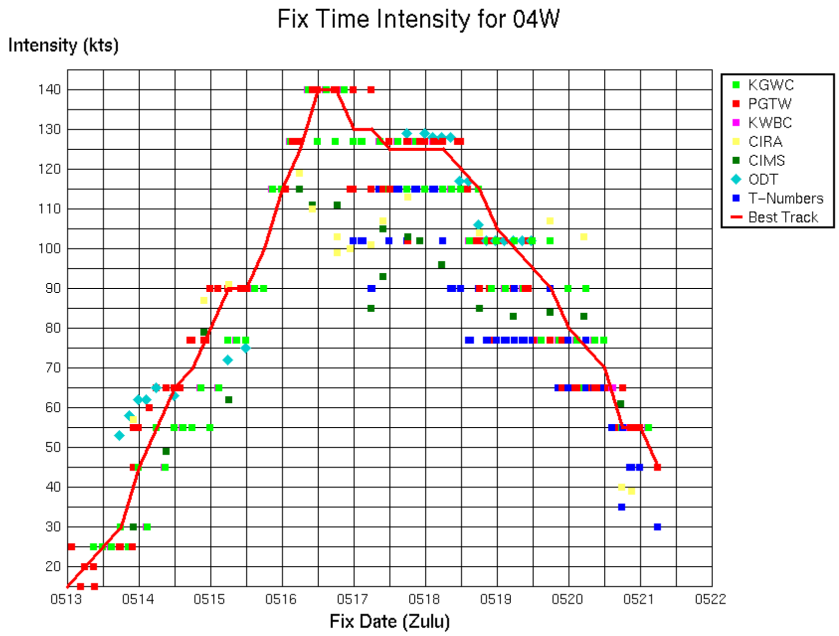


Figure 1-04W-4. 181113Z May 2004 TRMM Multi-Sensor satellite images of STY 04W (NIDA), reveals a ragged eye off the east coast of Luzon with small areas of dry air are invading the western side of the system. The outer bands on the west side are also beginning to interact with Northern Luzon. Systems peak intensity is 125kts.

SUPER TYPHOON 04W (NIDA)
12-21 MAY 2004





Tropical Depression (TD) 05W

First Poor : 1500Z 13 May 04

First Fair : 0600Z 14 May 04

First TCFA : 0600Z 14 May 04

First Warning : 1200Z 15 May 04

Last Warning : 0600Z 17 May 04, Dissipated over water

Max Intensity : 35 kts, gusts to 50 Kts

Landfall : None

Total Warnings : 8

Remarks:

1) Tropical Storm (TS) 05W, developed in the South China Sea approximately 400 nm east of Vietnam and initially tracked westward at 5 to 7 kts along the southern periphery of the mid-level subtropical ridge. A mid-latitude trough tracking eastward to the north created a weakness in the subtropical ridge allowing TS 05W to recurve poleward and track northeastward. Subsequently, the cyclone entered an environment of high vertical wind shear and the deep convection decoupled from the low level circulation center east of Nha Trang, Vietnam. The exposed low level circulation center moved northeastward and dissipated after 96 hours.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TD 05W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04051400		9.2N	113.8E	25																
04051406		9.4N	113.2E	25																
04051412		9.6N	112.6E	25																
04051418		9.7N	112.0E	25																
04051500		9.7N	111.4E	25																
04051506		9.5N	110.9E	25																
04051512	1	9.5N	110.4E	25	13	36	64	89	83	75			0	-5	0	5	15	20		
04051518	2	9.6N	109.9E	25	16	30	54	73	77				5	0	5	15	20			
04051600	3	9.9N	109.5E	30	37	125	61	24	71				0	5	5	15	20			
04051606	4	9.7N	108.9E	35	16	42	96	133	167				0	10	15	10	5			

04051612	5	9.7N	108.2E	30	16	109	130	116	84				5	5	10	15	15			
04051618	6	10.0N	108.8E	30	56	115	196	248					0	5	0	0				
04051700	7	10.3N	109.1E	30	24	18	19	17					0	5	10	15				
04051706	8	10.0N	109.4E	25	21	19	30						0	-5	-5					
04051712		10.1N	109.8E	25																
04051718		10.3N	110.1E	25																
04051800		10.5N	110.4E	25																
04051806		10.7N	110.7E	25																
04051812		11.0N	110.9E	25																
			AVERAGE		25	62	81	100	96	75			1	5	6	11	15	20		
			BIAS										1	3	5	11	15	20		
			# CASES		8	8	8	7	5	1			8	8	8	7	5	1		

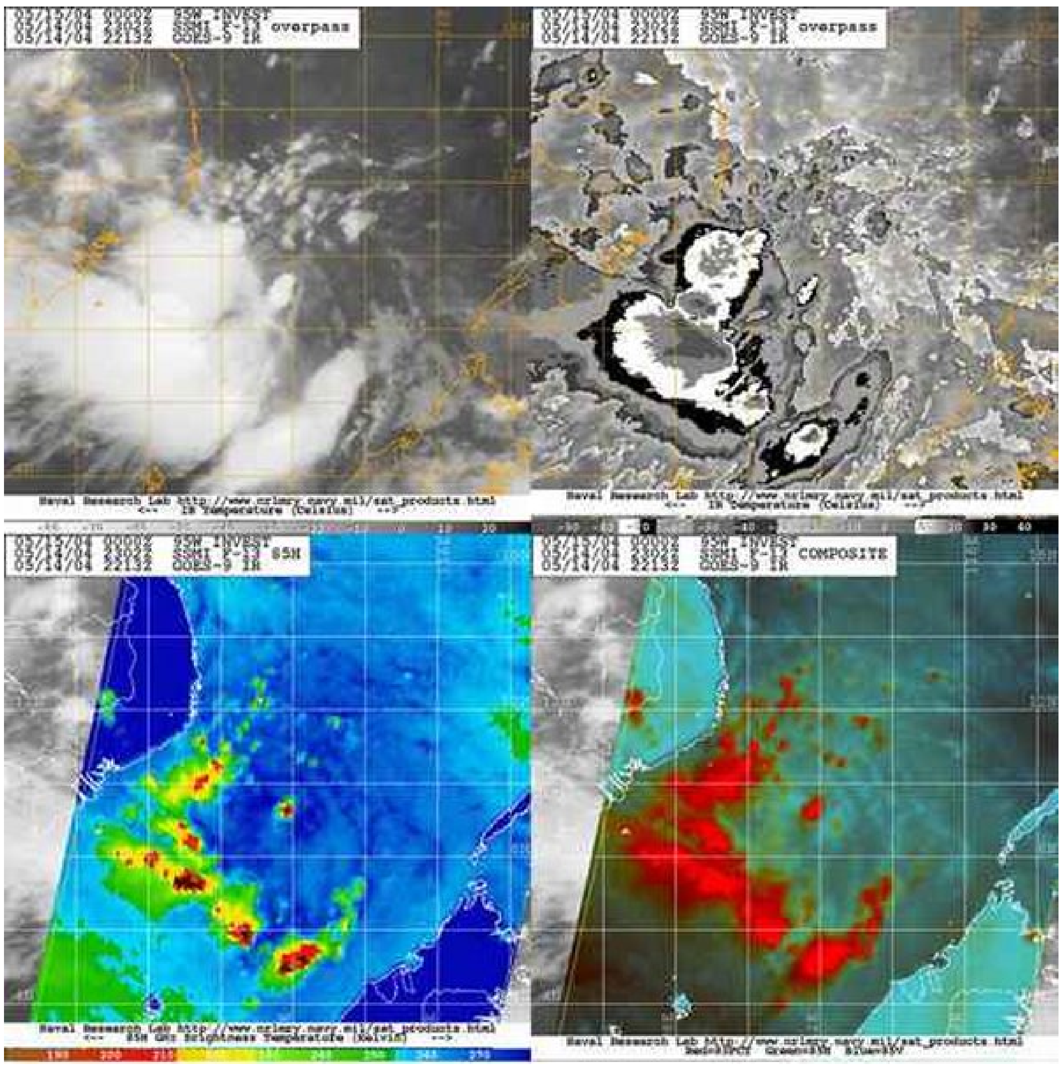
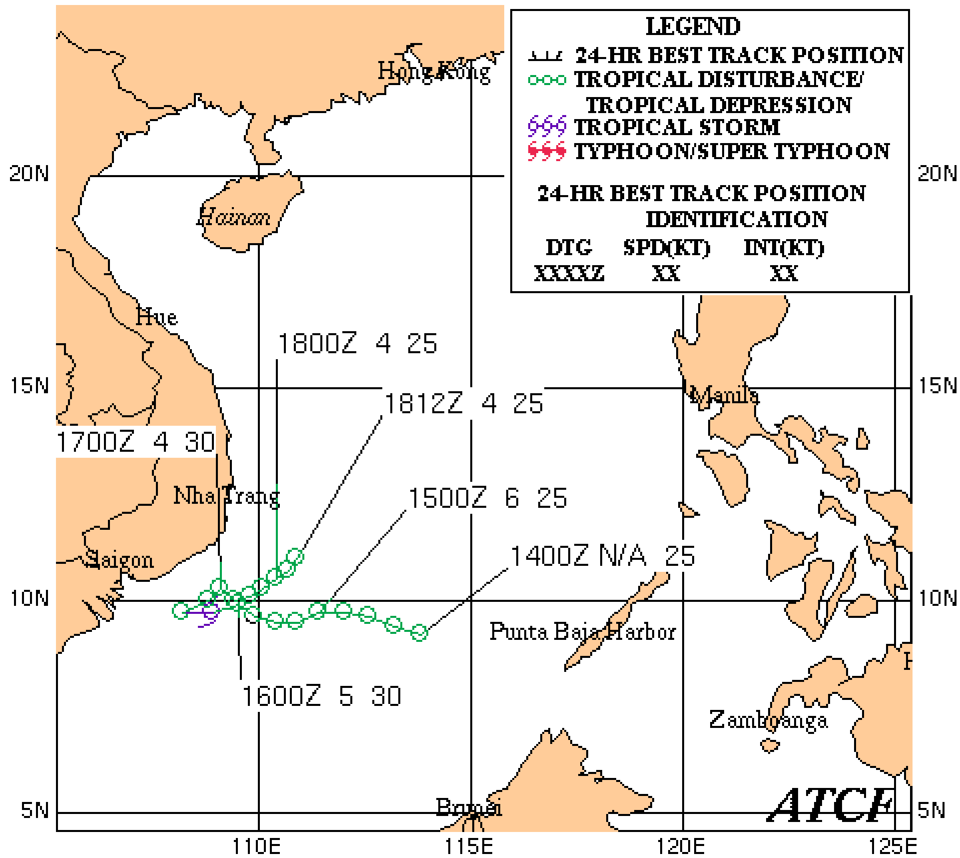
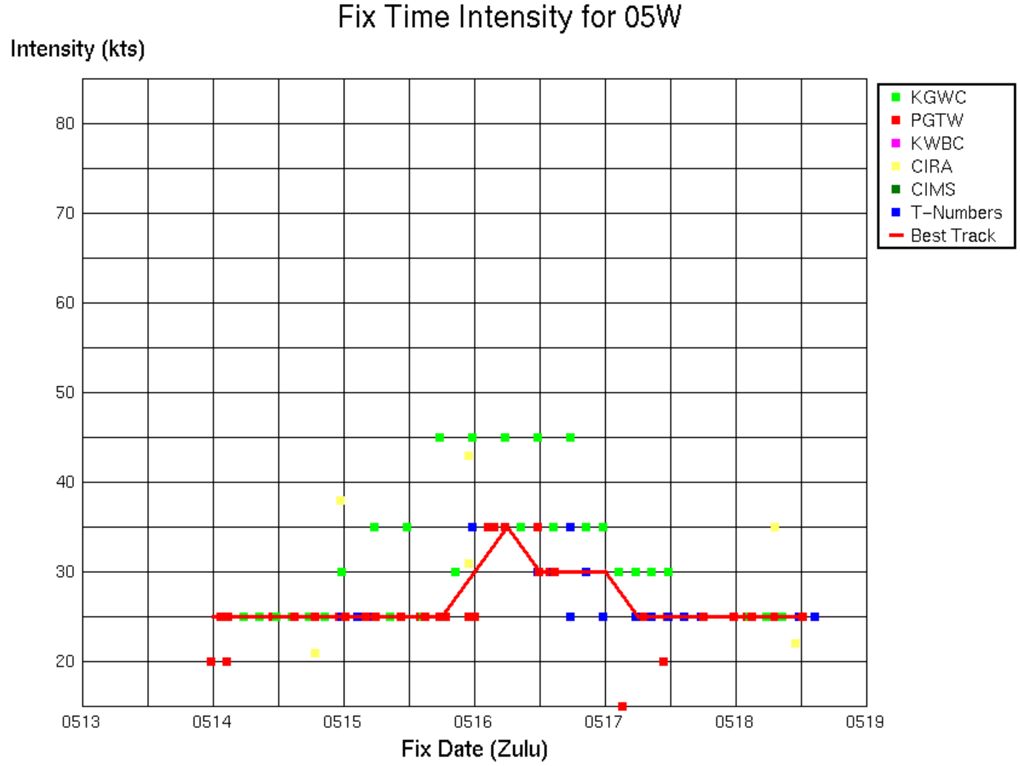


Figure 1-05W-1. 142302Z May 2004 SSM/I Multi-Sensor satellite images of TD 05W, reveals a partially exposed Low-level circulation center approximately 185nm from the southern Vietnam coast with a peak intensity of 25kts.

TROPICAL STORM 05W
14-18 MAY 2004





Typhoon (TY) 06W (Omais)

First Poor : 0600Z 14 May 04

First Fair : 0000Z 15 May 04

First TCFA : 2130Z 15 May 04

First Warning : 0000Z 16 May 04

Last Warning : 0600Z 22 May 04, Extra-tropical

Max Intensity : 60 kts, gusts to 75 kts

Landfall : No

Total Warnings : 26

Remarks:

1) Tropical Storm (TS) 06W developed as a tropical disturbance southwest of Chuuk and within 48 hours, the first warning was issued. The cyclone tracked westward along the southern periphery of the subtropical ridge and then after 18 hours began to move more west-northwestward towards Yap. After passing approximately 50 nm southwest of Yap with sustained wind speeds of 60 kts, TS 06W continued west-northwestward along the southwestern periphery of the subtropical ridge and reached maximum intensity of 60 kts at 0000z on 19 May. Approximately 18 hours later the cyclone began to recurve poleward and slowly weaken. Subsequently, TS 06W rapidly weakened as it encountered the mid-latitude westerly flow.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TY 06W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04051500		5.2N	147.5E	20																
04051506		5.6N	146.8E	20																
04051512		5.8N	145.8E	20																
04051518		5.9N	144.7E	25																
04051600	1	6.1N	143.6E	25	17	49	96	184	256	340			0	-5	-5	-5	0	5		
04051606	2	6.3N	142.6E	30	18	47	121	212	309	480			-5	-5	-5	-10	0	5		
04051612	3	6.5N	141.7E	35	11	6	17	51	66	161			0	0	0	0	5	5		
04051618	4	6.7N	140.9E	35	8	22	32	32	59	159	168	254	5	0	0	10	20	25	55	75

04051700	5	7.1N	140.3E	40	0	6	19	49	95	119	157	312	0	0	0	10	15	25	55	70
04051706	6	7.4N	139.7E	45	0	12	32	73	113	76	134		-5	-10	0	10	10	20	45	
04051712	7	7.8N	139.1E	50	18	30	71	108	150	47	136		-10	-5	0	5	10	25	35	
04051718	8	8.3N	138.6E	55	24	71	136	194	247	126	164		5	15	20	20	15	25	30	
04051800	9	8.8N	138.0E	55	16	55	115	173	165	30	157		5	10	10	10	5	25	25	
04051806	10	9.1N	137.1E	55	0	32	80	147	121	55			5	10	5	10	10	25		
04051812	11	9.5N	136.3E	55	0	31	87	172	174	78			5	5	10	5	5	15		
04051818	12	10.0N	135.5E	55	0	48	142	181	182	113			10	10	10	10	15	15		
04051900	13	10.4N	134.7E	60	13	60	140	138	181	142			5	10	15	20	30	30		
04051906	14	10.9N	134.0E	60	0	42	157	197	252				5	10	15	25	25			
04051912	15	11.4N	133.2E	60	5	93	168	208	235				5	10	15	25	20			
04051918	16	11.8N	132.6E	60	11	85	151	174	189				5	15	35	40	35			
04052000	17	12.4N	133.0E	60	41	168	217	230	245				0	10	30	30	40			
04052006	18	13.4N	133.6E	55	6	48	67	69					0	15	25	25				
04052012	19	14.6N	133.9E	50	13	6	17	23					5	20	25	35				
04052018	20	15.6N	134.2E	40	18	53	80						0	0	-5					
04052100	21	16.4N	134.5E	35	5	26	81						0	-5	0					
04052106	22	17.1N	134.8E	35	12	43							0	0						
04052112	23	17.9N	135.1E	35	29	33							0	5						
04052118	24	18.7N	135.3E	35	18								0							
04052200	25	19.9N	135.8E	30	24								5							
			AVERAGE		13	46	96	138	179	148	153	283	3	8	11	16	15	19	41	73
			BIAS										2	5	10	14	15	19	41	73
			# CASES		25	23	21	19	17	13	6	2	25	23	21	19	17	13	6	2

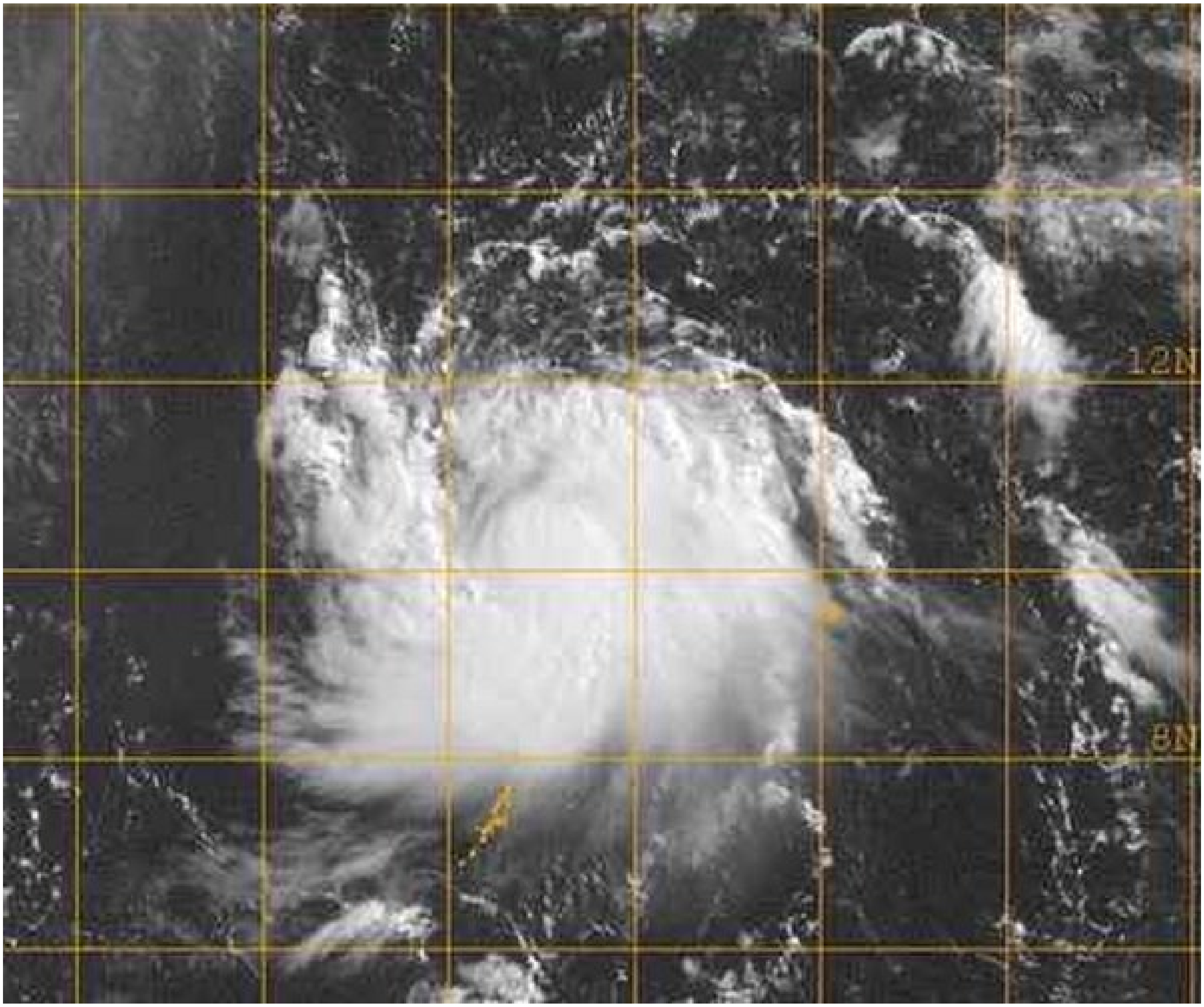
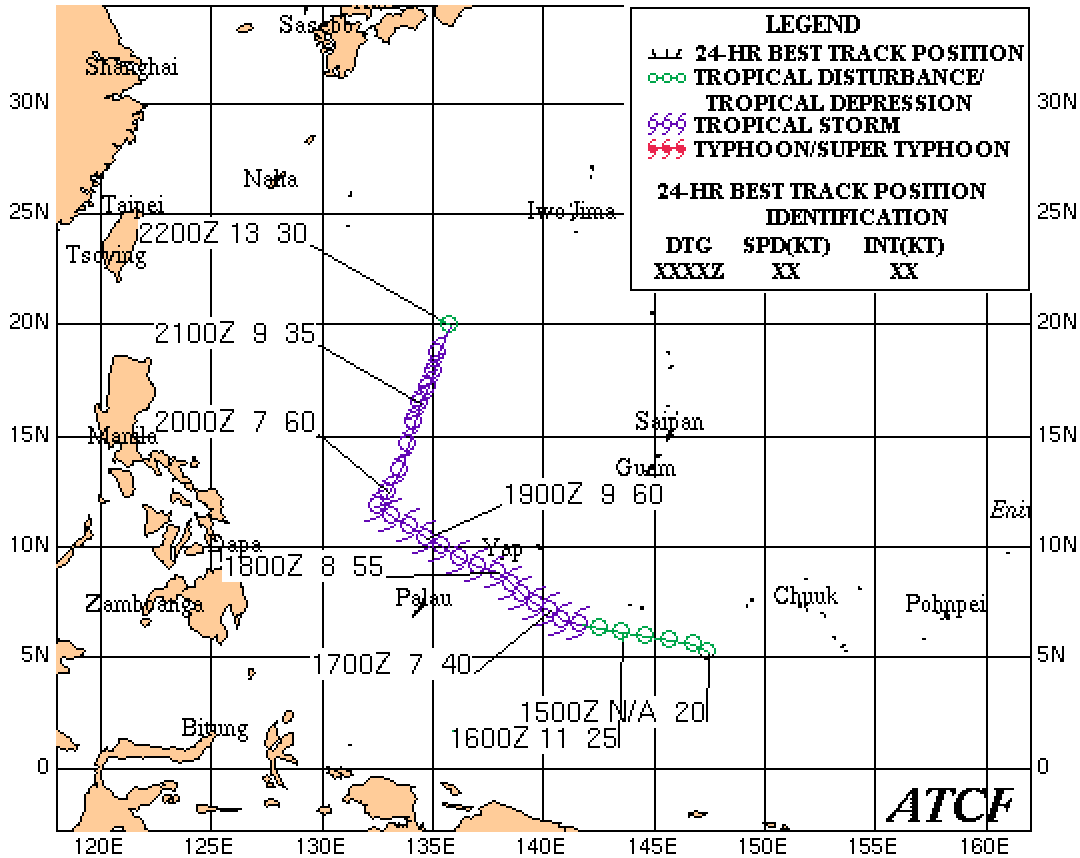
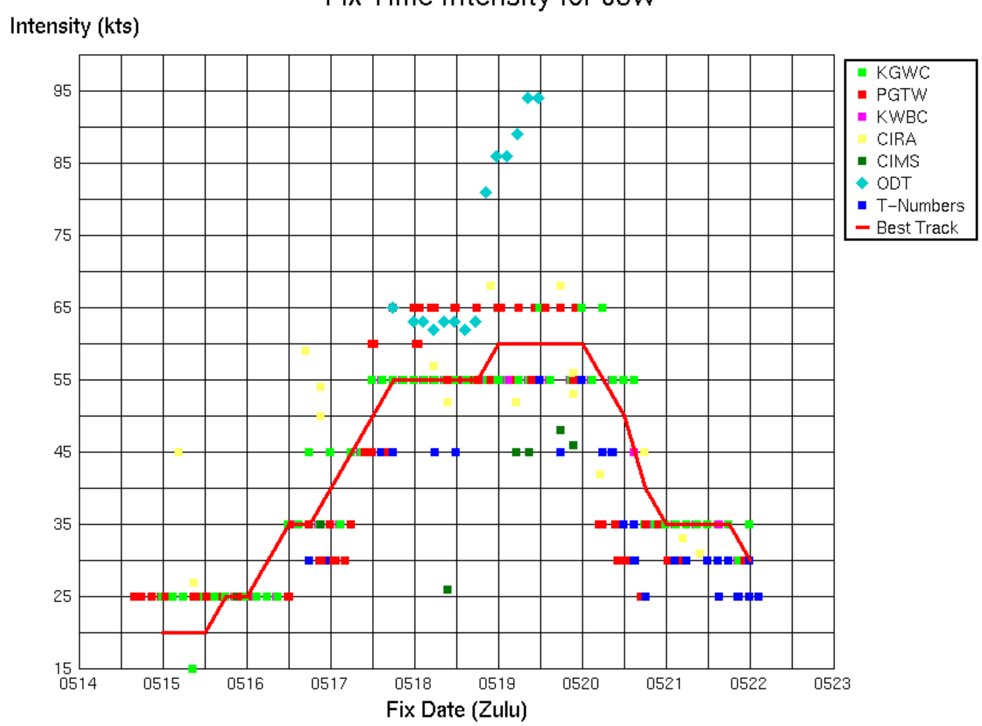


Figure 1-06W-1. 190030Z May 2004 Goes-9 VIS image of TY 06W (Omais), reveals a well defined Low-level circulation center approximately 155 nm North of Palau with a peak intensity of 65kts.

TROPICAL STORM 06W (OMAIS)
15-22 MAY 2004



Fix Time Intensity for 06W



Typhoon (TY) 07W (Conson)

First Poor : 0200Z 04 Jun 04

First Fair : 0600Z 04 Jun 04

First TCFA : 1430Z 04 Jun 04

First Warning : 1800Z 04 Jun 04

Last Warning : 0600Z 11 Jun 04, Extra-tropical

Max Intensity : 100 kts, gusts to 120 kts

Landfall: 70 nm SSW Kyoto, near Gobo, Japan (approx. 0900Z on 11 Jun, after the final warning)

Total Warnings : 27

Remarks:

1) Typhoon (TY) 07W was initially detected as a tropical disturbance near Cantanduanes Island, Philippines. JTWC tracked this disturbance as it moved westward over southern Luzon and dissipated. Post analysis indicates that another cyclone subsequently formed over the South China Sea west of Luzon in a region of very weak steering flow. This weak steering environment persisted until about 1200Z on 05 Jun after which the cyclone intensified to tropical storm intensity and began to move northeast. TY 07W reached typhoon intensity at 1800Z on 07 Jun just prior to exiting the South China Sea. The cyclone began extratropical transition around 0000Z on 09 Jun, east of Taiwan, and began to rapidly weaken as it tracked northeastward. TY 07W crested the ridge axis and forward motion of the system increased. The last warning was issued at 0600Z on 11 Jun as the cyclone had fully transitioned to an extra-tropical low prior to crossing Japan.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TY 07W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04060406		15.7N	116.6E	15																
04060412		15.5N	116.4E	20																
04060418	1	15.3N	116.2E	25	51	53	107	130	131	174			0	-5	-10	-10	-10	-25		
04060500	2	15.1N	116.3E	30	0	63	72	63	55	88			0	0	-5	0	0	-10		
04060506	3	14.9N	116.4E	30	24	50	44	46	59	40			0	-10	-10	-5	-5	-20		
04060512	4	14.8N	116.8E	35	6	29	35	31	35	41	208	468	0	-5	0	5	0	-15	-30	-25
04060518	5	14.9N	117.4E	40	13	42	53	44	36	69	245	513	-5	-5	0	0	-5	-20	-35	-10
04060600	6	15.3N	117.9E	45	6	13	12	17	13	86	381	740	0	10	10	5	10	-10	-25	10
04060606	7	15.6N	118.3E	45	8	21	38	32	25	103	306	538	5	10	5	0	0	-25	-30	0
04060612	8	16.0N	118.6E	45	0	30	45	74	83	100	204		5	5	0	0	-10	-40	-30	
04060618	9	16.3N	118.8E	45	0	43	74	107	119	81	312		5	5	0	-5	-15	-30	-10	
04060700	10	16.6N	118.9E	50	8	25	54	74	103	156	385		5	0	5	-10	-15	-30	-5	
04060706	11	16.9N	119.0E	55	11	29	29	36	17	141	376		0	-5	-10	-15	-20	-25	5	
04060712	12	17.4N	119.2E	60	6	34	38	32	50	187			-5	0	-10	-20	-35	-20		
04060718	13	18.0N	119.2E	65	8	17	40	126	247	534			0	-10	-20	-15	-35	-30		
04060800	14	18.7N	119.4E	65	6	23	67	178	295	603			0	-15	-15	-35	-60	-25		
04060806	15	19.3N	119.7E	75	0	23	108	220	327	620			0	-10	-5	-35	-45	-5		
04060812	16	19.9N	120.1E	85	5	52	155	275	401				0	-10	-15	-35	-40			
04060818	17	20.5N	120.5E	90	5	67	142	228	355				0	5	-5	0	10			
04060900	18	21.1N	121.4E	90	0	65	145	274	402				0	-10	-15	0	20			
04060906	19	22.3N	122.5E	90	5	67	149	265	375				0	-15	-5	10	15			
04060912	20	23.5N	123.7E	100	13	78	171	278					-5	-10	5	20				
04060918	21	24.7N	124.9E	100	8	70	147	228					-5	5	20	30				
04061000	22	25.9N	126.2E	100	5	53	125						-10	0	15					
04061006	23	27.1N	127.5E	85	0	53	121						-5	5	5					
04061012	24	28.3N	129.1E	80	13	55							-15	-5						
04061018	25	29.7N	130.6E	65	7	50							-5	5						
04061100	26	31.1N	132.2E	55	21								0							
04061106	27	33.0N	133.9E	45	5								-5							
			AVERAGE		9	44	86	131	165	201	302	565	3	7	8	12	18	22	21	11
			BIAS										-1	-3	-3	-5	-13	-22	-20	-6
			# CASES		27	25	23	21	19	15	8	4	27	25	23	21	19	15	8	4

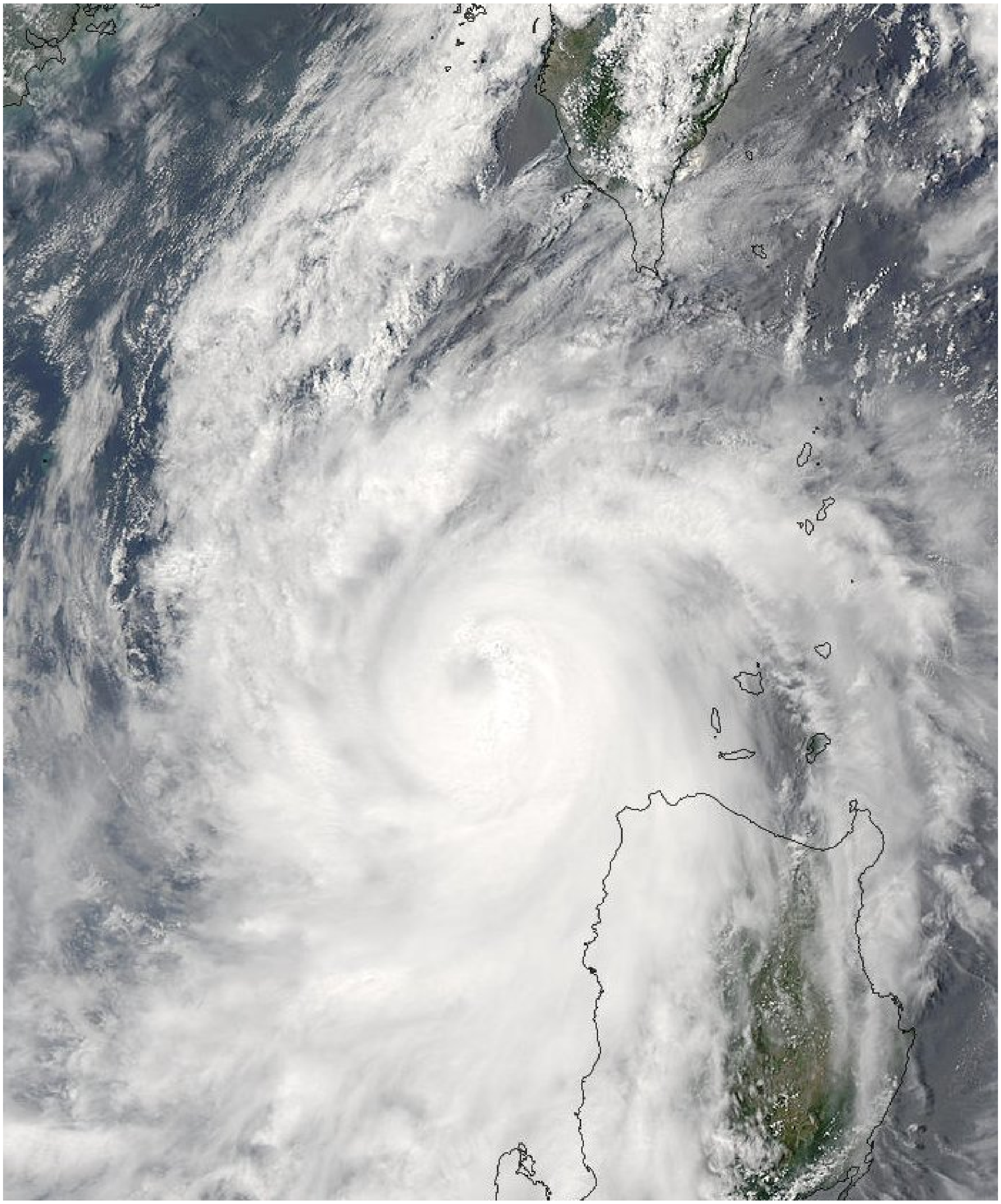


Figure 1-07W-1. 080505Z June 2004 MODIS true-color image of TY 07W (Conson), located 70 nm northwest of the Philippines with an intensity of 75 knots.

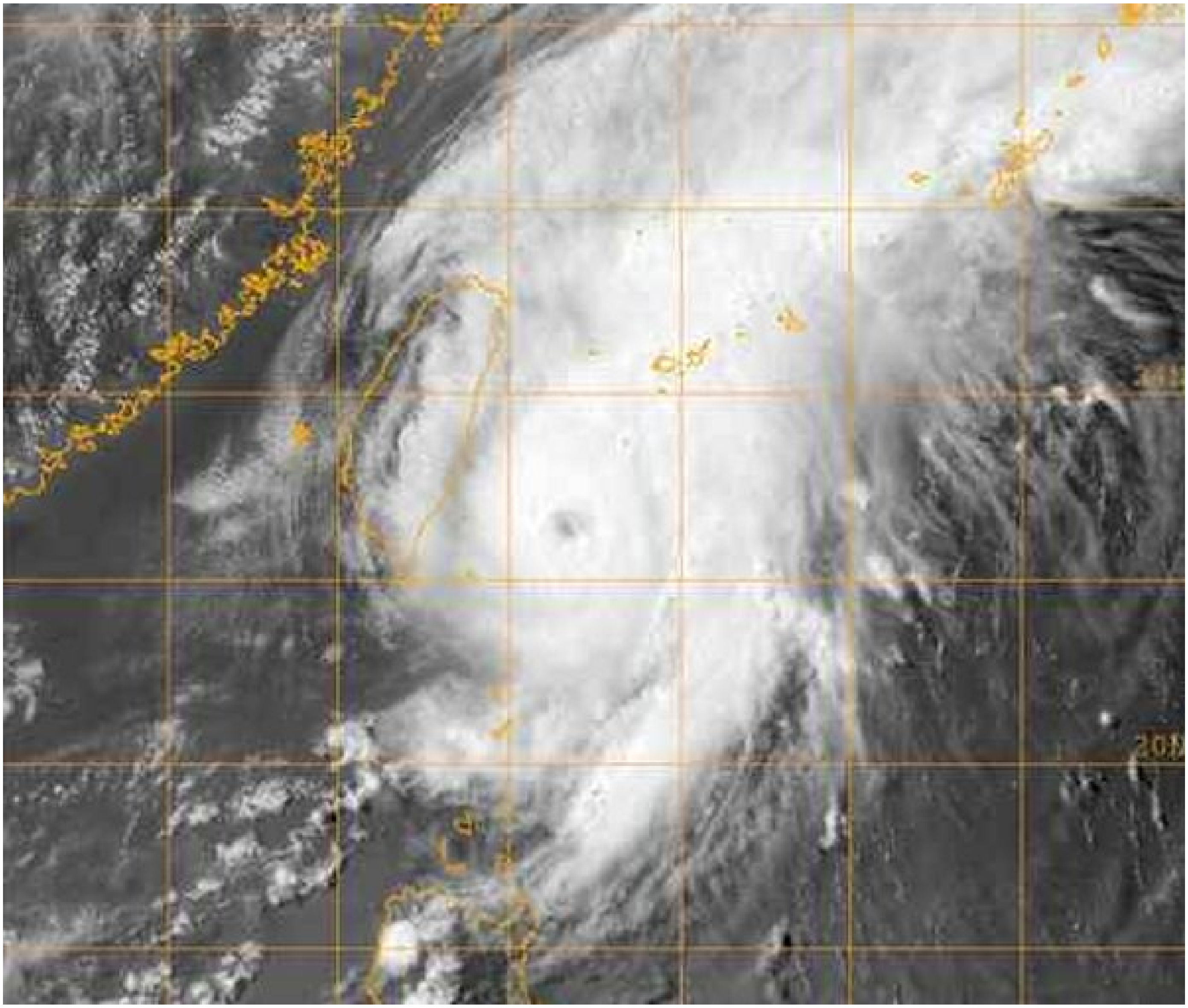
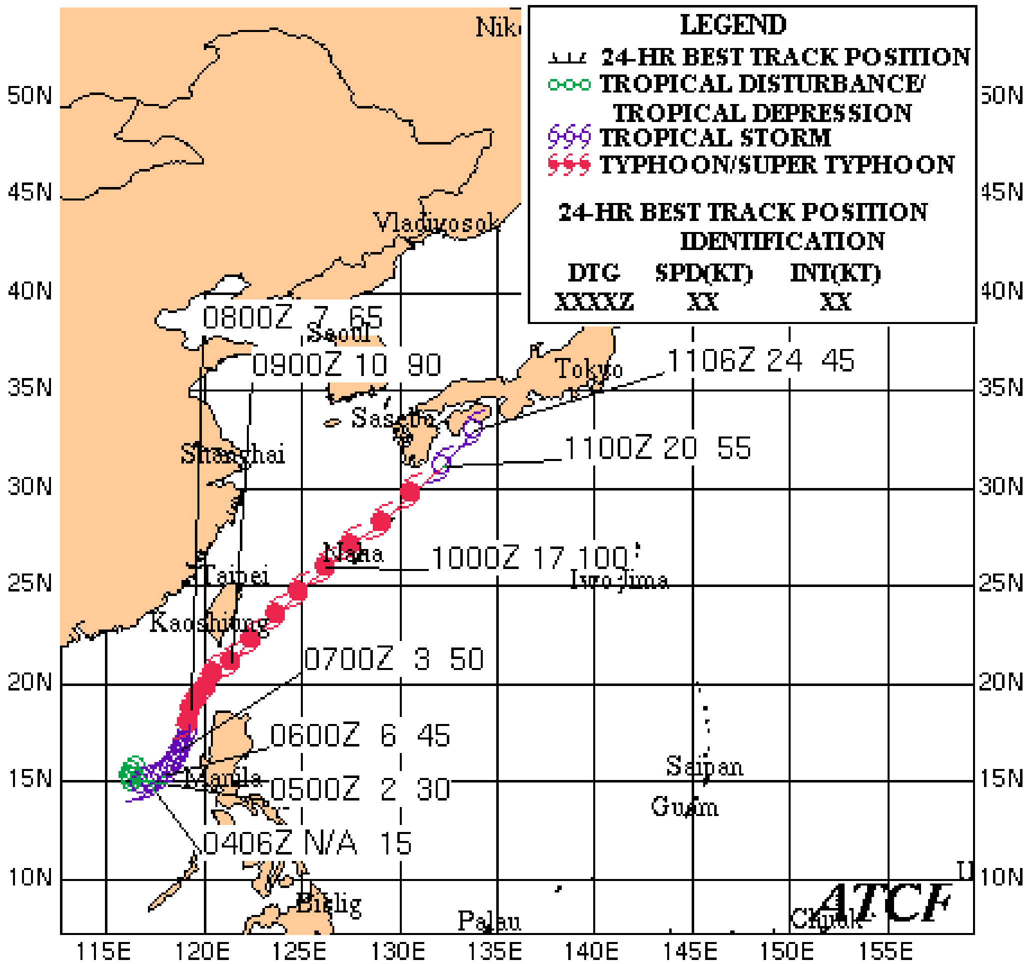
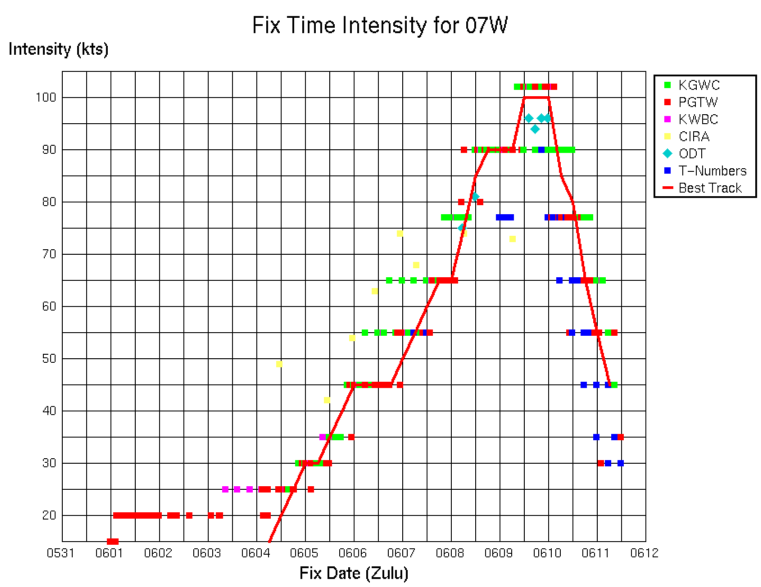


Figure 1-07W-2. 090625Z June 2004 Goes-9 visible image of TY 07W (Conson), reveals a small pinhole eye approximately 85 nm to the east of the Taiwan coast with a peak intensity of 90kts.

TYPHOON 07W (CONSON)
04-11 JUN 2004





Typhoon (TY) 08W (Chanthu)

First Poor : 0600Z 05 Jun 04

First Fair : 1300Z 05 Jun 04

First TCFA : 2000Z 08 Jun 04

First Warning : 0000Z 09 Jun 04

Last Warning : 0600Z 13 Jun 04, Dissipated over land

Max Intensity : 75 kts, gusts to 90 kts

Landfall : Que Nhon, Vietnam

Total Warnings : 18

Remarks:

1) Typhoon (TY) 08W initially formed as a tropical disturbance on 05 Jun, approximately 260 nm southeast of Yap. The cyclone was slow to develop and remained a tropical disturbance for nearly three days. The first warning was issued on 08 Jun at 1200Z as the system tracked towards the central Philippine Islands near Leyte Gulf. Over the next 18 hours the cyclone weakened as it tracked across the Philippines into the South China Sea, but was able to slowly reintensify to 45 kts after entering the South China Sea. Although the system had entered a more favorable environment of low vertical wind shear and warmer sea surface temperatures, slow intensification was noted due to outflow impinement caused by the inflow of upper level winds by the equatorward outflow of TY 07W located between Taiwan and Okinawa. By 1200Z on 11 Jun the cyclone began to infensify more rapidly as the outflow impingement associated with continued TY 07W lessened. This changed allowed TY 08W to reach typhoon strength on 12 Jun as it continued to track westward along the southern periphery of the mid level steering ridge. TY 08W made landfall approximately nine hours later in central Vietnam near Que Nhon with a max intensity of 75 kts. The system continued to track inland and dissipated as a tropical cyclone over land near 0600Z on 13 Jun.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TY 08W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04060512		6.7N	141.7E	25																
04060518		6.5N	141.2E	20																
04060600		6.4N	140.7E	20																
04060606		6.5N	140.2E	20																
04060612		6.6N	139.6E	20																
04060618		6.9N	138.7E	20																
04060700		7.3N	137.6E	20																
04060706		7.6N	136.0E	20																
04060712		8.0N	134.3E	20																
04060718		8.5N	132.4E	20																
04060800		9.0N	130.6E	20																
04060806		9.1N	128.8E	20																
04060812		9.2N	127.4E	30																
04060818		9.6N	126.3E	30																
04060900	1	10.6N	125.4E	35	26	93	161	202	248	387	571		5	0	-5	-5	-5	-20	5	
04060906	2	10.9N	124.1E	35	29	53	118	165	212	399			5	-5	-5	0	0	-20		
04060912	3	11.0N	122.7E	40	13	29	47	100	158	396			0	0	0	5	-5	-10		
04060918	4	11.1N	121.3E	45	24	95	135	187	263	476			0	5	10	10	5	20		
04061000	5	11.4N	120.2E	45	18	47	83	136	214	403			0	5	15	10	10	45		
04061006	6	11.6N	119.1E	45	6	36	60	102	157				-5	0	0	-5	-15			
04061012	7	12.1N	118.2E	45	0	21	46	81	164				0	5	0	0	5			
04061018	8	12.4N	117.2E	45	29	58	87	141	216				0	0	-5	-10	20			
04061100	9	12.7N	116.2E	45	23	27	51	142	228				0	-5	-10	0	40			
04061106	10	13.1N	115.2E	50	8	39	94	171					0	-5	-15	15				
04061112	11	13.3N	114.1E	55	13	37	113	183					0	-5	0	45				
04061118	12	13.6N	112.9E	60	8	50	118						0	-10	25					
04061200	13	13.9N	111.6E	65	5	60	117						0	10	20					
04061206	14	14.0N	110.2E	75	6	67							0	10						
04061212	15	13.9N	108.7E	65	8	68							5	20						
04061218	16	13.8N	107.6E	50	5								5							
04061300	17	14.0N	106.1E	35	0								0							
			AVERAGE		13	52	95	146	207	412	571		1	6	8	10	12	23	5	
			BIAS										1	2	2	6	6	3	5	
			# CASES		17	15	13	11	9	5	1		17	15	13	11	9	5	1	

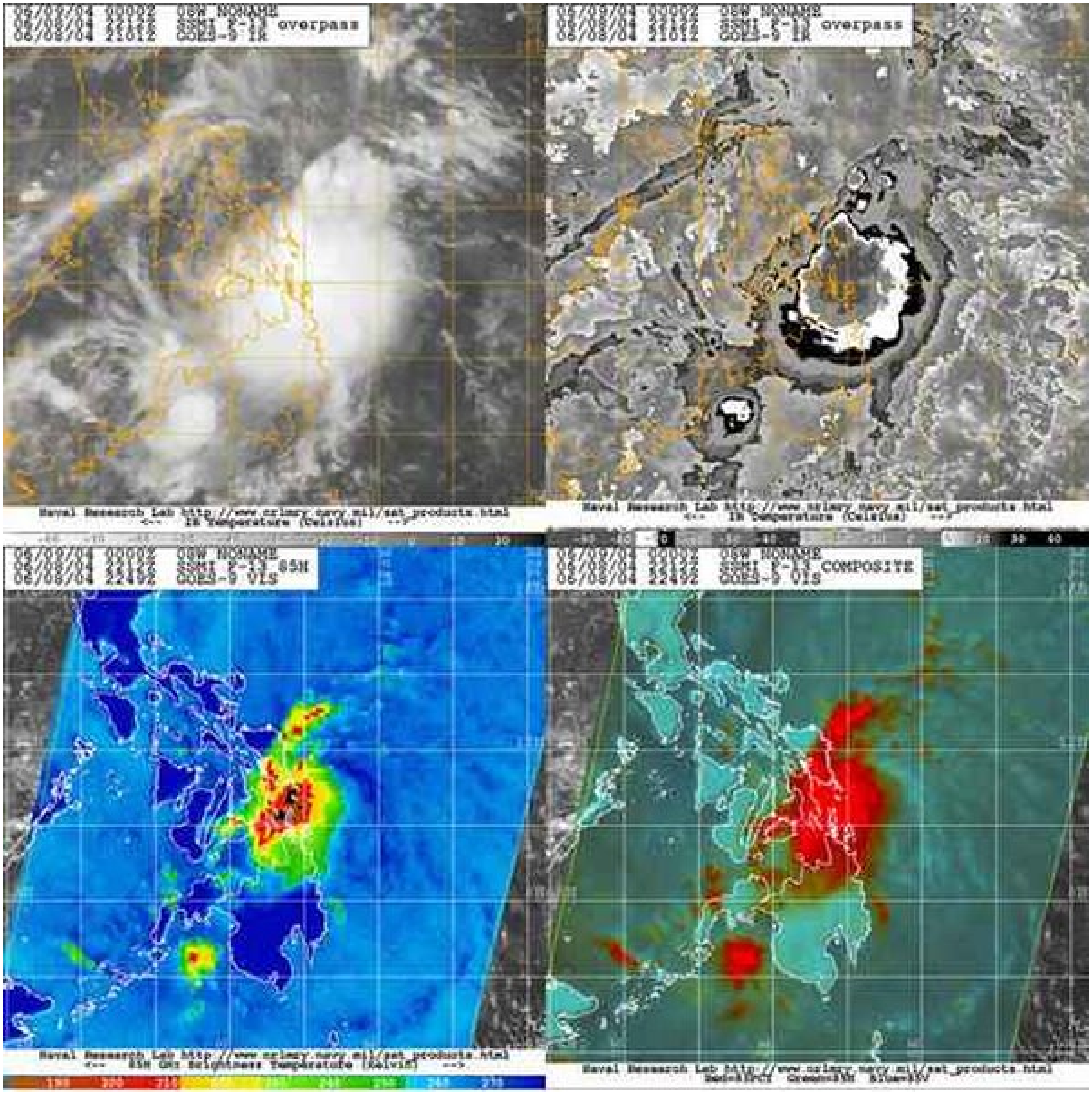
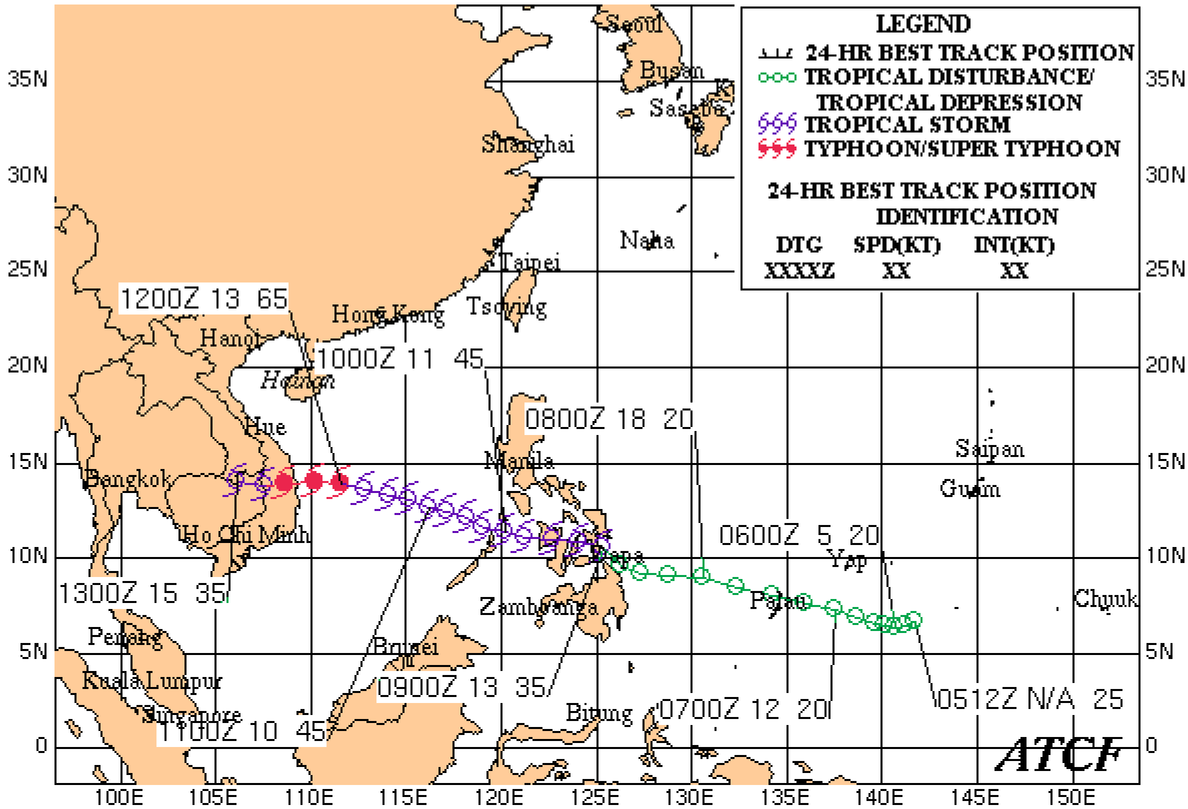
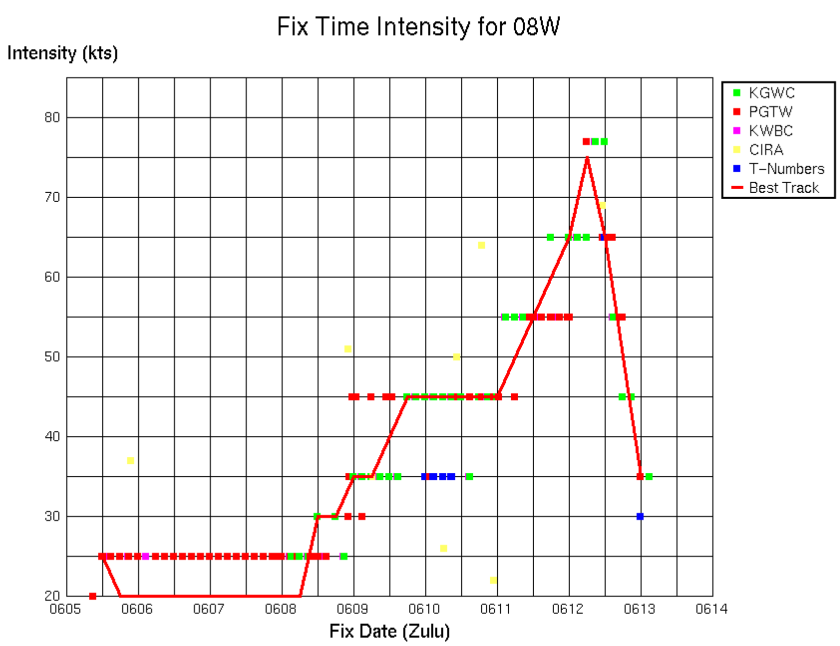


Figure 1-08W-1. 082212Z June 2004 SSm/I Mulit-Sensor images of TS 08W (Chanthu), reveals a Low-level circulation center embedded in a large area of deep cnvctn just about to enter the eastern side of the Phillipine Islands with an intensity of 40kts.

TYPHOON 08W (CHANTHU)
05-13 JUN 2004





Typhoon (TY) 09W (Dianmu)

First Poor : 0600Z 11 Jun 04

First Fair : 0600Z 12 Jun 04

First TCFA : N/A

First Warning : 0600Z 13 Jun 04

Last Warning : 1800Z 21 Jun 04, Extra-tropical

Max Intensity : 155 kts, gusts to 190 kts

Landfall : Muroto, Japan

Total Warnings : 36

Remarks:

1) Super Typhoon (STY) 09W formed as a tropical disturbance on 11 Jun, approximately 220 nm south-southeast of Yap. The cyclone rapidly developed into a tropical depression and initially tracked slowly north for 24 hours along the periphery of the low to mid level steering ridge located to the northeast. Subsequently, the cyclone began moving more poleward in response to the weakening and eastward movement of the ridge caused by a deepening mid-latitude trough. During this poleward movement an upper level low located northeast of STY 09W provided good poleward and eastward outflow. Along with these poleward outflow channels, a cross equatorial outflow channel increased. These factors allowed rapid deepening to occur and within 72 hours of the first warning, the cyclone was classified as a Super Typhoon with maximum intensity of 155 kts. The system maintained Super Typhoon intensity for approximately 42 hours. After the system crested the ridge axis and approached Japan it began to interact with a short wave trough approaching from the west causing the cyclone to weaken. The intensity of the cyclone continued to decrease before making landfall over Shikoku. The cyclone then became embedded in the baroclinic zone and began to move northeastward across Japan out into the Sea of Japan where it rapidly became extra-tropical. The final warning was issued at 1800Z on 21 Jun just prior to making landfall a second time over the southern tip of Hokkaido.

2) Three people were killed and two went missing in Japan. Thousands of homes and businesses lost power, domestic flights were cancelled and the oil companies stopped shipping fuel from the refineries located along the western coast of Japan as the system tracked across Shikoku into central Japan.

Statistics for JTWC on TY 09W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04061118		6.4N	140.0E	15																
04061200		6.9N	139.3E	15																
04061206		7.3N	138.5E	15																
04061212		7.6N	138.0E	15																
04061218		7.8N	137.4E	25																
04061300	1	8.1N	136.9E	30	34	72	44	83	88	146			0	10	5	10	5	-65		
04061306	2	8.5N	136.4E	30	18	27	59	95	89	104			0	0	-10	-10	-25	-80		
04061312	3	8.9N	136.1E	30	18	51	110	116	121	122			0	-10	-10	-15	-55	-80		
04061318	4	9.2N	136.3E	35	46	119	164	169	175	147	114	100	0	-15	-15	-30	-80	-75	-30	-25
04061400	5	9.4N	136.6E	45	13	88	108	108	111	73	95	168	0	0	-5	-45	-65	-55	-20	-15
04061406	6	9.6N	136.9E	55	23	54	54	71	67	32	137	191	0	0	-15	-55	-55	-35	-15	-10
04061412	7	9.9N	137.4E	55	24	55	46	43	63	111	172	213	0	-5	-45	-60	-55	-25	-20	-5
04061418	8	10.7N	137.4E	65	0	34	29	35	49	132	189	195	0	-15	-45	-35	-20	20	15	30
04061500	9	11.4N	137.4E	70	13	29	8	13	27	99	157	199	0	-35	-40	-30	-15	20	20	35
04061506	10	11.9N	137.1E	90	5	17	13	17	31	64	162	161	-5	-50	-45	-30	-5	15	15	40
04061512	11	12.7N	136.9E	120	0	17	24	18	46	68	147	81	0	-15	-10	0	15	0	5	35
04061518	12	13.5N	136.8E	145	6	8	6	33	79	113	148	78	0	5	10	15	25	5	20	40
04061600	13	14.4N	136.5E	150	8	21	17	75	95	132	146	83	0	5	10	20	25	10	25	35
04061606	14	15.2N	136.0E	155	5	13	36	77	93	112	60	128	0	0	10	20	0	-5	25	40
04061612	15	15.9N	135.6E	155	11	6	51	69	86	83	72	301	0	0	10	10	-10	-5	30	35
04061618	16	16.5N	135.1E	155	5	32	56	36	40	33	126	427	0	5	20	0	-15	15	20	10
04061700	17	17.2N	134.6E	150	12	41	41	16	29	61	187		5	15	20	-5	-10	25	25	
04061706	18	17.4N	133.7E	140	13	35	24	0	34	107	369		0	10	0	-5	-5	25	35	
04061712	19	17.7N	132.8E	130	11	19	11	29	66	142	487		0	5	-10	-5	-5	30	35	
04061718	20	18.1N	132.0E	120	8	29	48	79	113	213	562		5	-10	-15	-5	25	40	15	
04061800	21	18.7N	131.5E	120	24	27	68	85	116	250			-5	-15	-10	0	20	35		
04061806	22	19.4N	131.0E	125	18	33	64	91	115	368			-5	-5	-5	10	30	40		
04061812	23	20.2N	130.3E	130	8	24	60	96	164	484			-5	0	0	20	40	50		
04061818	24	21.2N	129.7E	125	0	32	58	101	142	437			0	0	10	30	25	10		
04061900	25	22.3N	129.4E	120	8	38	76	107	187				5	5	25	30	25			
04061906	26	23.4N	129.1E	120	6	34	53	74	162				0	5	10	10	10			
04061912	27	24.5N	129.1E	115	8	25	44	76	213				-10	-5	0	0	5			
04061918	28	25.7N	129.4E	100	8	21	50	108	171				-10	-5	-5	-5	0			
04062000	29	26.9N	129.7E	90	0	38	79	164					-10	-5	-5	0				
04062006	30	28.2N	130.4E	80	12	28	69	112					-10	-5	-5	5				
04062012	31	29.5N	131.3E	70	0	28	121						0	0	5					
04062018	32	30.9N	132.2E	65	7	46	110						-5	-5	5					
04062100	33	32.8N	133.7E	60	7	95							-5	5						
04062106	34	35.4N	135.6E	50	36	125							5	10						

04062112	35	38.6N	138.4E	40	0								0							
04062118	36	41.5N	139.7E	35	0								0							
			AVERAGE		12	40	56	73	99	151	196	179	3	8	14	17	24	32	22	27
			BIAS										-1	-4	-5	-5	-6	-4	12	19
			# CASES		36	34	32	30	28	24	17	13	36	34	32	30	28	24	17	13

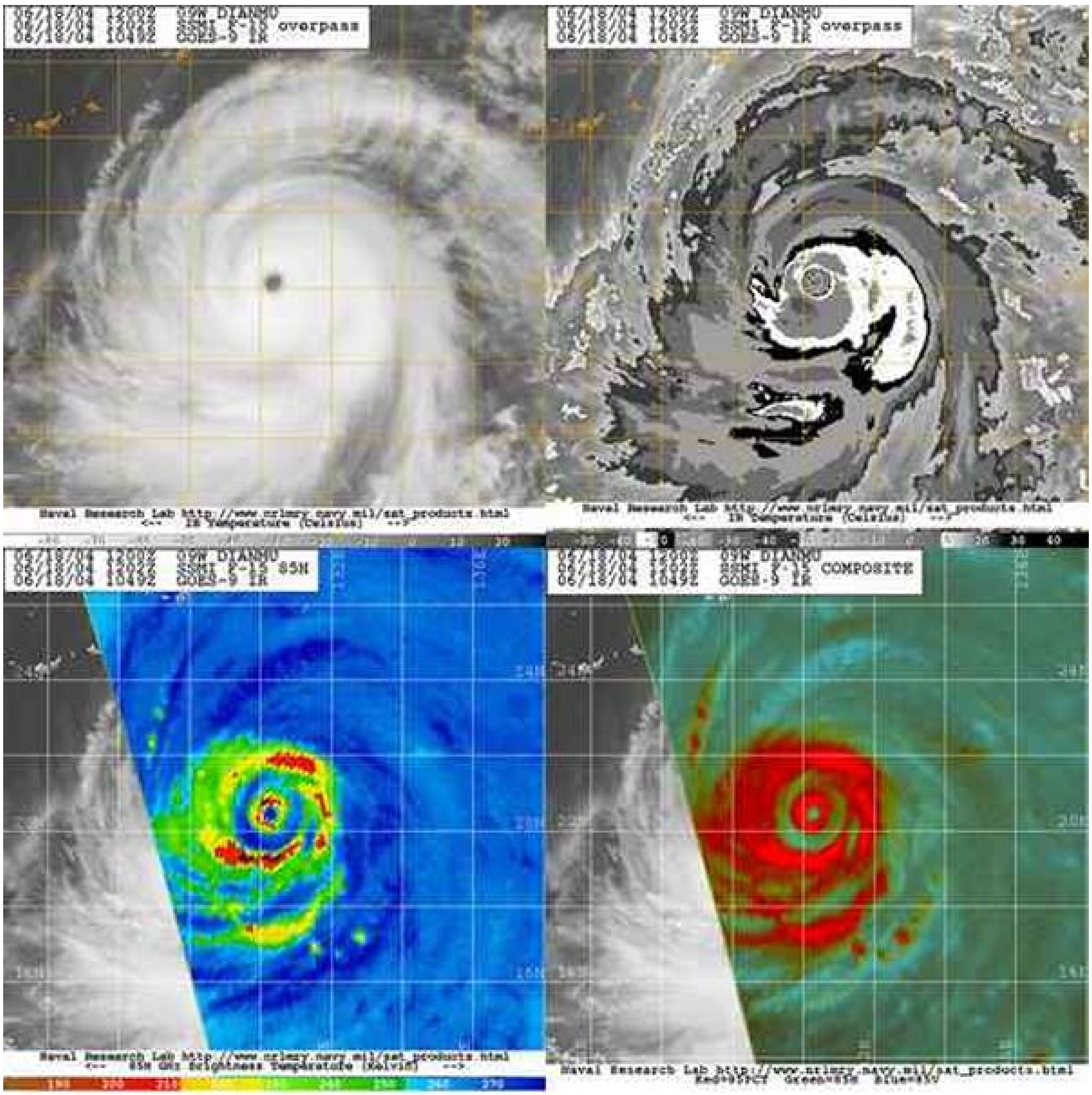


Figure 1-09W-1. 180825Z June 2004 Goes-9 visible imagery of TY 09W (Dianmu), reveals a well defined symmetrical eye approximately 410 nm to the south-southeast of Kadena AB with a peak intensity of 120kts.

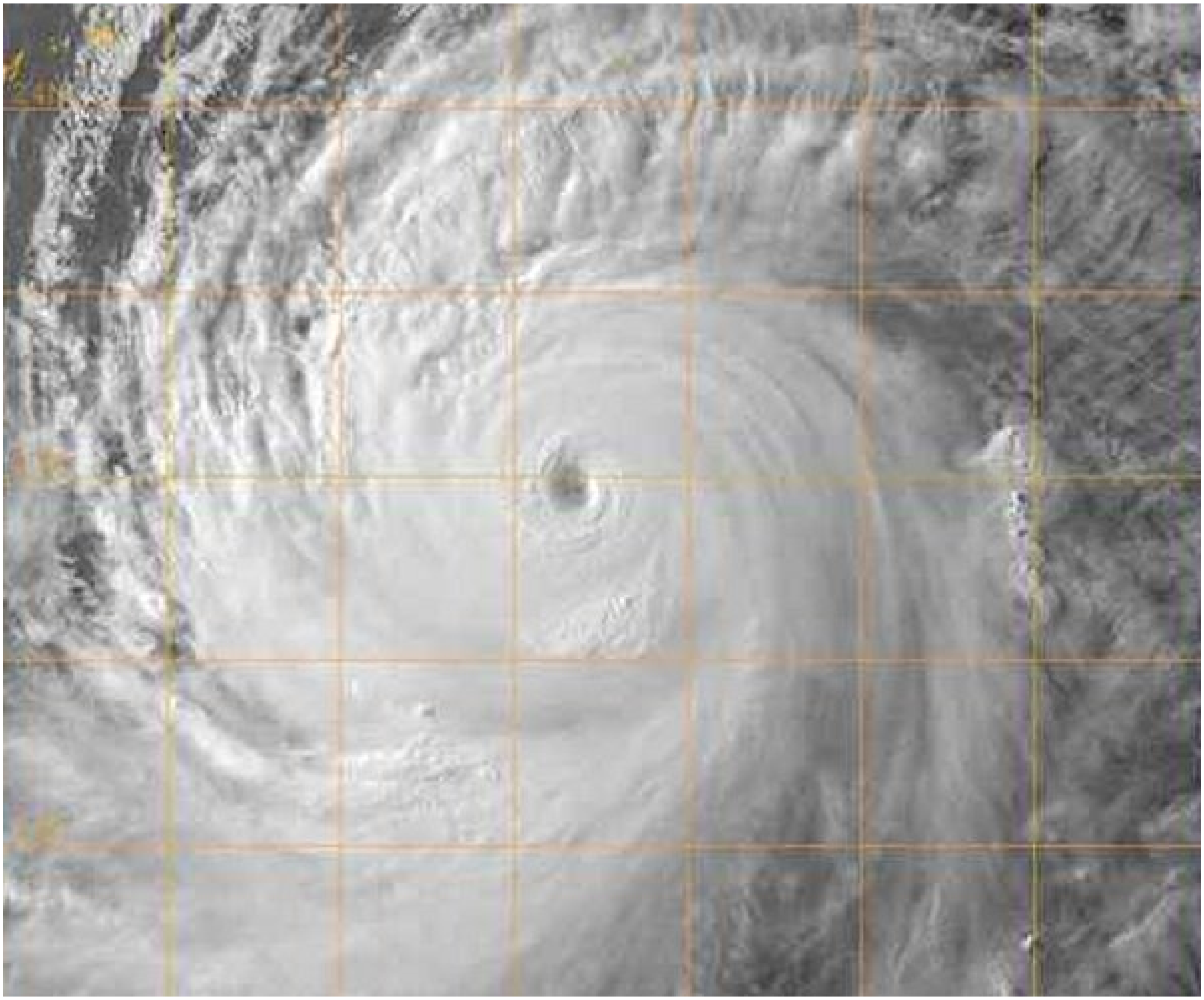


Figure 1-09W-1. 18/1202Z June 2004 SSM/I Multi-Sensor satellite images of TY 09W (Dianmu), reveals a well defined eye in the IR and BD imagery and concentric eyewalls in the microwave imagery. At this time the system was approximately 400 nm to the south-southeast of Kadena AB with a peak intensity of 125kts.

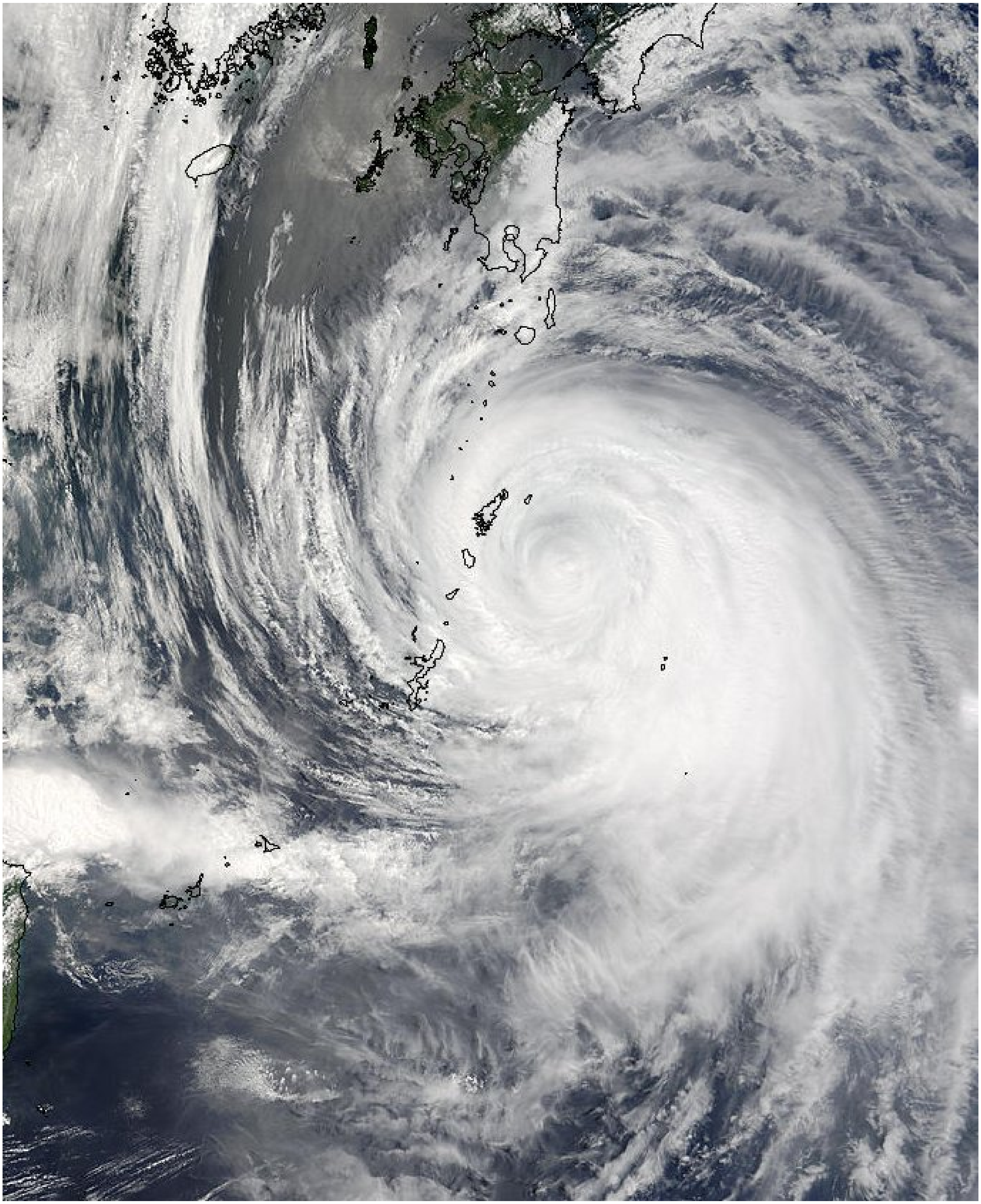
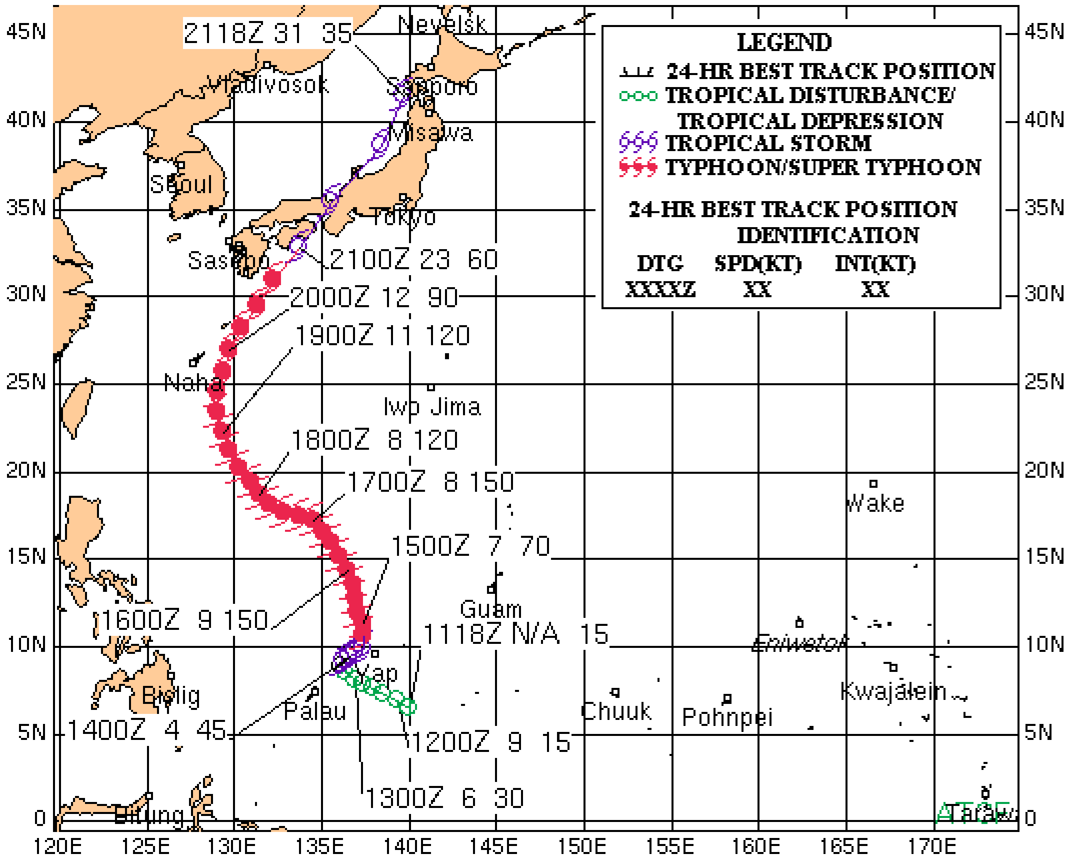
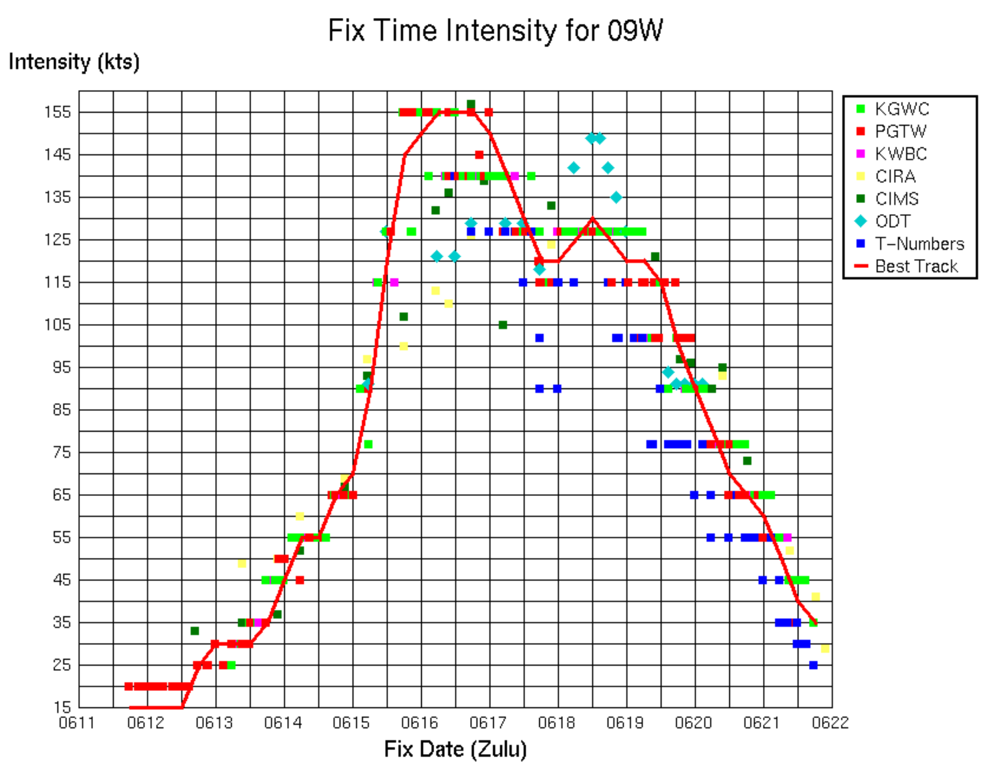


Figure 1-08W-3. 200225Z June 2004 MODIS true-color image of TY 08W (Dianmu), located 140 nm east-northeast of Okinawa with an intensity of 75 knots.

TYPHOON 09W (DIANMU)
13 -21 JUN 2004





Typhoon (TY) 10W (Mindulle)

First Poor : 0100Z 21 Jun 04

First Fair : 1300Z 22 Jun 04

First TCFA : 0000Z 23 Jun 04

First Warning : 0600Z 23 Jun 04

Last Warning : 0600Z 04 Jul 04, Extra-tropical

Max Intensity : 125 kts, gusts to 150 kts

Landfall : Taiwan

Total Warnings : 45

Remarks:

1) Typhoon (TY) 10W formed as an area of multiple convective areas consolidated approximately 60 nm east of Guam. An area of persistant convection had initially formed approximately 180 nm south of Guam on 21 Jun, however, the convection weakened and reconsolidated approximately three degrees further north. After tracking across Saipan the cyclone strengthened into a tropical depression and then tracked west-northwest under the influence of a low to mid-level steering ridge north of the system. On 23 Jun the cyclone reached tropical storm intensity and began tracking toward the southwest. Strong equatorward outflow as well as temporary poleward outflow provided by an upper-level low north of the system allowed the cyclone to further intensify to 55 kts on 24 Jun. However, increasing vertical wind shear began weakening the cyclone early on 25 Jun. TY 10W continued to weaken to 45 kts before turning more northwestward and intensifing again by 1200Z on 25 Jun. A combination of a mid-level ridge to the southeast and a developing weakness in the subtropical ridge caused the cyclone to turn poleward towards Taiwan on 30 Jun. TY 10W made landfall along the northeast coast of Taiwan and tracked inland towards Taipei, weakened rapidly and exited the island on approximately 0600Z on 02 Jul. The low level circulation center was very difficult to locate at this point, but the cyclone eventually turned poleward along the eastern coastline of China and became extra-tropical by 0600Z 04 Jul, when the final warning was issued.

2) TY 10W killed 31 and left 11 missing in the Philippines while 6 deaths were reported in Taiwan. TY 10W destroyed $11.7 million worth of crops and livestock and $7.94 million in infrastructure in the Philippines, while Taiwan reported $15.65 million damage to crops and infrastructure.

Statistics for JTWC on TY 10W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04062118		13.0N	147.3E	15																
04062200		13.7N	147.2E	15																
04062206		14.3N	146.8E	15																
04062212		14.7N	146.2E	15																
04062218		15.1N	145.5E	15																
04062300		15.6N	144.5E	20																
04062306	1	16.2N	143.5E	25	21	68	144	180	178	185			5	0	5	10	15	35		
04062312	2	16.8N	142.5E	35	8	57	136	169	175	173	145	182	0	-5	5	5	15	30	10	-25
04062318	3	17.0N	141.3E	40	0	54	116	121	125	79	31	57	-5	-5	5	5	15	15	-15	-40
04062400	4	17.1N	140.0E	45	12	83	121	113	97	27	38	85	0	5	5	10	25	15	-20	-40
04062406	5	16.4N	138.5E	50	25	79	75	78	90	117	161	126	-5	5	5	15	20	5	-40	-55
04062412	6	15.8N	137.1E	50	8	17	34	60	90	164	170	151	0	0	5	20	15	-5	-40	-60
04062418	7	15.4N	135.9E	50	47	59	70	70	98	140	128	110	5	0	10	20	10	-20	-45	-45
04062500	8	15.1N	134.9E	55	8	17	13	18	25	72	61	93	-10	-15	-10	-10	-10	-35	-50	-30
04062506	9	15.1N	133.9E	55	21	17	6	21	43	46	103	254	-10	-5	0	-5	-5	-50	-50	-25
04062512	10	15.0N	133.1E	55	0	26	26	18	54	85	187	322	-5	10	10	5	-5	-40	-45	-5
04062518	11	15.0N	132.3E	50	0	24	12	30	50	85	195	305	0	10	5	0	-20	-40	-40	10
04062600	12	15.0N	131.3E	45	11	12	8	25	25	70	217	268	5	5	0	-10	-30	-45	-25	15
04062606	13	15.1N	130.4E	45	16	42	58	57	43	51	131	126	5	0	-5	-25	-45	-45	-10	40
04062612	14	15.4N	129.7E	50	16	42	44	49	31	52	112	101	0	-5	-15	-35	-45	-45	5	40
04062618	15	15.8N	129.1E	55	13	8	33	21	36	116	153	153	0	-5	-25	-40	-40	-40	10	45
04062700	16	16.3N	128.5E	60	13	25	33	31	40	83	62	65	0	-10	-25	-35	-40	-20	20	55
04062706	17	16.8N	127.8E	65	18	34	13	13	21	56	82	174	0	-15	-30	-30	-30	0	25	35
04062712	18	17.3N	127.1E	75	8	18	23	13	12	26	163	234	0	-10	-10	-10	-5	25	25	35
04062718	19	17.8N	126.4E	90	5	28	40	42	54	67	133	160	-10	-25	-20	-20	-15	30	40	30
04062800	20	18.1N	126.0E	100	11	17	29	23	21	48	86	123	-5	-10	-10	-5	5	35	40	35
04062806	21	18.3N	125.5E	115	8	17	24	36	26	54	92	163	0	10	15	10	25	50	35	50
04062812	22	18.5N	125.0E	115	8	17	17	13	8	75	111	214	0	-5	0	15	25	30	35	50
04062818	23	18.6N	124.5E	120	11	25	36	60	56	111	117	266	5	5	15	45	75	85	70	70
04062900	24	18.7N	124.0E	125	8	19	42	49	52	109	140	341	0	5	20	40	60	65	65	70
04062906	25	18.8N	123.5E	125	5	13	43	63	94	101	169	356	0	0	25	50	70	75	65	75
04062912	26	18.9N	123.1E	125	11	29	69	112	157	151	269		0	10	25	45	55	70	65	
04062918	27	19.0N	122.7E	125	0	18	67	110	150	169	329		0	15	35	55	60	65	60	
04063000	28	19.1N	122.3E	110	0	36	86	130	146	171	288		5	20	30	40	50	45	40	
04063006	29	19.3N	121.9E	105	0	66	98	135	110	151	265		0	30	45	50	45	35	35	
04063012	30	19.9N	122.1E	90	32	83	119	129	106	204			0	20	40	45	35	35		
04063018	31	20.7N	122.0E	80	5	6	42	49	92	154			0	10	10	5	20	25		
04070100	32	21.6N	121.8E	75	5	19	43	53	104	256			0	0	10	10	25	30		
04070106	33	22.4N	121.7E	65	13	32	36	89	110	266			0	5	0	5	25	35		
04070112	34	23.3N	121.8E	65	5	26	49	89	141				0	10	15	25	25			

04070118	35	24.1N	121.6E	55	13	33	72	81	135				0	5	20	25	25			
04070200	36	24.8N	121.5E	45	18	49	84	121	149				5	15	25	25	25			
04070206	37	25.2N	121.0E	45	45	76	80	137	139				0	0	15	15	15			
04070212	38	26.1N	121.0E	40	54	88	105	112					0	5	5	10				
04070218	39	27.0N	120.9E	40	77	63	87	101					0	5	10	10				
04070300	40	27.9N	121.3E	35	82	94	108						0	0	5					
04070306	41	28.7N	121.9E	35	20	58	70						0	5	5					
04070312	42	30.3N	122.3E	35	23	12							0	5						
04070318	43	31.8N	123.2E	30	18	30							0	5						
04070400	44	33.5N	124.5E	30	16								0							
04070406	45	34.9N	125.2E	25	15								0							
			AVERAGE		17	38	59	72	83	113	148	185	2	8	14	22	29	37	37	41
			BIAS										0	2	7	10	13	14	9	14
			# CASES		45	43	41	39	37	33	28	24	45	43	41	39	37	33	28	24

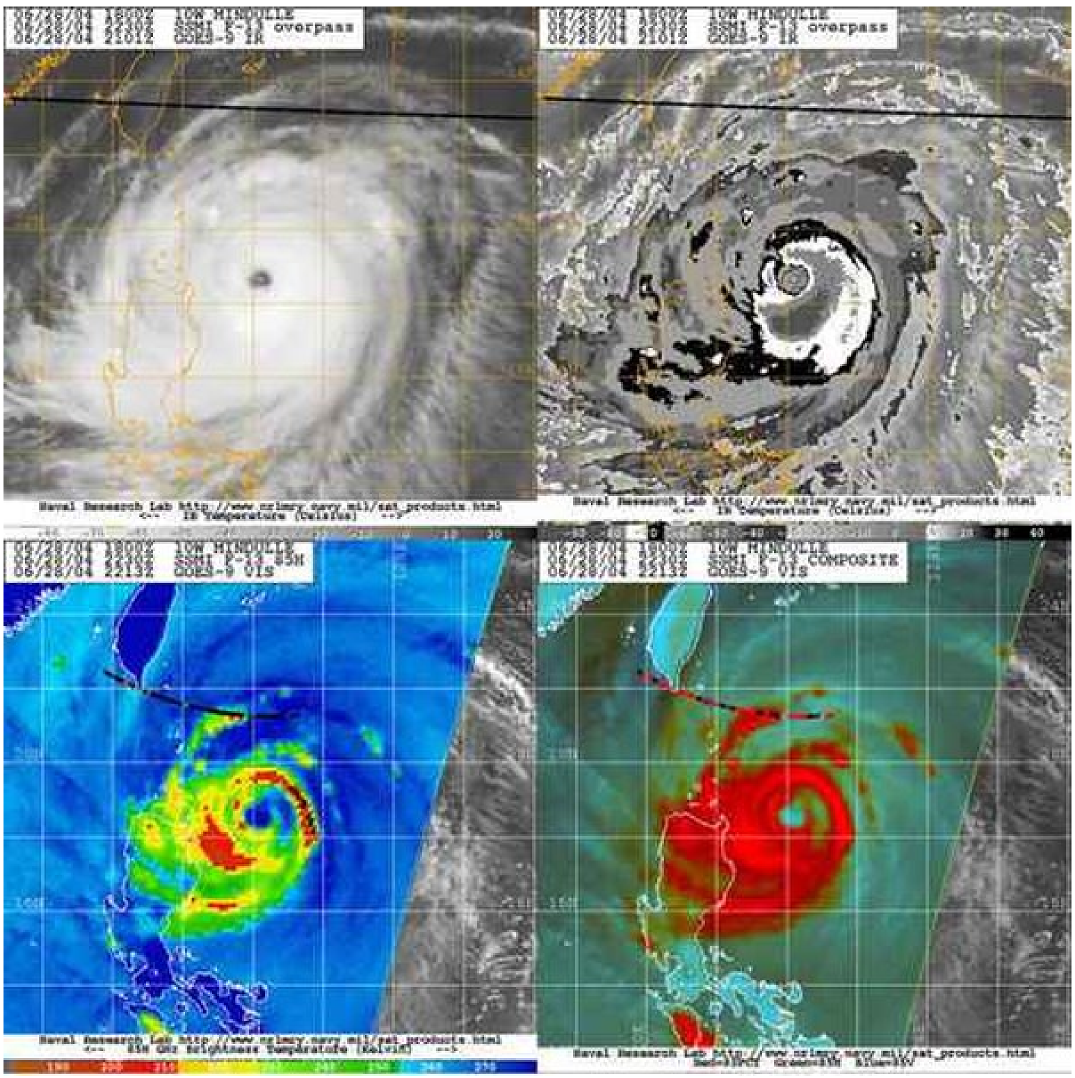


Figure 1-10W-1. 282230Z June 2004 SSM/I Multi-Sensor satellite images of TY 10W (Mindulle), reveals a well defined eye northeast-east of the northeast coast of Luzon. Microwave imagery reveals a nearly symmetrical eye with the western bands interacting with northern Luzon. Associated peak intensity was 125kts.

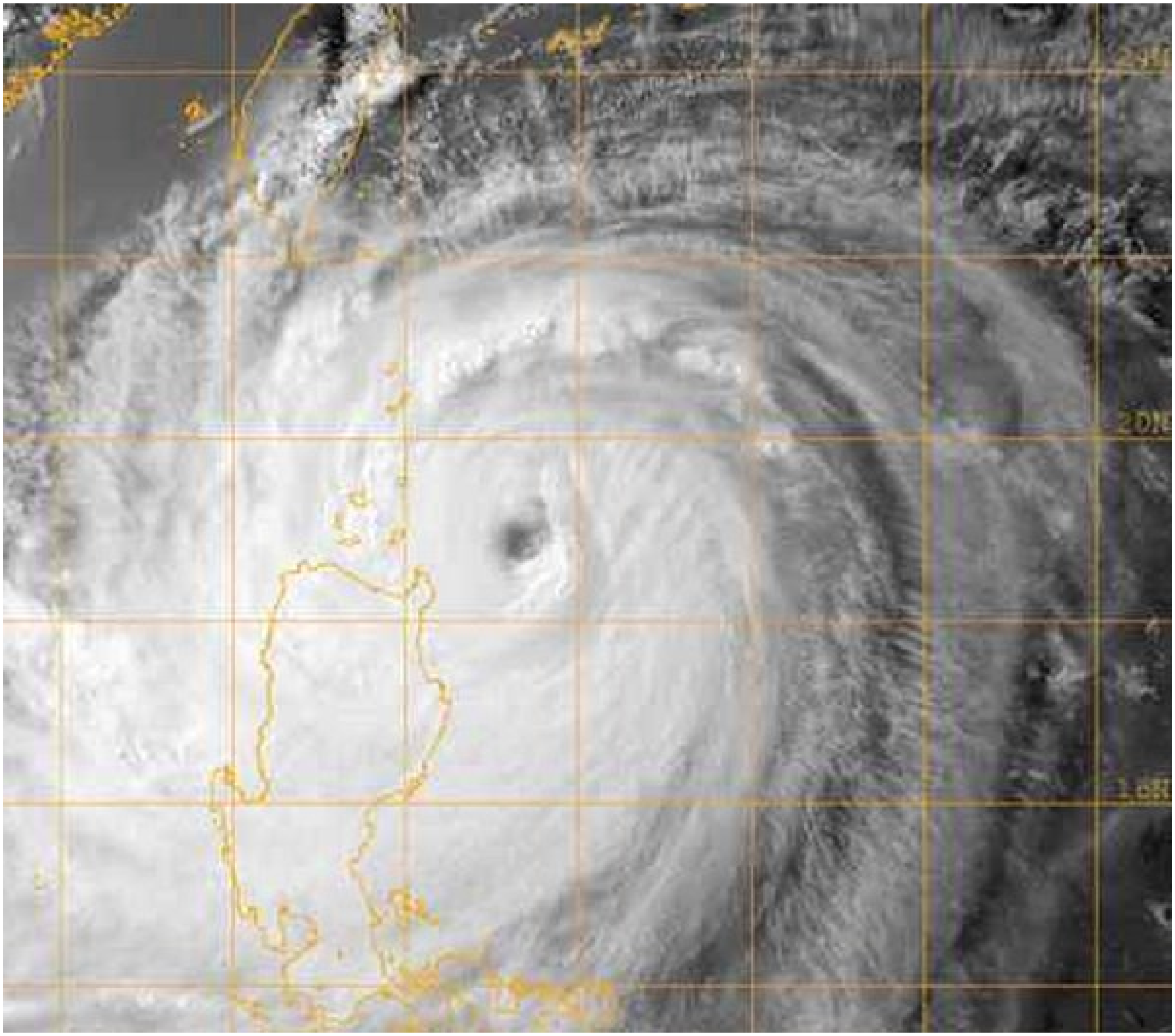


Figure 1-10W-2. 290220Z June 2004 MODIS true-color image of TY 10W (Mindulle), located off the northeast coast of the Philippines with an intensity of 125 knots.

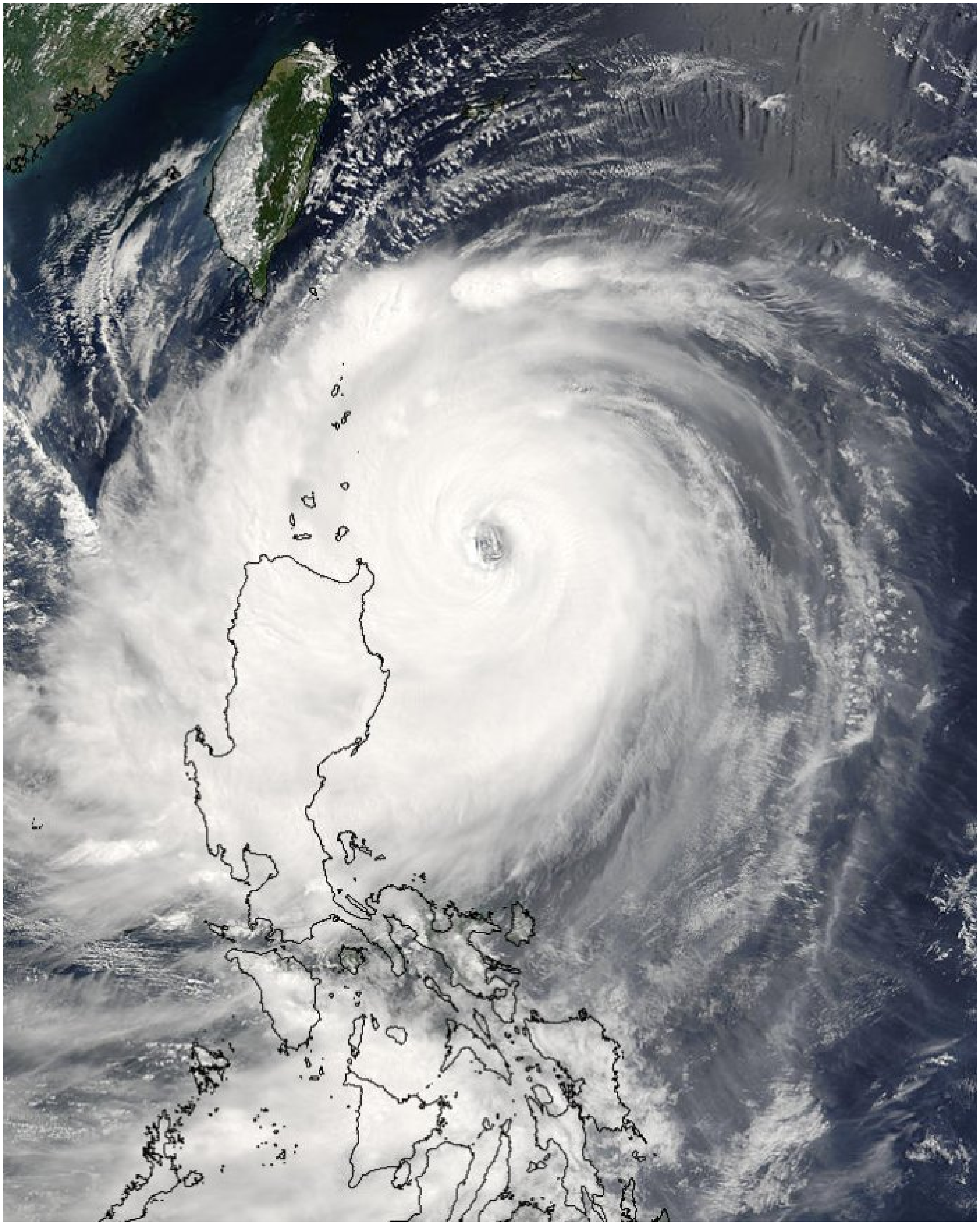


Figure 1-10W-3. 290220Z June 2004 MODIS true-color image depicting eye detail of TY 10W (Mindulle), located off the northeast coast of the Philippines with an intensity of 125 knots. Resolution of image is 250m.

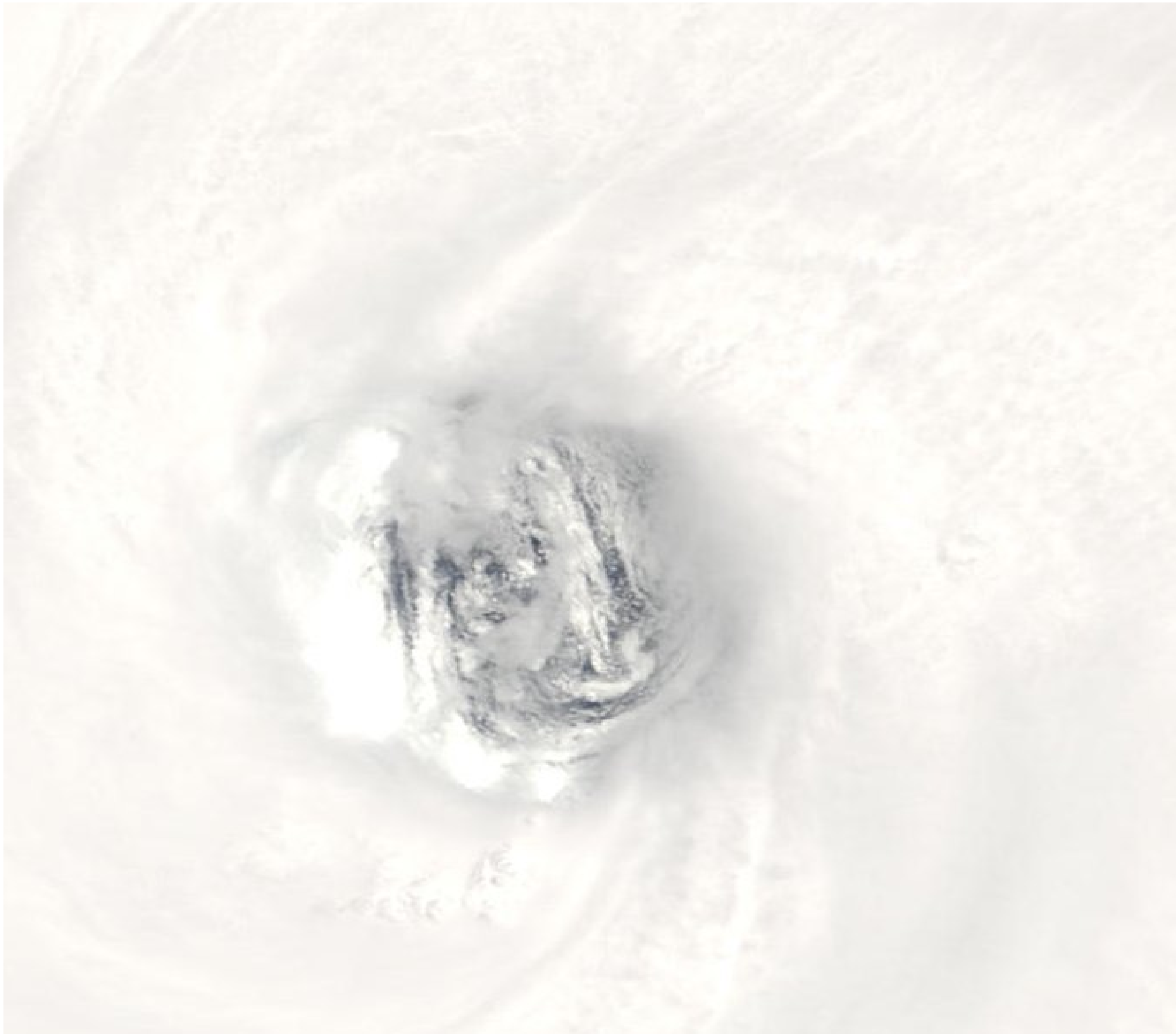
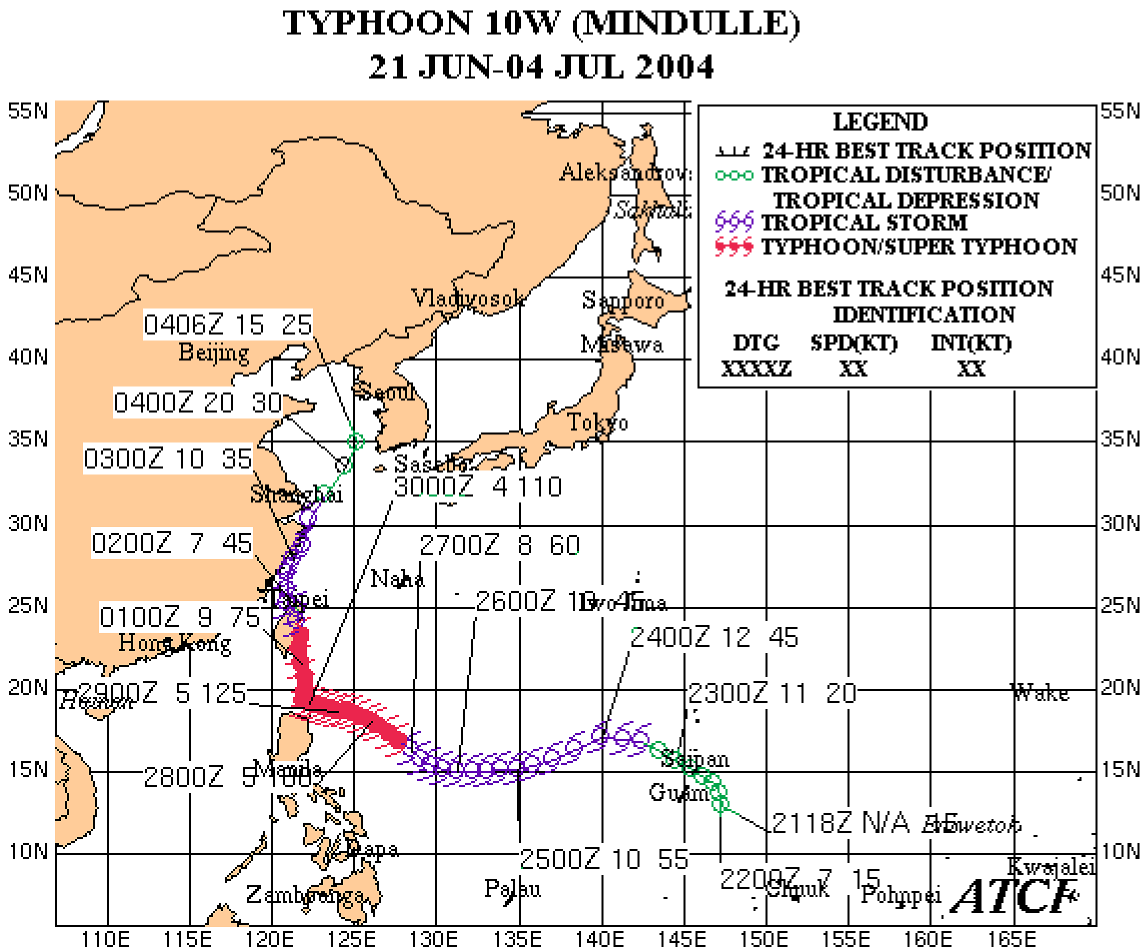
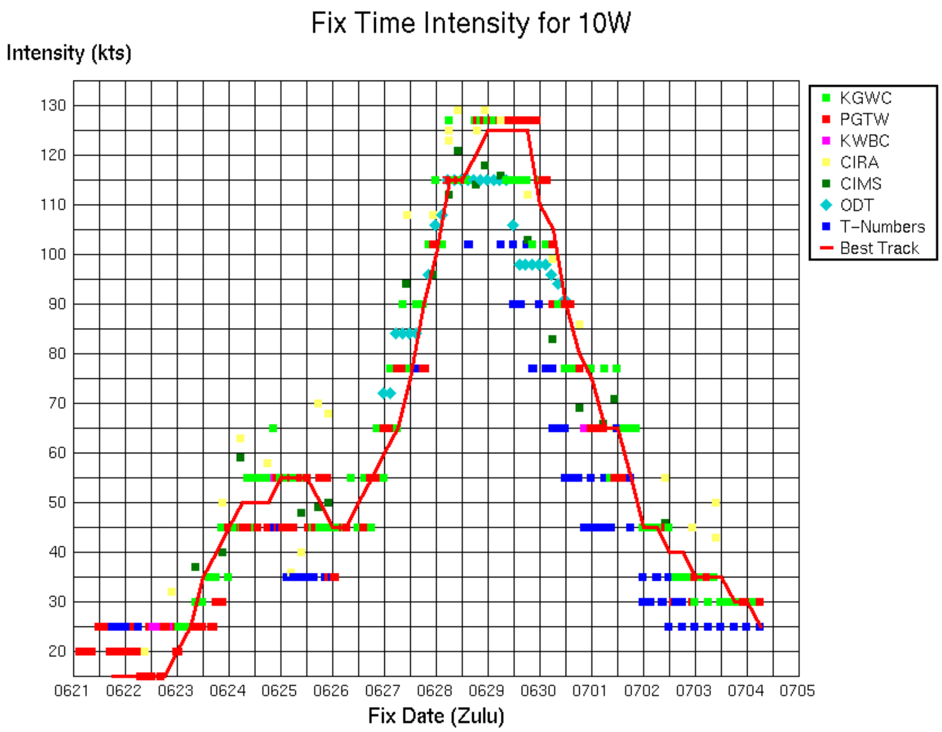


Figure 1-10W-4. 290801Z June 2004 Goes-9 visible satellite image of TY 10W (Mindulle), revealing a well defined eye to the northeast of Luzon with a peak intensity of 125kts.


TYPHOON 10W (MINDULLE)
21 JUN-04 JUL 2004
LEGEND
24-HR BEST TRACK POSITION
TROPICAL DISTURBANCE/ TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON/SUPER TYPHOON
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
0406Z 15 25
0400Z 20 30
0300Z 10 35
0200Z 7 45
0100Z 9 75
3000Z 4 110
2900Z 5 125
2800Z 5 100
2700Z 8 60
2600Z 10 45
2500Z 10 55
2400Z 12 45
2300Z 11 20
2209Z 7 15
2118Z N/A 15
ATCF


Fix Time Intensity for 10W
Intensity (kts)
KGWC
PGTW
KWBC
CIRA
CIMS
ODT
T-Numbers
Best Track
Fix Date (Zulu)

Typhoon (TY) 11W (Tingting)

First Poor : 0600Z 24 Jun 04

First Fair : N/A

First TCFA : 0000Z 25 Jun 04

First Warning : 1200Z 25 Jun 04

Last Warning : 1800Z 03 Jul 04, Extra-tropical

Max Intensity : 80 kts

Landfall : No

Total Warnings : 34

Remarks:

1) Typhoon (TY) 11W developed approximately 600 nm southeast of Guam in the monsoon trough. The cyclone initially intensified slowly as it tracked along the southwestern periphery of the subtropical ridge. The cyclone passed approximately 65 nm to the east of Saipan on 27 Jun around 2100Z and Saipan reported maximum sustained winds of 47 kts with a peak gust of 67 kts as a result of this passage. After passing Saipan, TY 11W began to track north-northwestward in response to a passing shortwave trough and reached a maximum intensity of 80 kts as poleward outflow improved. TY 11W crested the subtropical ridge axis approximately 60 nm east of Iwo Jima and began to accelerate northeastward and weaken as it merged with the mid-latitude westerlies. The final warning was issued on 03 Jul at 1800Z as the system completed extra-tropical transition.

2) Reports indicated that although TY 11W passed at a distance of over 180 nm to the east of Guam, record setting rainfall caused extensive flooding and mudslides damaging many structures to that island. Saipan reported 3 deaths and extensive crop damage.

Statistics for JTWC on TY 11W																				
	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04062418		11.6N	153.8E	20																
04062500		11.6N	153.3E	25																
04062506		11.6N	152.8E	25																
04062512	1	11.6N	152.3E	30	0	26	63	100	151	160			0	5	0	-5	0	-15		
04062518	2	11.7N	151.8E	30	8	32	55	94	116	178			0	0	-5	-10	-5	-15		
04062600	3	11.9N	151.2E	30	5	18	41	74	75	183			0	-5	-10	-10	-10	-15		

04062606	4	12.1N	150.7E	35	12	43	51	80	99	119	201	234	0	0	-5	-5	-15	-10	15	35
04062612	5	12.5N	150.3E	40	24	54	49	70	90	151	242	196	0	-5	-5	-10	-20	-5	15	45
04062618	6	13.3N	149.9E	45	18	21	36	42	85	164	257	174	0	-5	0	-5	0	10	25	50
04062700	7	13.9N	149.2E	50	8	17	24	25	46	146	221	232	0	5	0	-5	5	20	35	55
04062706	8	14.3N	148.4E	55	8	25	35	60	45	124	206	177	0	5	0	5	20	50	70	60
04062712	9	14.9N	147.7E	55	13	33	49	61	73	145	160	75	0	0	-5	5	25	50	60	50
04062718	10	15.6N	147.1E	60	5	8	19	12	25	115	78	81	0	-10	-5	5	25	50	60	50
04062800	11	16.2N	146.4E	65	0	6	13	25	49	78	45	88	0	-5	5	20	30	50	65	55
04062806	12	16.8N	145.7E	75	0	25	16	29	53	39	30	67	0	15	30	45	65	70	60	45
04062812	13	17.6N	144.9E	80	0	19	29	45	57	74	102	152	-5	10	30	45	60	65	40	25
04062818	14	18.6N	144.3E	80	0	6	21	58	69	105	117	170	0	5	20	45	50	60	40	25
04062900	15	19.3N	143.6E	80	23	34	58	83	84	89	129	232	0	10	20	35	50	55	40	35
04062906	16	20.2N	143.1E	80	18	32	63	92	115	157	156		0	10	25	35	55	50	35	
04062912	17	21.2N	142.8E	75	13	36	64	77	95	100	202		0	10	20	30	40	30	20	
04062918	18	22.4N	142.5E	75	8	13	28	64	111	138	148		0	15	15	25	30	20	15	
04063000	19	23.7N	142.4E	70	5	16	40	75	98	149	126		5	15	20	30	30	20	25	
04063006	20	25.0N	142.4E	65	30	18	27	60	47	93			10	15	25	30	25	15		
04063012	21	26.2N	142.5E	65	0	16	47	58	72	119			5	10	20	20	15	15		
04063018	22	27.4N	142.7E	65	0	22	45	12	47	124			0	15	15	10	5	0		
04070100	23	28.4N	143.2E	60	5	16	26	36	79	153			5	15	15	10	5	10		
04070106	24	29.3N	143.7E	50	11	31	36	71	111				15	20	15	15	10			
04070112	25	29.9N	144.5E	45	10	16	26	72	109				10	10	5	5	5			
04070118	26	30.5N	145.3E	45	11	59	47	42	85				10	5	5	5	0			
04070200	27	31.2N	145.9E	45	18	28	21	62	163				10	5	5	5	10			
04070206	28	31.9N	146.5E	45	13	31	64	85					10	5	10	0				
04070212	29	32.3N	147.5E	45	32	81	108	192					10	5	10	10				
04070218	30	32.7N	148.8E	45	55	102	131						5	10	0					
04070300	31	33.3N	150.3E	45	20	81	187						0	0	5					
04070306	32	34.3N	151.8E	40	19	20							5	-5						
04070312	33	35.1N	153.5E	40	15	49							0	5						
04070318	34	36.1N	155.2E	45	12								-5							
04070400		37.8N	157.8E	35																
			AVERAGE		13	31	49	64	83	126	151	157	3	8	11	17	23	30	39	44
			BIAS										3	6	9	13	19	25	39	44
			# CASES		34	33	31	29	27	23	16	12	34	33	31	29	27	23	16	12

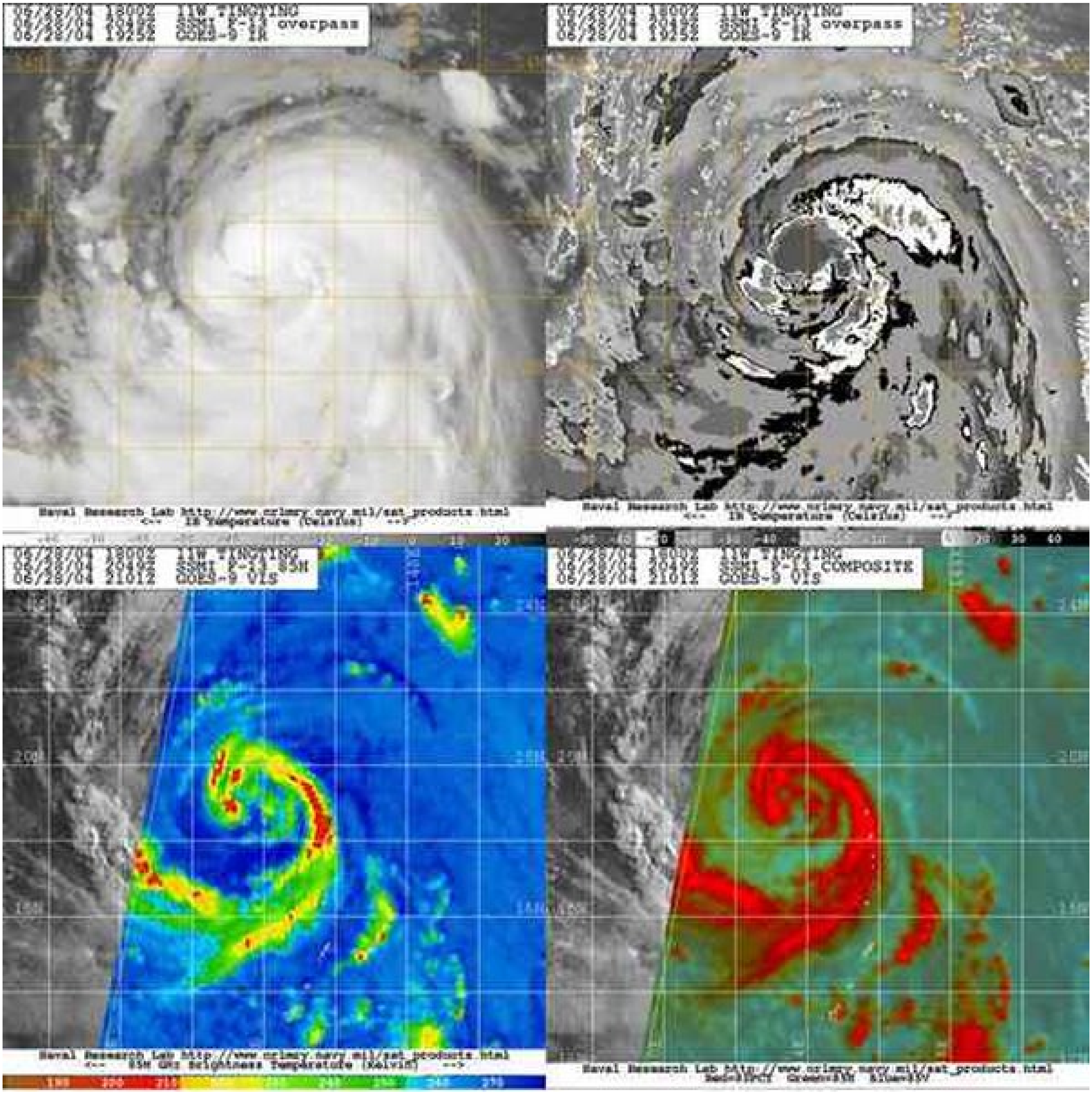


Figure 1-11W-1. 282049Z June 2004 SSM/I Multi-Sensor satellite image of TY 11W (Tingting), shows the system pattern of tightly curved band transitoning into a banding eye pattern with a peak intensity of 80kts.

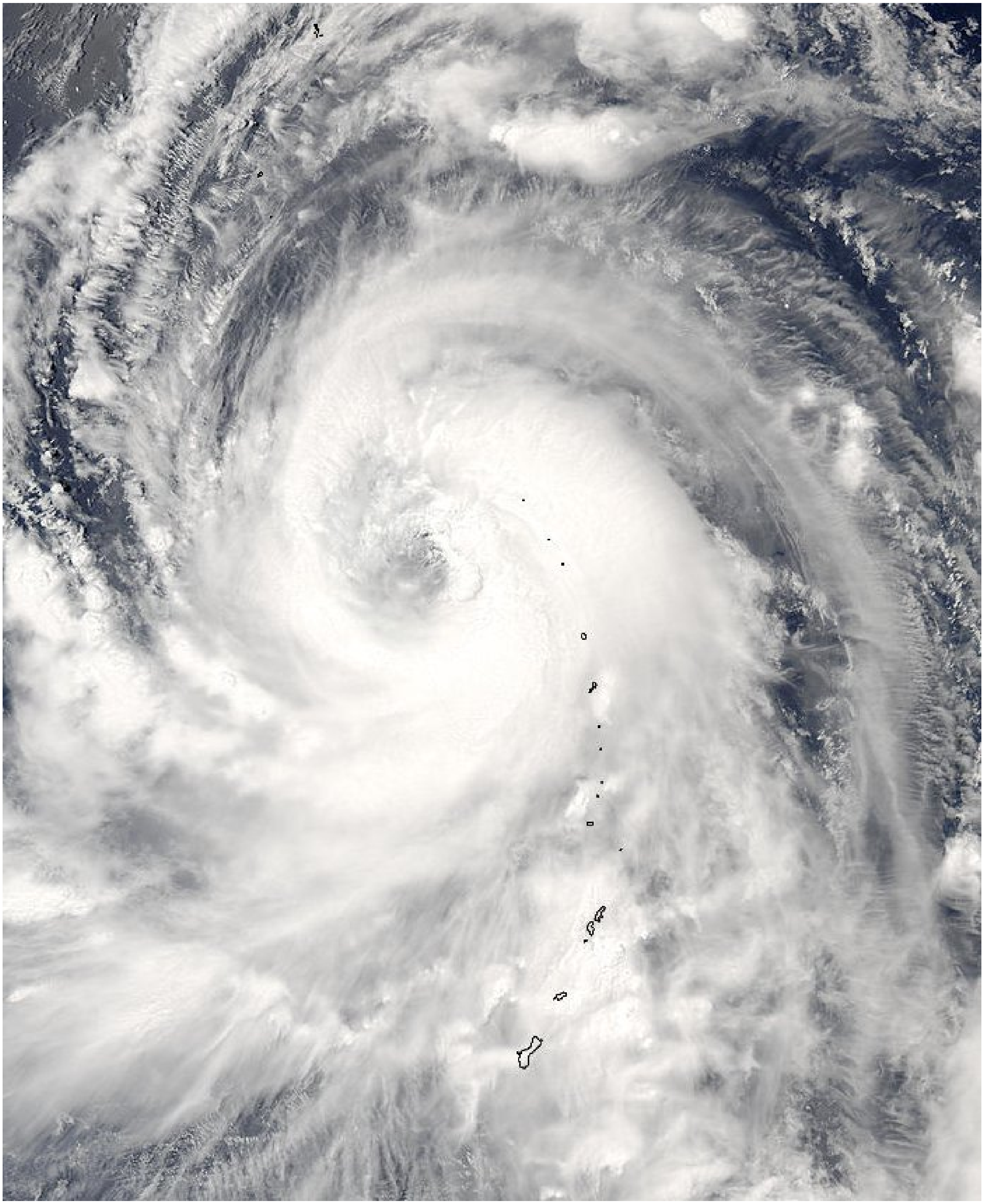
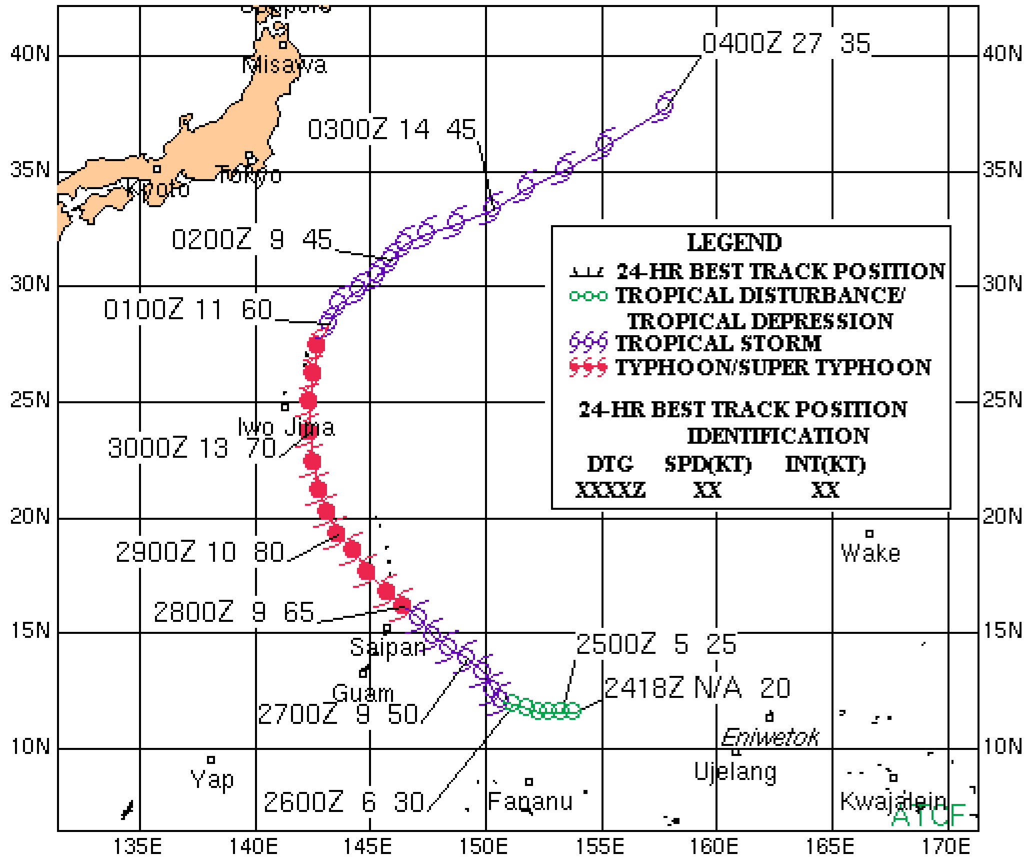
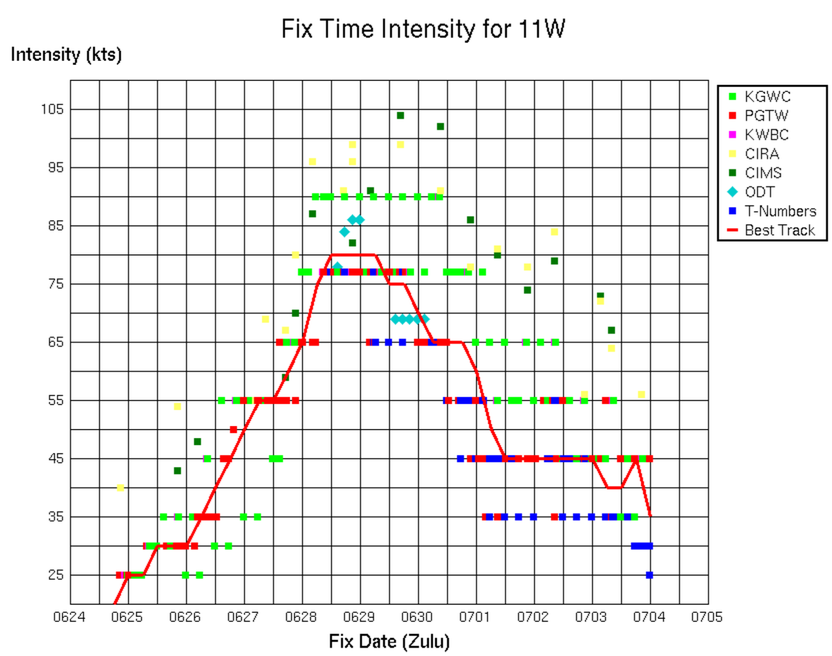


Figure 1-11W-2. 290345Z June 2004 MODIS true-color image of TY 11W (Tingting), located 370 nm north-northwest of Guam with an intensity of 80 knots.

TYPHOON 11W (TINGTING)
25 JUN-04 JUL 2004





Tropical Storm (TS) 12W (Kompasu)

First Poor : 0600Z 12 Jul 04

First Fair : 1930Z 12 Jul 04

First TCFA : 0200Z 13 Jul 04

First Warning : 0600Z 13 Jul 04

Last Warning : 1200Z 16 Jul 04, Dissipated over land

Max Intensity : 45 kts, gusts to 55 kts

Landfall : Hong Kong

Total Warnings : 14

Remarks:

1) Tropical Storm (TS) 12W was initially began as a broad amorphous mass of convection located approximately 425 nm south-southwest of Iwo Jima on 10 Jul. This unorganized mass of convection was tracked moving west for 2 days before cyclonic turning could be detected. Subsequently, TS 12W reached a maximum intensity of 45 knots on 14 Jul at 1800Z and remained at this strength for 24 hours. By 16 Jul at 0600Z, the cyclone weakened and began to track poleward as the subtropical steering ridge became situated to the northeast. The system made landfall over Hong Kong and quickly dissipated.

2) No damage reports were received for this system.

Statistics for JTWC on TS 12W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04071206		20.0N	133.3E	15																
04071212		20.3N	132.3E	20																
04071218		20.6N	131.3E	25																
04071300		20.9N	130.3E	25																
04071306	1	20.9N	129.2E	25	17	66	121	241	278	312			0	0	0	-5	-5	0		
04071312	2	20.9N	127.9E	30	8	54	90	172	205	206			0	5	0	-5	0	0		
04071318	3	21.0N	126.3E	30	21	34	161	217	248				0	0	-5	-5	0			
04071400	4	21.4N	124.7E	30	16	120	186	196	216				0	-5	-5	-10	-10			
04071406	5	21.4N	123.1E	35	23	146	180	184	164				0	-5	-10	-10	-5			
04071412	6	20.5N	121.5E	40	12	69	79	137	95				0	0	5	15	-5			
04071418	7	20.1N	120.0E	45	11	31	25	34					0	5	10	15				
04071500	8	20.2N	118.8E	45	24	60	74	139					0	5	15	20				

04071506	9	20.4N	117.8E	45	21	40	83						0	5	20					
04071512	10	20.7N	116.9E	45	12	56	62						0	10	15					
04071518	11	21.0N	116.0E	45	12	41							0	10						
04071600	12	21.2N	114.8E	40	11	40							0	0						
04071606	13	22.1N	114.3E	35	12								0							
04071612	14	23.1N	114.3E	35	8								0							
			AVERAGE		15	63	106	165	201	259			0	4	9	11	4	0		
			BIAS										0	3	5	2	-4	0		
			# CASES		14	12	10	8	6	2			14	12	10	8	6	2		

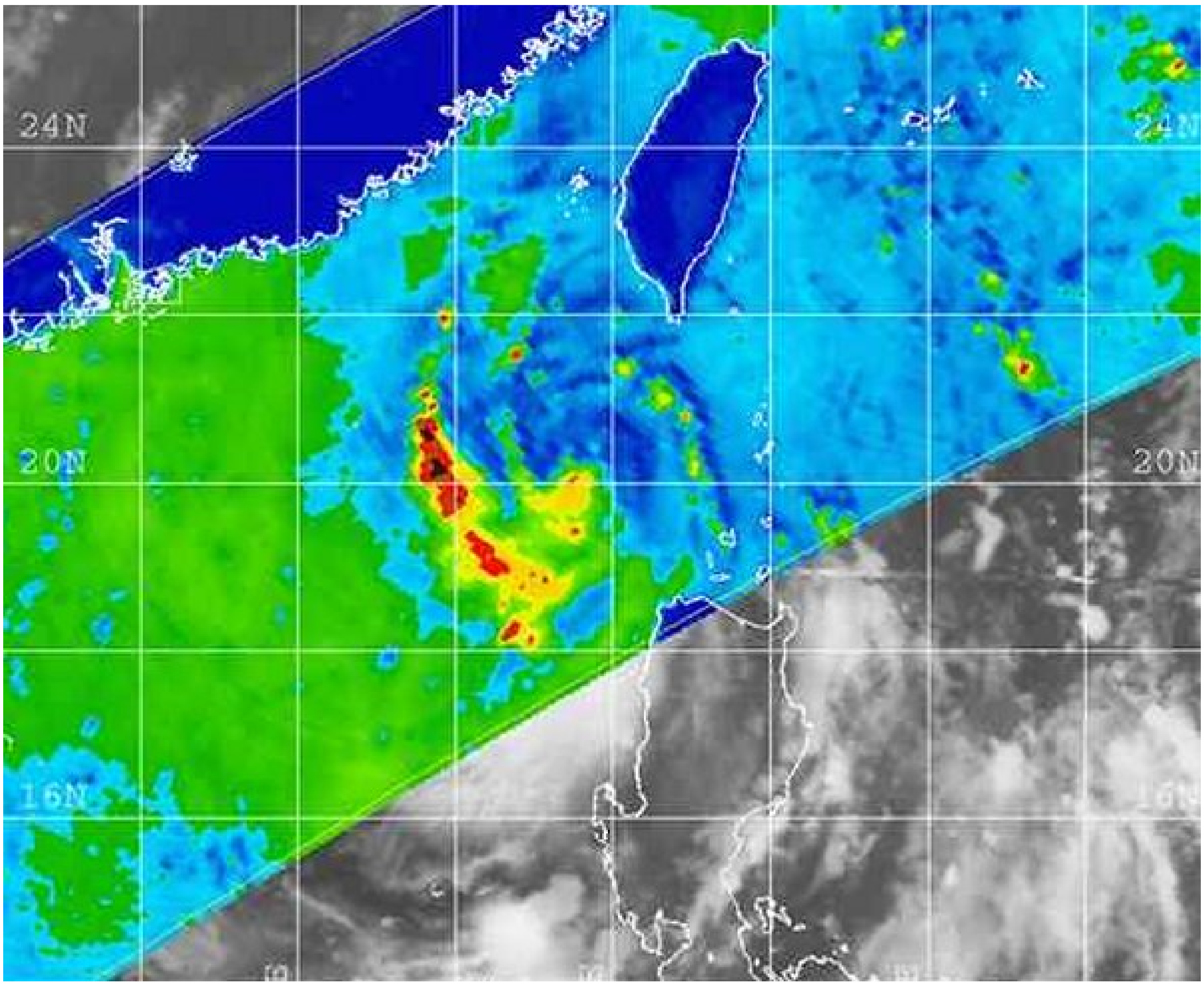
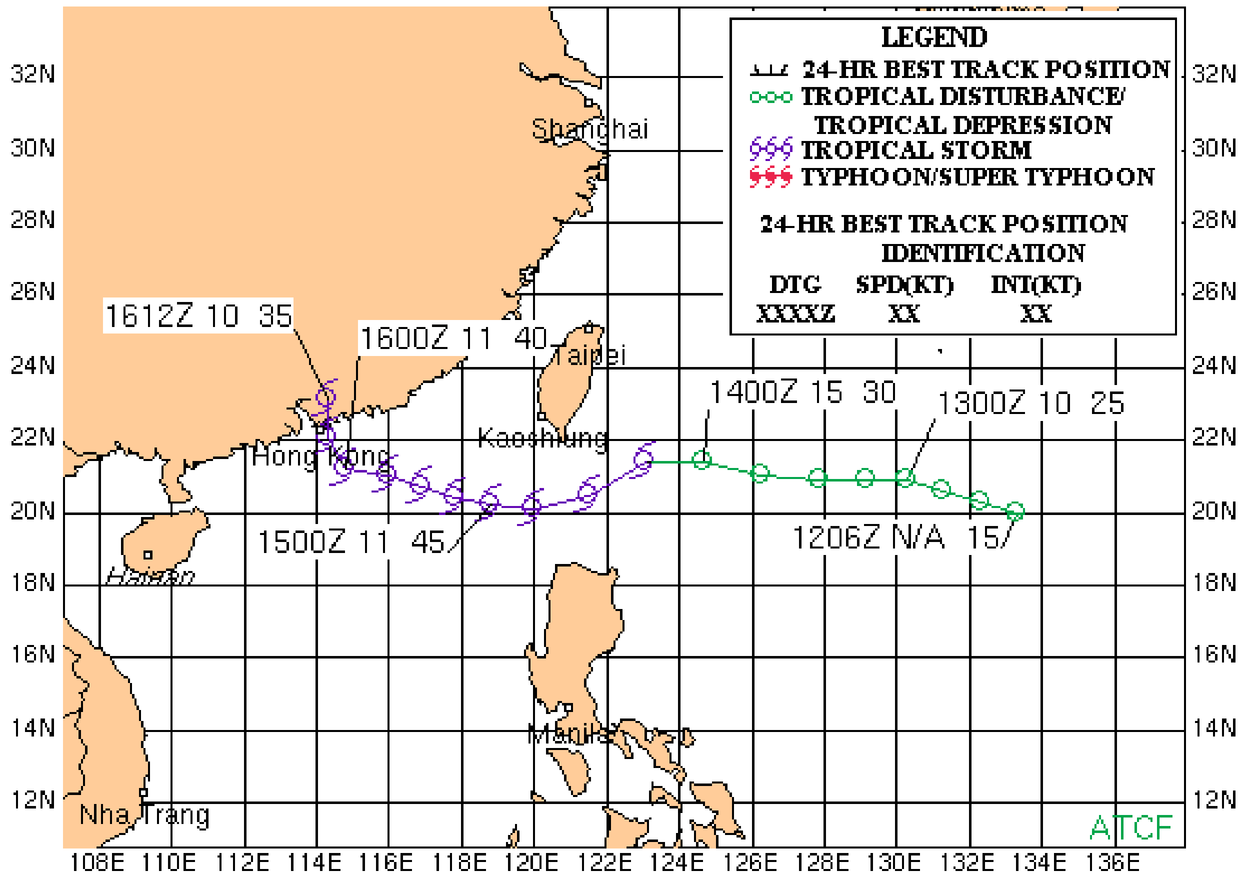
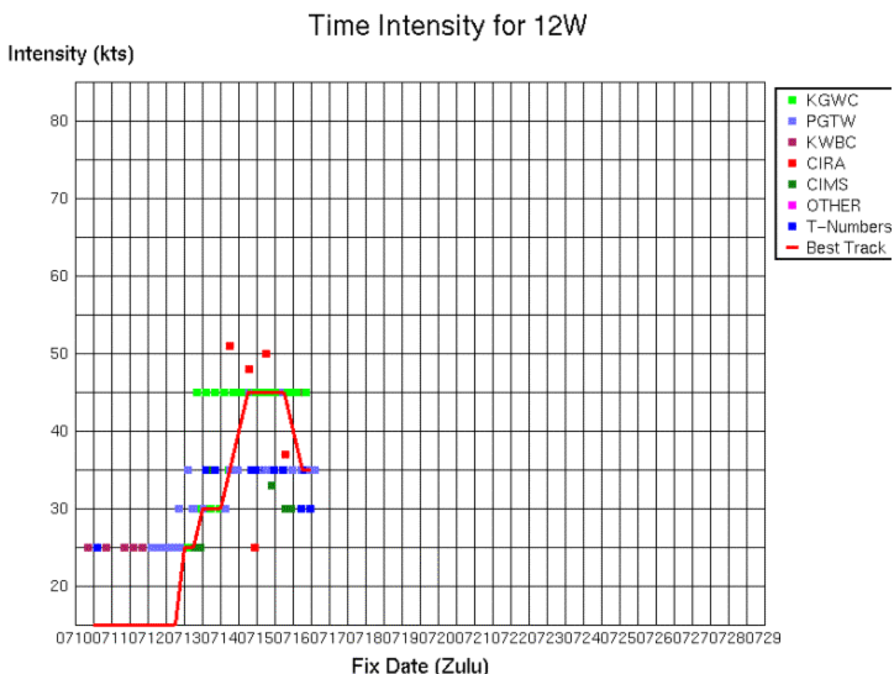


Figure 1-WP12-1. 142221Z July 2004 TRMM Infrared image of TS 12W, located 155 nm Southwest of Taiwan. At this time the systems Low-Level circulation center was partially exposed to the Northeast of the associated deep cnvctn, with a peak intensity of 45KTS.

TROPICAL STORM 12W (KOMPASU)
12-16 JUL 2004





Typhoon (TY) 13W (Namtheun)

First Poor : 0230Z 24 Jul 04

First Fair : 1130Z 24 Jul 04

First TCFA : 1400Z 24 Jul 04

First Warning : 0000Z 25 Jul 04

Last Warning : 0600Z 01 Aug 04, Extra-tropical

Max Intensity : 90 kts, gusts to 110 kts

Landfall : Japan

Total Warnings : 30

Remarks:

1) Typhoon (TY) 13W was first detected as an area of heavy convection at about 390 nm northeast of Saipan on 23 Jul. The disturbance was upgraded to a Tropical Depression on 25 July and initially moved northwest along the southwest periphery of the subtropical ridge. During this northwest movement, the cyclone rapidly intensified (25kts/6 hours) at around 0600Z on 26 Jul due to enhanced outflow provided by the TUTT to the northeast. TY 13W made landfall over Shikoku Island shortly after 0600Z on 31 Jul. The cyclone subsequently began transition into an extra-tropical low as it entered the Sea of Japan at which time a final warning was issued.

2) Reports indicated 6 injuries in southern Japan and as many as 155 flights in Shikoku were grounded. Reports also indicate approximately 500 mm of rain fell within a 24 hour period over southern Japan.

Statistics for JTWC on TY 13W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04072406		20.1N	150.8E	20																
04072412		20.7N	150.7E	20																
04072418		21.4N	150.5E	20																
04072500	1	22.1N	150.3E	25	45	54	60	66	102	163			0	-5	-30	-65	-70	-40		
04072506	2	22.8N	150.0E	30	0	11	33	46	65	90			0	-10	-45	-65	-55	-25		
04072512	3	23.6N	149.5E	35	8	22	40	73	118	103	110	206	15	0	-30	-30	-10	15	25	30
04072518	4	24.2N	148.9E	50	5	22	32	71	107	101	137	195	0	-25	-40	-30	-5	10	30	35
04072600	5	24.8N	148.4E	65	8	17	48	99	105	113	165	208	0	-30	-30	-15	5	20	30	35
04072606	6	25.4N	147.8E	90	0	6	30	62	60	65	125	210	0	-5	10	25	20	25	35	40
04072612	7	26.1N	147.2E	105	5	16	44	43	50	78	107	229	0	5	25	35	30	35	40	45
04072618	8	26.9N	146.6E	115	0	19	42	36	48	64	74	152	0	15	40	30	30	35	40	50
04072700	9	27.8N	146.0E	115	5	25	17	16	26	49	10	86	0	15	30	30	25	35	35	45
04072706	10	28.7N	145.2E	110	15	26	28	31	18	24	36	69	0	20	15	25	30	40	40	10
04072712	11	29.7N	144.6E	105	5	21	33	34	44	47	66		0	15	20	20	30	40	45	
04072718	12	30.4N	143.6E	90	5	31	32	36	47	34	65		0	-5	0	0	10	15	25	
04072800	13	30.8N	142.5E	90	5	26	16	28	36	41	23		0	5	-5	5	0	5	15	
04072806	14	31.2N	141.6E	90	0	6	19	36	43	55	97		0	5	5	10	10	10	15	
04072812	15	31.4N	140.8E	80	5	21	31	49	57	95			0	-5	10	5	15	15		
04072818	16	31.5N	140.3E	80	0	16	31	54	70	134			0	10	15	10	15	25		
04072900	17	31.5N	139.8E	80	0	15	35	47	78	155			0	15	10	15	10	20		
04072906	18	31.5N	139.3E	75	0	6	34	62	119	223			5	15	20	30	30	20		
04072912	19	31.4N	138.8E	65	6	24	41	84	153				15	15	25	30	30			
04072918	20	31.6N	138.2E	65	7	30	48 1	8	175				10	15	15	20	30			
04073000	21	31.8N	137.5E	65	19	36	56 1	17	162				10	15	15	25	30			
04073006	22	31.9N	136.8E	60	5	12	47	95	134				15	20	20	15	10			
04073012	23	31.9N	136.0E	55	5	24	66 1	13					10	5	10	10				
04073018	24	32.2N	135.2E	55	5	36	56	85					5	5	10	5				
04073100	25	32.6N	134.4E	55	19	60	79						5	10	10					
04073106	26	33.2N	133.4E	50	6	21	50						5	10	5					
04073112	27	33.8N	132.6E	45	5	15							5	10						
04073118	28	34.3N	131.9E	35	46	87							5	0						
04080100	29	34.9N	131.5E	35	20								0							
04080106	30	35.6N	131.2E	35	11								-5							
			AVERAGE		9	25	40	62	83	91	85	169	4	11	19	23	23	24	31	36
			BIAS										3	5	5	6	10	17	31	36
			# CASES		30	28	26	24	22	18	12	8	30	28	26	24	22	18	12	8

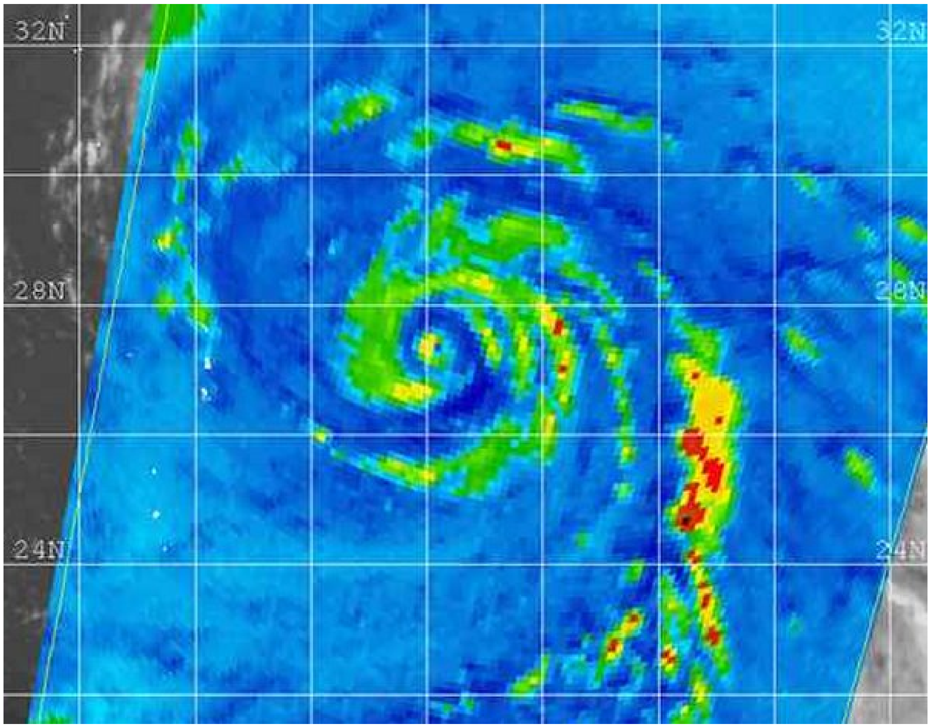


Figure 1-WP13-1. 262055Z July 2004 SSM/I Imagery of TY 13W (Namtheun), at this time, dry air was beginning to invade the south and eastern sides of the systems center. The eye was becoming cloud filled and was approximately 310 nm to the ne of Iwo Jima with a peak intensity of 115kts.

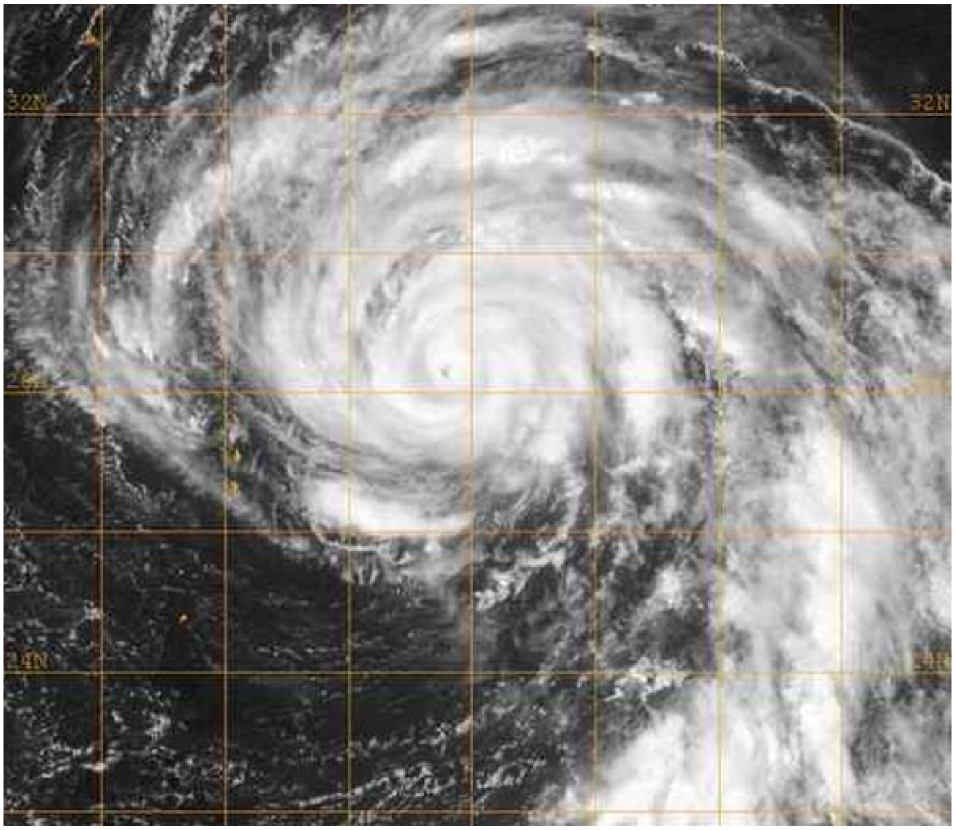


Figure 1-WP13-2. 270325Z July 2004 Goes-9 visible image of TY 13W (Namtheun), At this time, you can begin to see seperation in the outer cloud bands as dry air is beginning to invade the systems center. Peak intensity was 115kts.

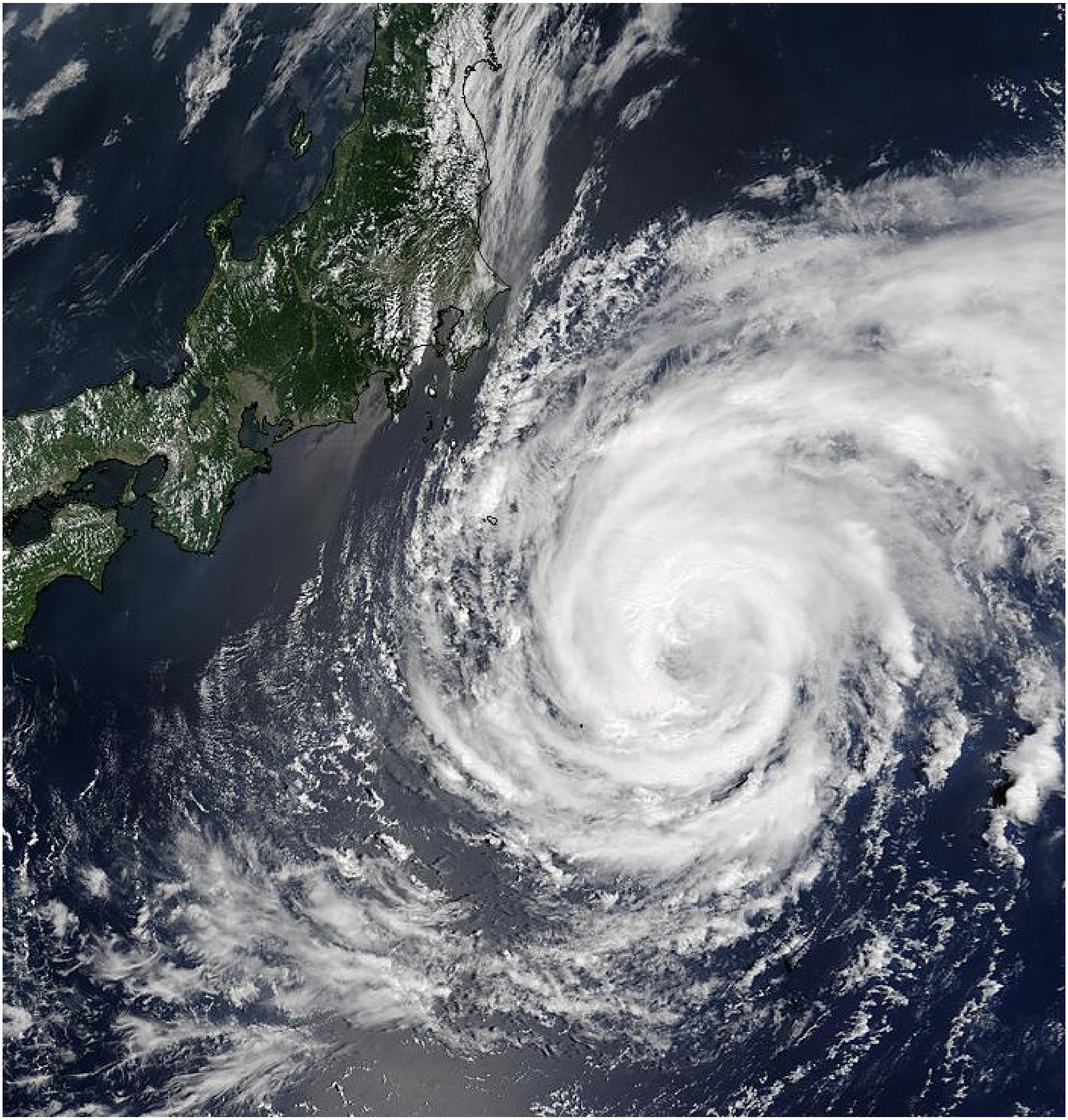
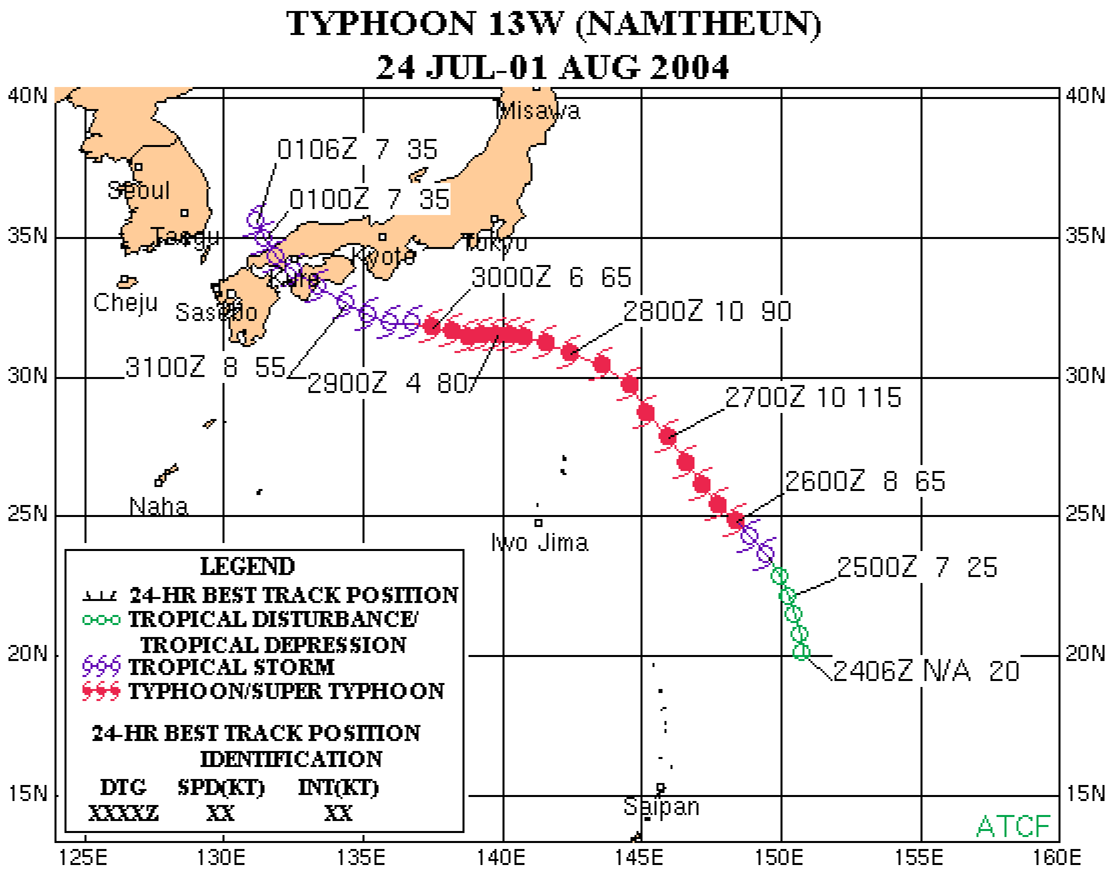
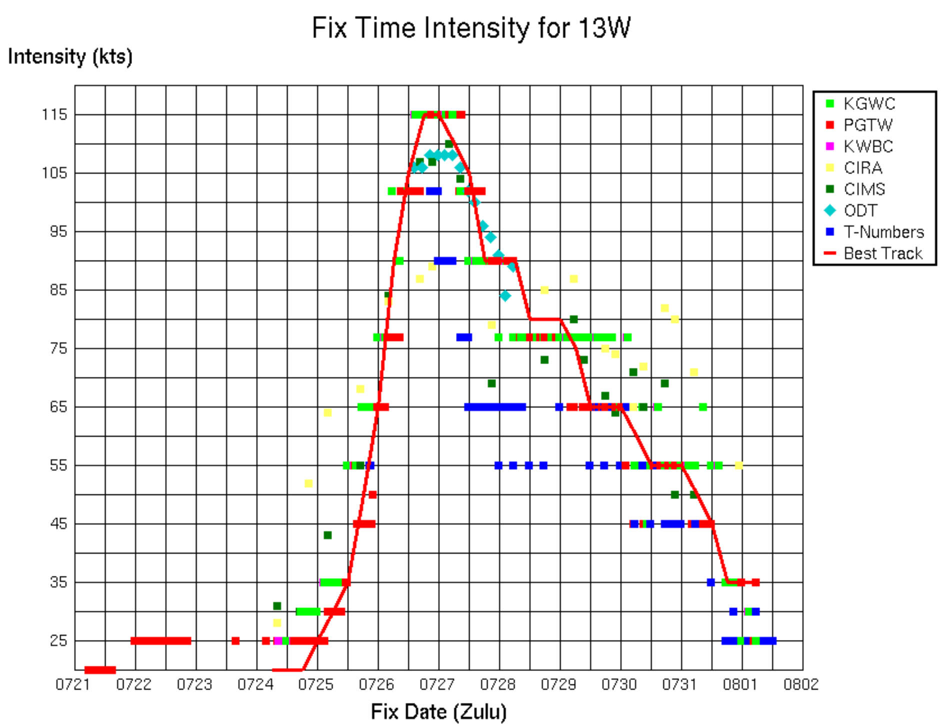


Figure 1-WP13-3. 280145Z July 2004 MODIS true-color image of TY 13W (Namtheun), approaching the east coast of Japan with an intensity of 90 knots.



TYPHOON 13W (NAMTHEUN)
24 JUL-01 AUG 2004
40N
35N
30N
25N
20N
15N
125E
130E
135E
140E
145E
150E
155E
160E
Misawa
Seoul
Taegu
Kyoto
Tokyo
Kure
Cheju
Sasebo
Naha
Iwo Jima
Saipan
0106Z 7 35
0100Z 7 35
3000Z 6 65
2800Z 10 90
3100Z 8 55
2900Z 4 80
2700Z 10 115
2600Z 8 65
2500Z 7 25
2406Z N/A 20
LEGEND
24-HR BEST TRACK POSITION
TROPICAL DISTURBANCE/ TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON/SUPER TYPHOON
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
ATCF



Fix Time Intensity for 13W
Intensity (kts)
115
105
95
85
75
65
55
45
35
25
0721
0722
0723
0724
0725
0726
0727
0728
0729
0730
0731
0801
0802
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
ODT
T-Numbers
Best Track

Typhoon (TY) 14W (Meranti)

First Poor : 0600Z 31 Jul 04

First Fair : 2100Z 02 Aug 04

First TCFA : 0230Z 03 Aug 04

First Warning : 1800Z 03 Aug 04

Last Warning : 0600Z 08 Aug 04, Extra-tropical

Max Intensity : 90 kts gusts to 110 kts

Landfall : None

Total Warnings : 19

Remarks:

1) Typhoon (TY) 14W was first detected as a tropical disturbance approximately 255 nm south of Wake Island On 02 Aug. TY 14W developed into a Tropical Depression about 03 Aug while moving northward. The cyclone passed 24 nm of Wake Island and then intensified to a tropical storm about 8 hours after CPA. By 1200Z on 05 Aug,TY 14W had intensified to typhoon strength, and then shortly thereafter, rapidly intensified to 90 knots. The cyclone maintained maximum intensity for 18 hours before beginning to weaken in an environment of high vertical wind shear and cooler sea surface temperatures. By 0600Z on 08 Aug, TY 14W began to transition into an extra-tropical system and the final warning was issued around the same period.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TY 14W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04080218		15.8N	165.8E	20																
04080300		16.7N	166.1E	25																
04080306		17.6N	166.4E	25																
04080312		18.5N	166.5E	25																
04080318	1	19.4N	166.2E	30	17	43	50	29	72	195			0	0	10	0	-25	-10		
04080400	2	20.6N	166.0E	35	42	79	91	75	75	163	313	478	0	10	10	-5	-15	25	35	50
04080406	3	21.9N	165.8E	35	24	25	38	37	42	137	324	488	0	5	-10	-35	-25	15	35	40
04080412	4	23.2N	165.5E	35	48	33	5	24	75	162	298		0	-5	-25	-40	-35	5	30	
04080418	5	24.4N	165.5E	35	12	49	86	110	122	126	286		0	-15	-45	-40	-15	10	25	
04080500	6	25.5N	165.8E	45	23	48	92	137	172	226	330		0	-20	-35	-35	0	20	35	
04080506	7	26.3N	166.3E	55	17	53	87	102	116	202	223		0	-25	-20	5	15	30	40	
04080512	8	27.1N	166.8E	70	0	24	55	71	92	174			-5	-20	-15	15	20	35		
04080518	9	27.9N	167.5E	90	8	5	10	16	54	46			0	10	45	50	50	60		
04080600	10	28.7N	168.1E	90	10	22	38	30	32	66			0	5	40	40	45	55		
04080606	11	29.5N	168.8E	90	12	26	47	21	45	39			0	25	35	40	45	50		
04080612	12	30.3N	169.5E	90	5	26	28	43	50				-10	5	5	5	5			
04080618	13	31.2N	170.2E	65	20	34	38	23					-15	-20	-15	-5				
04080700	14	32.1N	171.0E	60	28	58	42	33					0	-10	-10	-5				
04080706	15	32.9N	171.7E	55	37	36	60	56					0	5	10	15				
04080712	16	34.0N	172.0E	55	18	53	51	31					0	5	10	15				
04080718	17	34.9N	171.4E	45	4	19	33	36					0	5	10	10				
04080800	18	35.9N	171.6E	45	20	18	15						-5	0	10					
04080806	19	37.1N	171.7E	35	18	66	75						5	10	15					
04080812		37.8N	172.1E	35																
04080818		38.4N	172.7E	25																
04080900		39.2N	172.6E	25																
04080906		40.0N	172.6E	20																
			AVERAGE		20	38	50	51	79	140	296	483	2	11	20	21	25	29	33	45
			BIAS										-2	-2	1	2	5	27	33	45
			# CASES		19	19	19	17	12	11	6	2	19	19	19	17	12	11	6	2

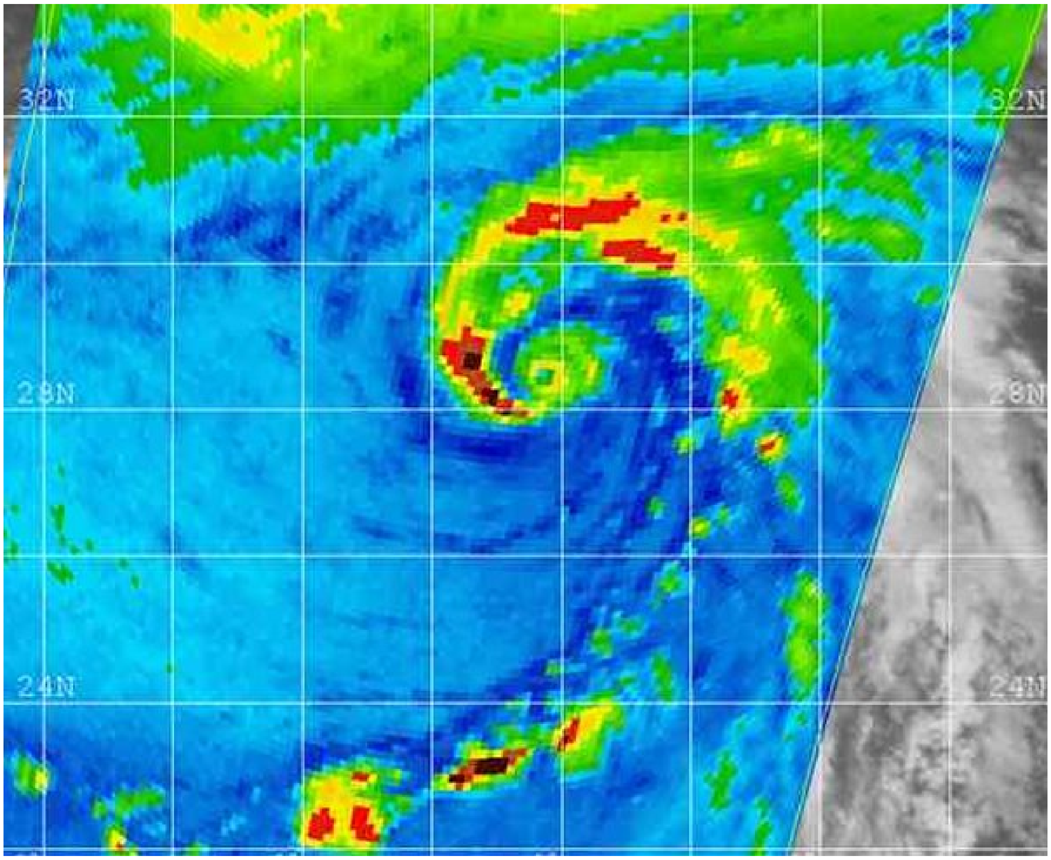


Figure 1-WP14-1. 052221Z August 2004 SSM/I Goes-9 visible image of TY 14W (Meranti), approximately 593NM north of Wake Island. At this time, the system had a slightly cloud filled eye with dry air beginning to invade the east side with a peak intensity of 90 knots.

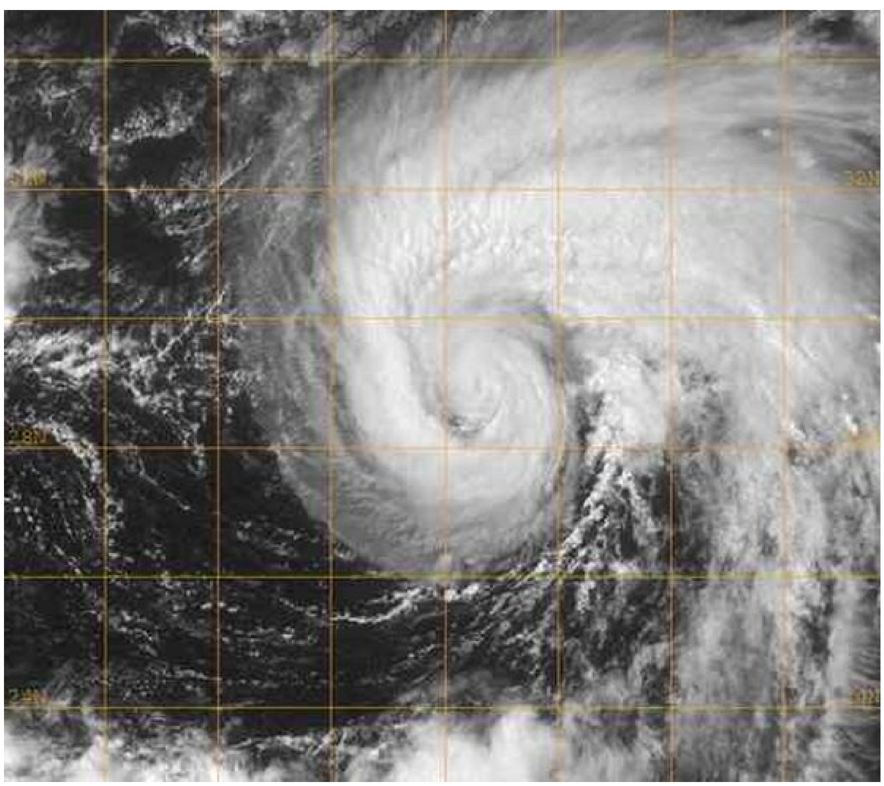
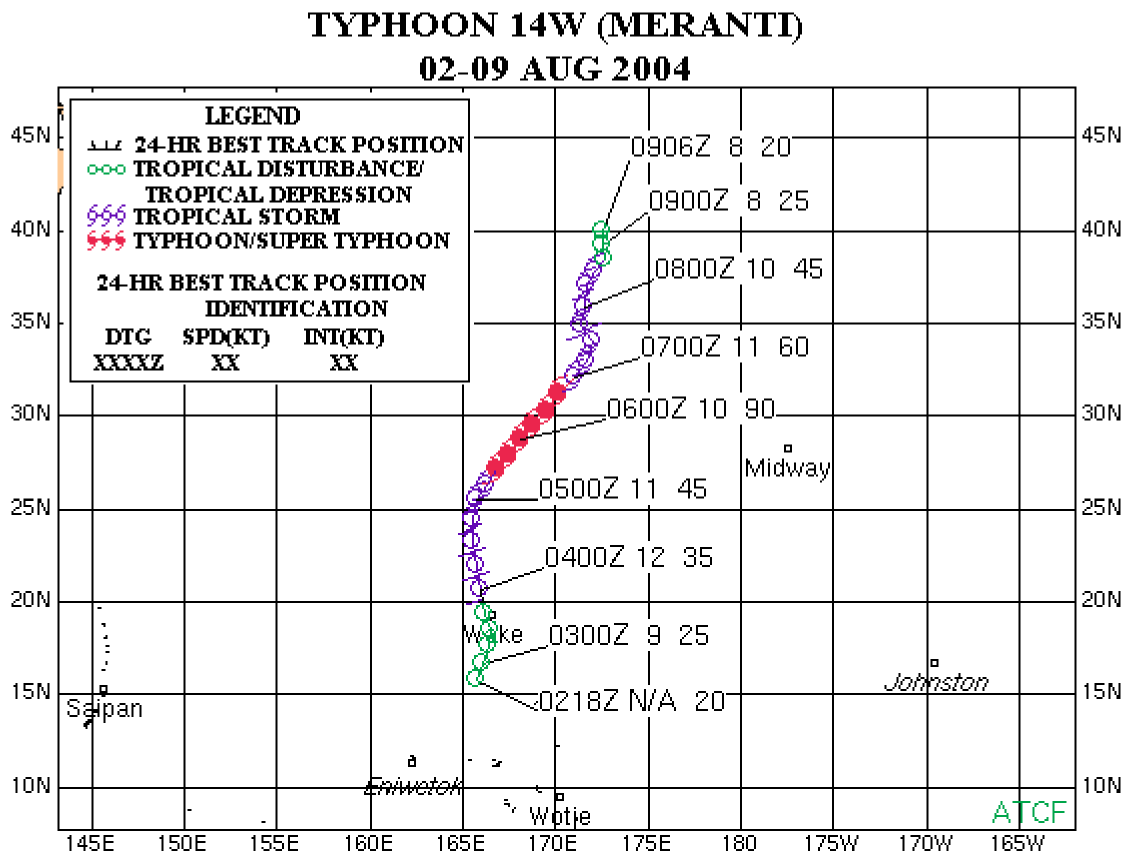
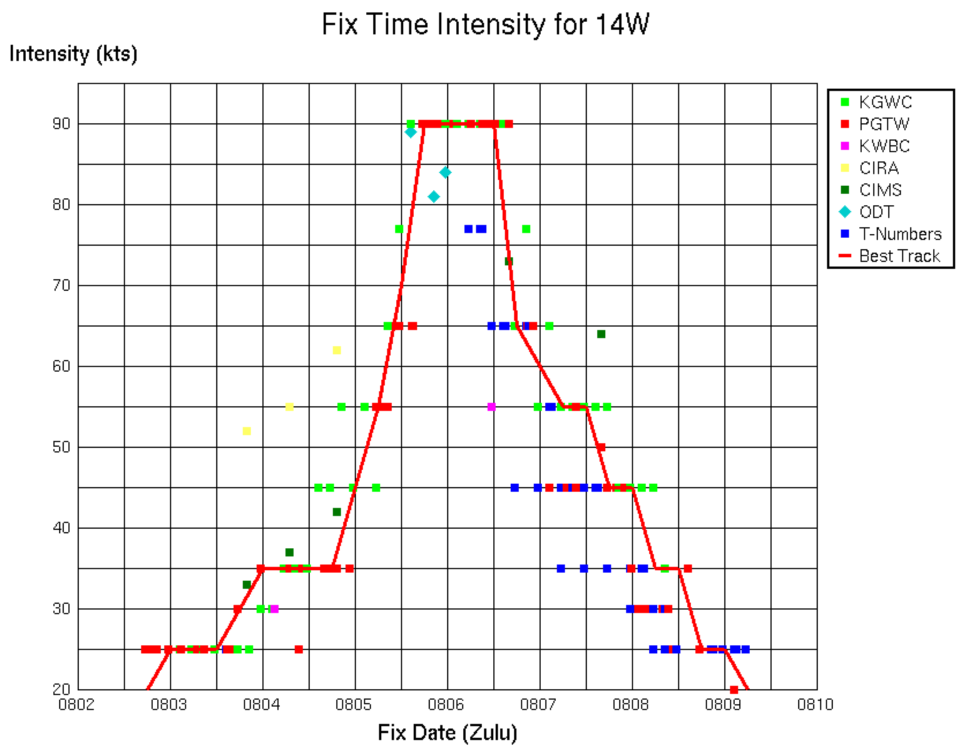


Figure 1-WP14-2. 060325Z August 2004 Goes-9 visible image of TY 14W (Meranti), at this time the system was located far north of Wake Island with a peak intensity of 90 knots.



TYPHOON 14W (MERANTI)
02-09 AUG 2004
LEGEND
24-HR BEST TRACK POSITION
TROPICAL DISTURBANCE/
TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON/SUPER TYPHOON
24-HR BEST TRACK POSITION
IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
0906Z 8 20
0900Z 8 25
0800Z 10 45
0700Z 11 60
0600Z 10 90
0500Z 11 45
0400Z 12 35
0300Z 9 25
0218Z N/A 20
Midway
Wake
Johnston
Saipan
Eniwetok
Wotje
ATCF
45N
40N
35N
30N
25N
20N
15N
10N
145E 150E 155E 160E 165E 170E 175E 180 175W 170W 165W



Fix Time Intensity for 14W
Intensity (kts)
90
80
70
60
50
40
30
20
KGWC
PGTW
KWBC
CIRA
CIMS
ODT
T-Numbers
Best Track
0802 0803 0804 0805 0806 0807 0808 0809 0810
Fix Date (Zulu)

Tropical Depression (TD) 15W (Malou)

First Poor : 0600Z 31 Jul 04

First Fair : 0600Z 02 Aug 04

First TCFA : 0230Z 03 Aug 04

First Warning : 0000Z 04 Aug 04

Last Warning : 0600Z 05 Aug 04, Extra-tropical

Max Intensity : 30 kts, gusts to 40 kts

Landfall : Near Ako, Japan, west of Kyoto

Total Warnings : 6

Remarks:

1) Tropical Depression (TD) 15W developed approximately 375 nautical miles east-southeast of Iwo Jima, Japan, in the southwestern quadrant of a low to mid level steering ridge centered to the northeast. The system tracked rapidly northwestward around the western periphery of the subtropical ridge axis and intensified slightly in an environment of weak vertical wind shear. TD 15W tracked up the Kii Channel, passing just east of Shikoku, and made landfall near Ako, Japan, within 24 hours of its development. The low-level circulation center became disorganized as the system tracked across Honshu, and did not re-develop as the system moved over the Sea of Japan as it encountered cooler sea surface temperatures and strong vertical wind shear associated with the mid-latitude westerlies. 36 hours after the first warning was issued, TD 15W had completed extra-tropical transition approximately 275 nm northwest of Tokyo, Japan.

2) Reports from Japan indicate significant rainfall totals associated with this system in southern Shikoku, however no damages or fatalities were cited.

Statistics for JTWC on TD 15W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04080200		22.3N	148.0E	20																
04080206		22.9N	147.6E	20																
04080212		23.5N	147.2E	20																
04080218		24.0N	146.3E	20																
04080300		24.7N	144.8E	20																
04080306		25.8N	143.2E	20																
04080312		26.9N	141.5E	25																
04080318		28.3N	139.8E	30																
04080400	1	30.1N	137.9E	35	46	70	138						-10	0	-5					
04080406	2	32.0N	136.0E	35	17	78	143						-5	0	5					
04080412	3	33.5N	134.9E	30	0	97							0	0						
04080418	4	35.7N	134.2E	30	7	137							0	0						
04080500	5	37.6N	135.0E	30	4								0							
04080506	6	39.0N	136.2E	30	0								0							
			AVERAGE		13	96	141						3	0	5					
			BIAS										-3	0	0					
			# CASES		6	4	2						6	4	2					

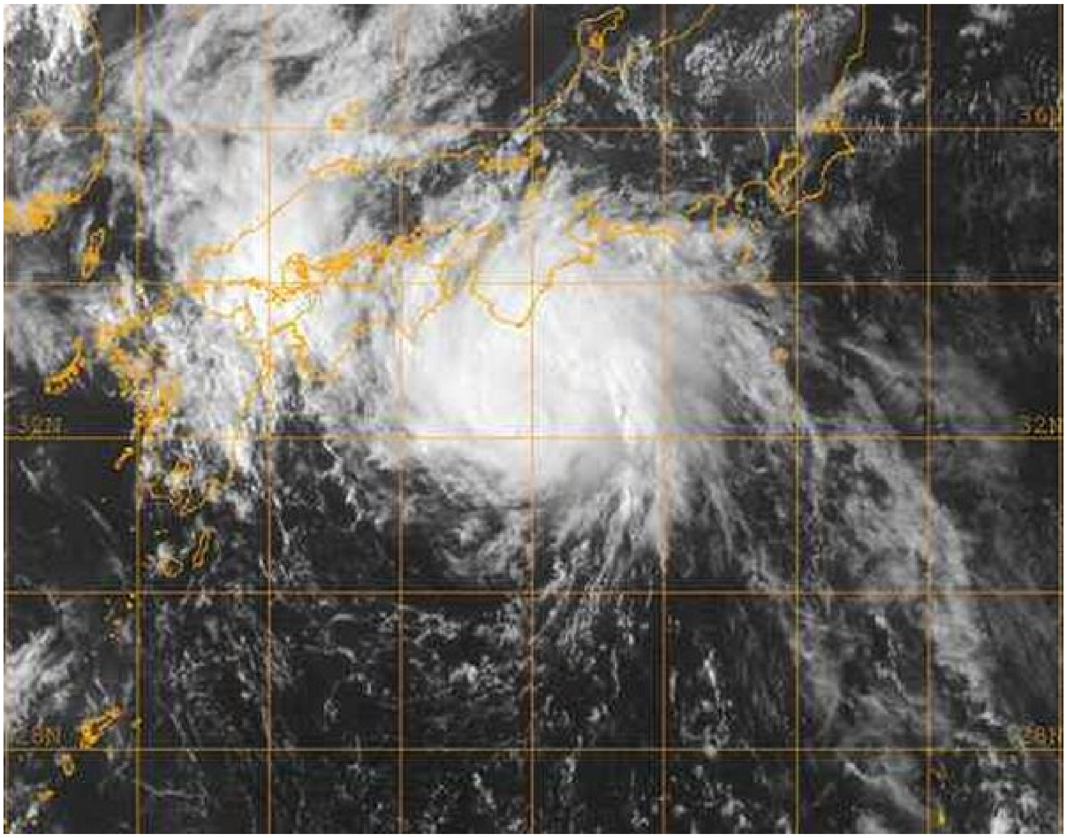


Figure 1-WP15-1. 040625Z August 2004 Goes-9 visible image of TD 15W (Malou), reveals a very small llcc south of Honshu at an intensity of 30 knots.

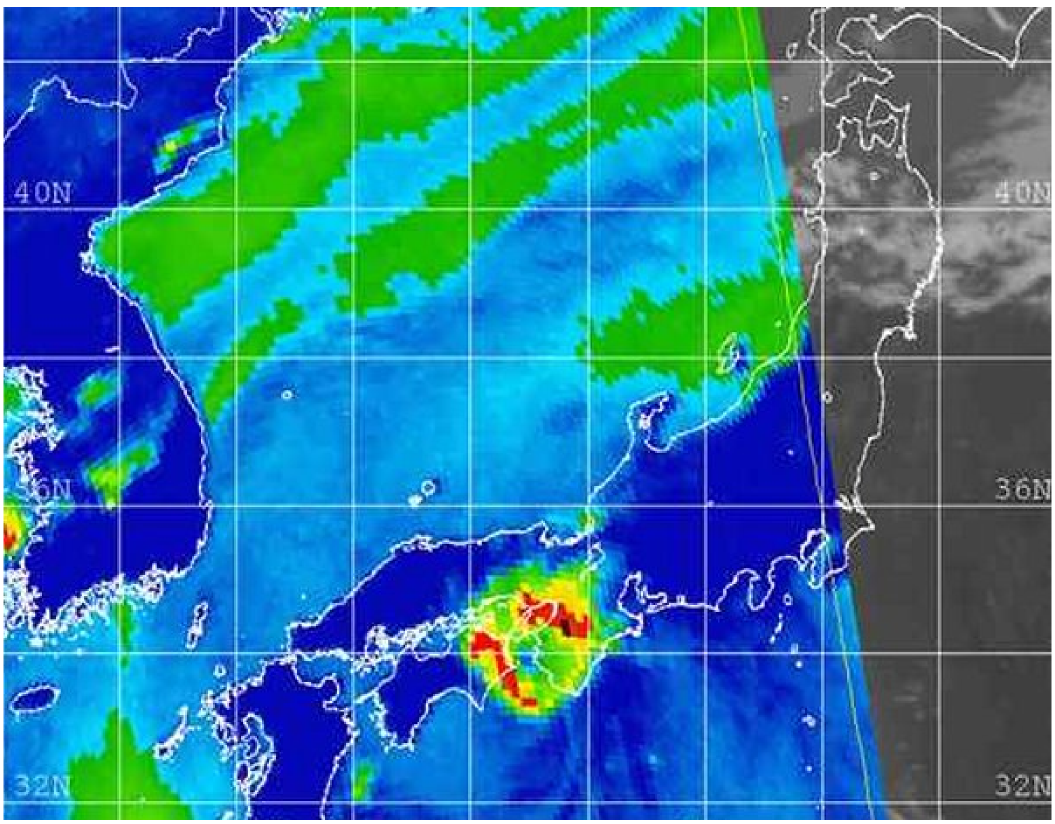
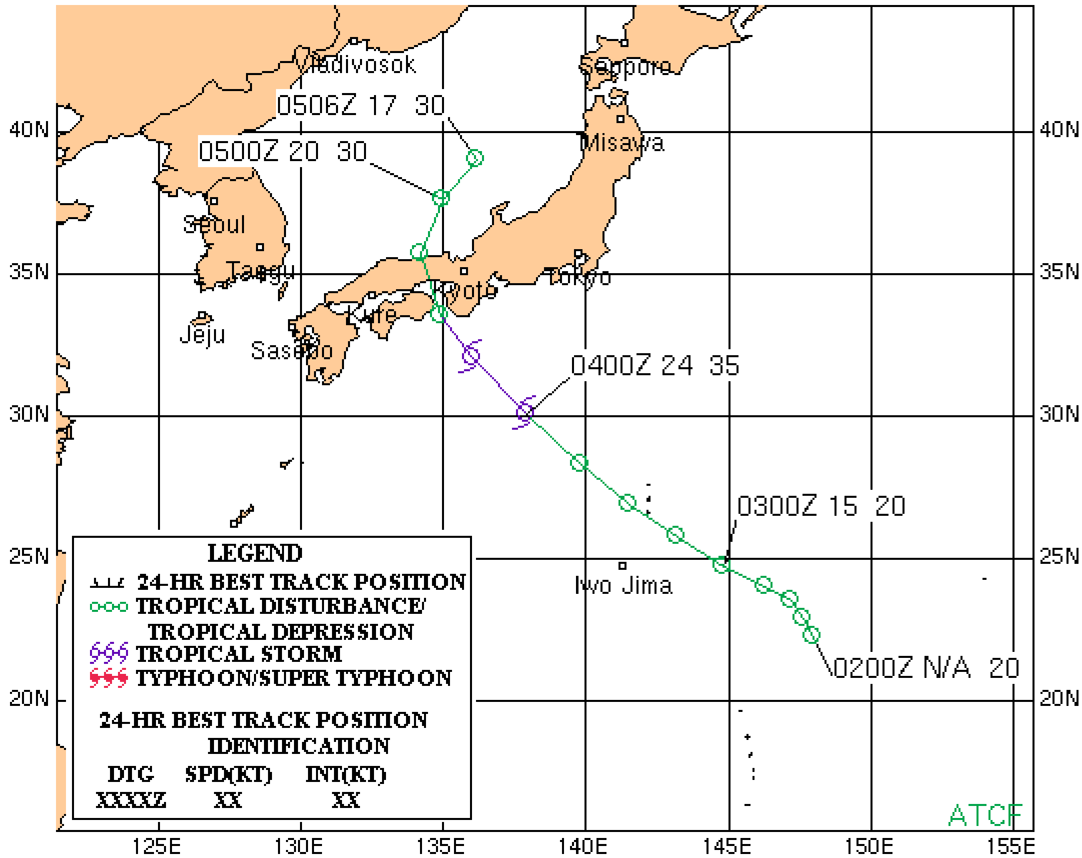
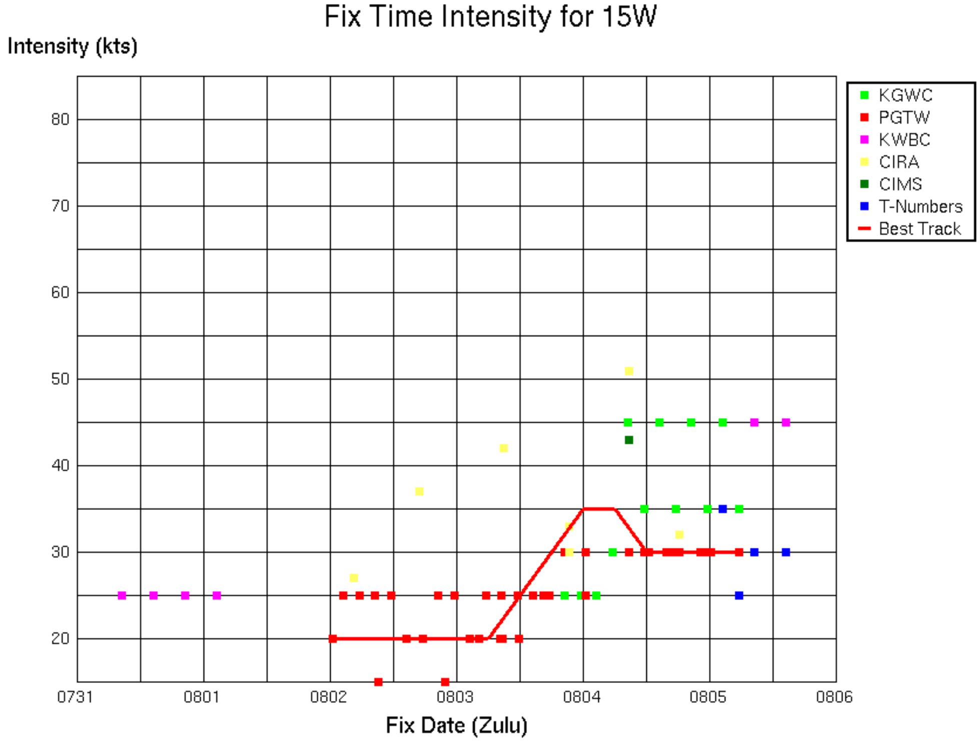


Figure 1-WP15-2. 041154Z August 2004 SSM/I satellite image of TD 15W (Malou), at this time the systems llcc was off the east coast of Shikoku tracking north towards Honshu at an intensity of 30 knots.

TROPICAL DEPRESSION 15W (MALOU)
02-05 AUG 2004





Typhoon (TY) 16W (Rananim)

First Poor : 0600Z 05 Aug 04

First Fair : 1430Z 06 Aug 04

First TCFA : 2100Z 06 Aug 04

First Warning : 1800Z 07 Aug 04

Last Warning : 0000Z 13 Aug 04, Dissipated over land

Max Intensity : 90 kts, gusts to 110 kts

Landfall : Near Wenling, China in the Zhenjiang Province

Total Warnings : 22

Remarks:

1) Typhoon (TY) 16W formed approximately 540 nm south-southeast of Okinawa, Japan and was initially steered poleward along the northwestern periphery of the near equatorial ridge located south of the system. The cyclone continued poleward along the western periphery of the ridge for approximately 48 hours until the Tropical Upper Tropospheric Trough (TUTT) located between the near equatorial ridge and the subtropical ridge to the north weakened and retreated eastward. Once the TUTT retreated, the two ridges merged and the subtropical ridge became the primary steering mechanism. This shift in steering ridges caused TY 16W to shift to a northwestward track towards Taiwan and intensify. The system was slow to intensify initially as the inflow from an upper level low located in the southern point of the TUTT hampered development. As the TUTT receded eastward the upper level low provided a poleward outflow channel for TY 16W and it reached typhoon status. The poleward outflow channel weakened as the upper level low filled, however, the system maintained radial outflow and the system reached a maximum intensity of 90 kts approximately 18 hours before making landfall. After landfall the cyclone weakened due to dry air entrainment and limited outflow. The system made landfall shortly after 1200Z on 12 Aug, approximately 200 nm south of Shanghai, China near Wenling and dissipated over land.

2) 415,000 people were evacuated from the east coast of China, 115 people were killed, 16 were listed as missing and 1800 others had been injured. Most of the fatalities was caused by collapsing buildings. More than forty-thousand buildings were destroyed and another 90,000 were damaged and over 677,500 acres of crops were damaged. Approximately 4 billion dollars in damage occurred. This was reported to be the worst typhoon to hit China since 1997.

Statistics for JTWC on TY 16W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04080700		14.8N	130.2E	25																
04080706		15.4N	130.1E	25																
04080712		16.1N	130.0E	25																
04080718	1	16.7N	130.1E	30	18	44	159	188	270	335			0	5	0	10	15	5		
04080800	2	17.3N	130.2E	35	16	54	72	155	299	480			-5	5	0	0	5	-10		
04080806	3	17.9N	130.4E	35	12	47	113	220	280	470			-5	-15	-15	-15	-15	-35		
04080812	4	18.4N	130.3E	35	13	46	125	229	286	436	556		0	-5	-5	-5	-10	-25	-10	
04080818	5	18.9N	130.4E	45	12	51	128	153	190	210	275		-5	-5	-5	-5	-10	-20	-5	
04080900	6	19.5N	130.4E	45	5	69	146	169	203	217	301		0	5	5	5	0	-5	25	
04080906	7	20.0N	130.0E	50	16	90	113	153	195	209			0	0	0	-5	-10	-10		
04080912	8	20.4N	129.5E	50	28	95	106	134	145	216			0	0	-5	-15	-20	-10		
04080918	9	20.8N	128.7E	55	8	25	16	51	64	155			0	0	-10	-15	-20	0		
04081000	10	21.4N	128.1E	55	6	16	13	33	53	211			5	0	-10	-15	-10	5		
04081006	11	22.1N	128.0E	60	5	40	58	33	45				0	-10	-15	-15	-10			
04081012	12	22.4N	127.4E	65	0	20	33	24	68				0	-10	-15	-10	-10			
04081018	13	22.8N	126.9E	75	5	13	13	29	64				0	-5	-5	-10	0			
04081100	14	23.3N	126.2E	80	8	8	49	77	103				-5	-10	-10	-10	5			
04081106	15	23.8N	125.5E	85	0	25	60	55					-5	0	0	10				
04081112	16	24.5N	125.0E	90	5	24	58	73					-5	-10	-10	5				
04081118	17	25.3N	124.3E	90	0	25	29						-10	-15	-20					
04081200	18	26.4N	123.8E	90	6	32	46						0	0	-10					
04081206	19	27.3N	122.6E	90	6	48							0	0						
04081212	20	28.0N	121.3E	85	7	39							5	-5						
04081218	21	28.4N	120.1E	70	7								0							
04081300	22	28.5N	118.9E	60	0								0							
			AVERAGE		9	41	74	111	162	294	377		2	5	8	9	10	13	13	
			BIAS										-1	-4	-7	-6	-6	-11	3	
			# CASES		22	20	18	16	14	10	3		22	20	18	16	14	10	3	

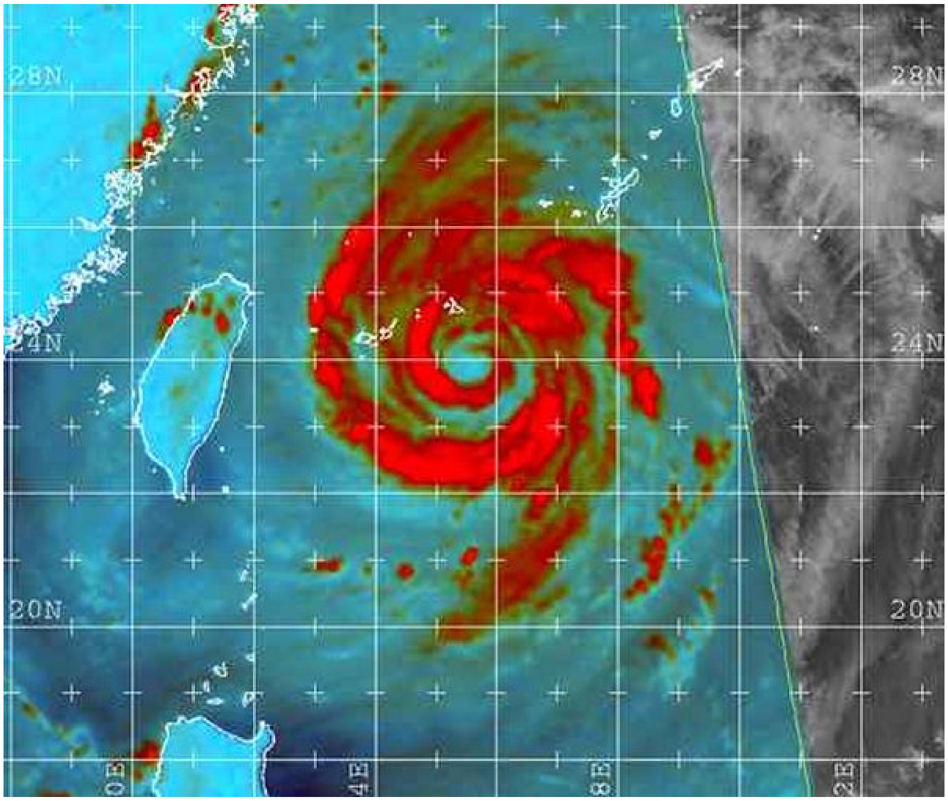


Figure 1-WP16-1. 11/0506Z August 2004 AMSR-E satellite image of TY 16W (Rananim), at this time, the system was located approximately 200nm southwest of Okinawa Japan with a rough eye diameter of 45nm and a peak intensity of 80 knots.

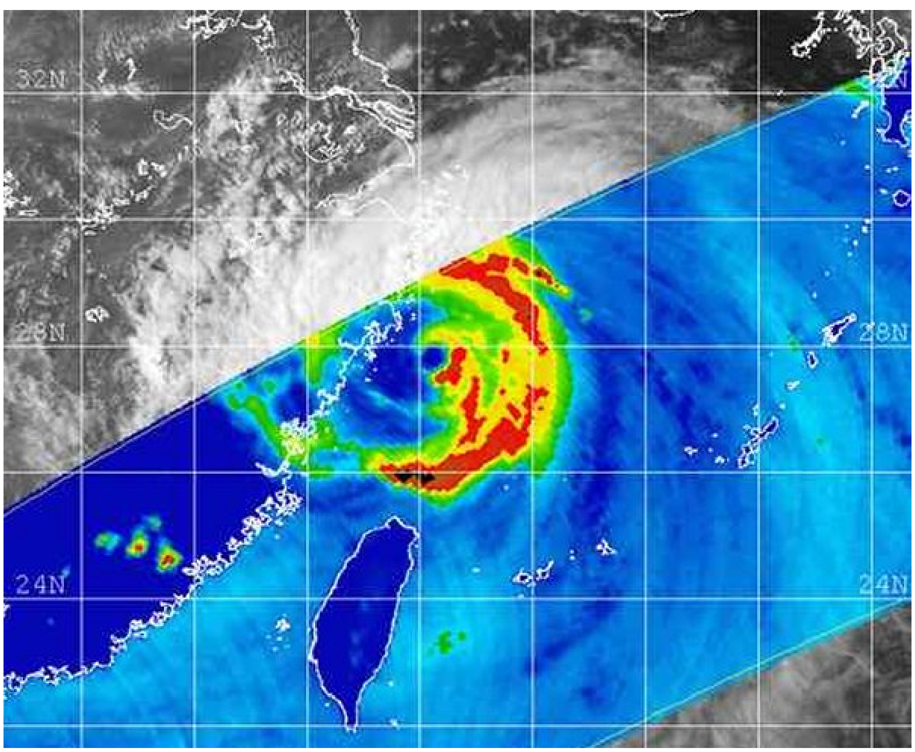


Figure 1-WP16-2. 120808Z August 2004 TRMM satellite image of TY 16W (Rananim), reveals a well defined eye approximately 37NM east of the eastern coast of China. At this time, the deep convection on the western side of the system began to decrease due to the land interaction with China. During this time the peak intensity was 90 knots.

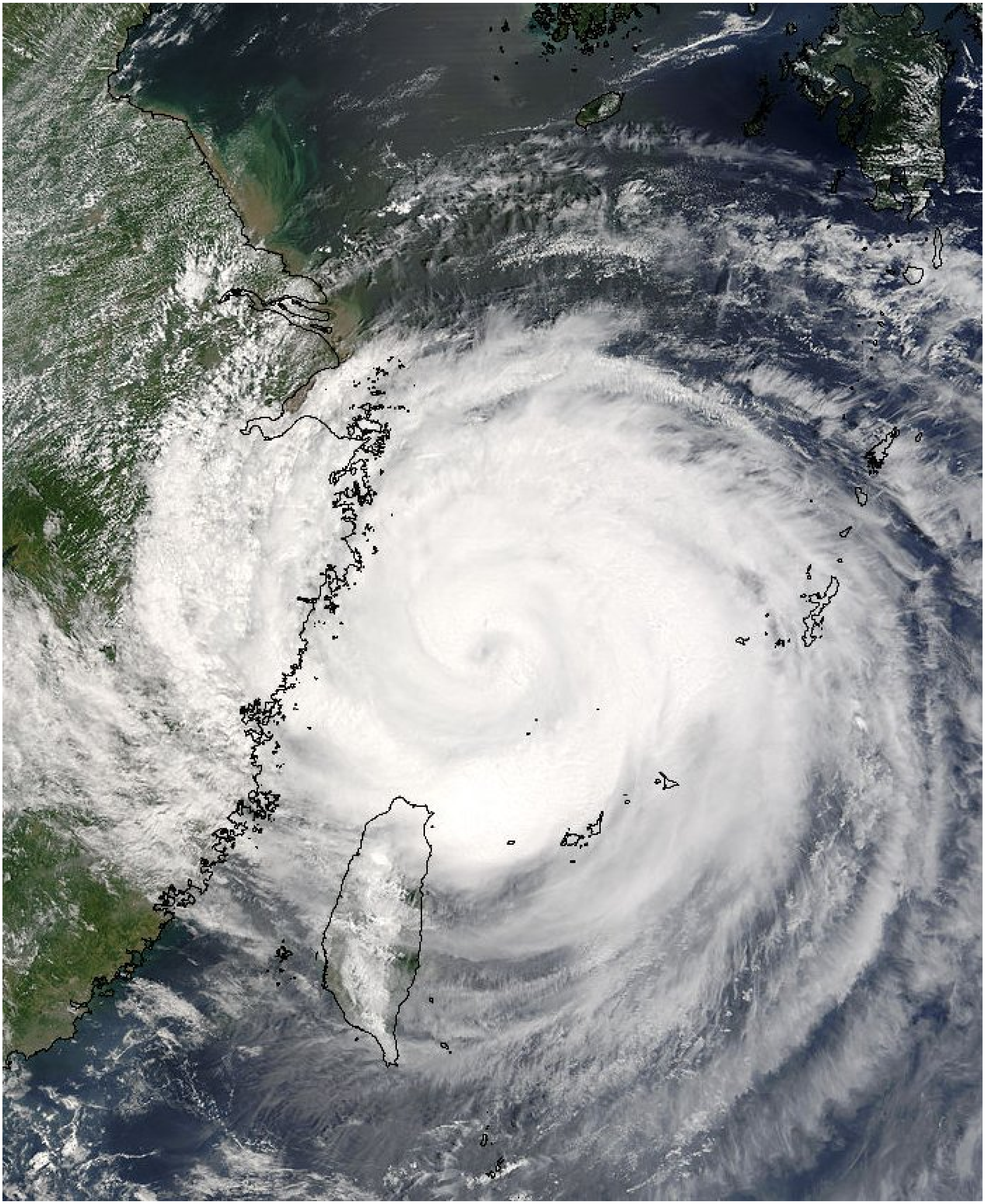
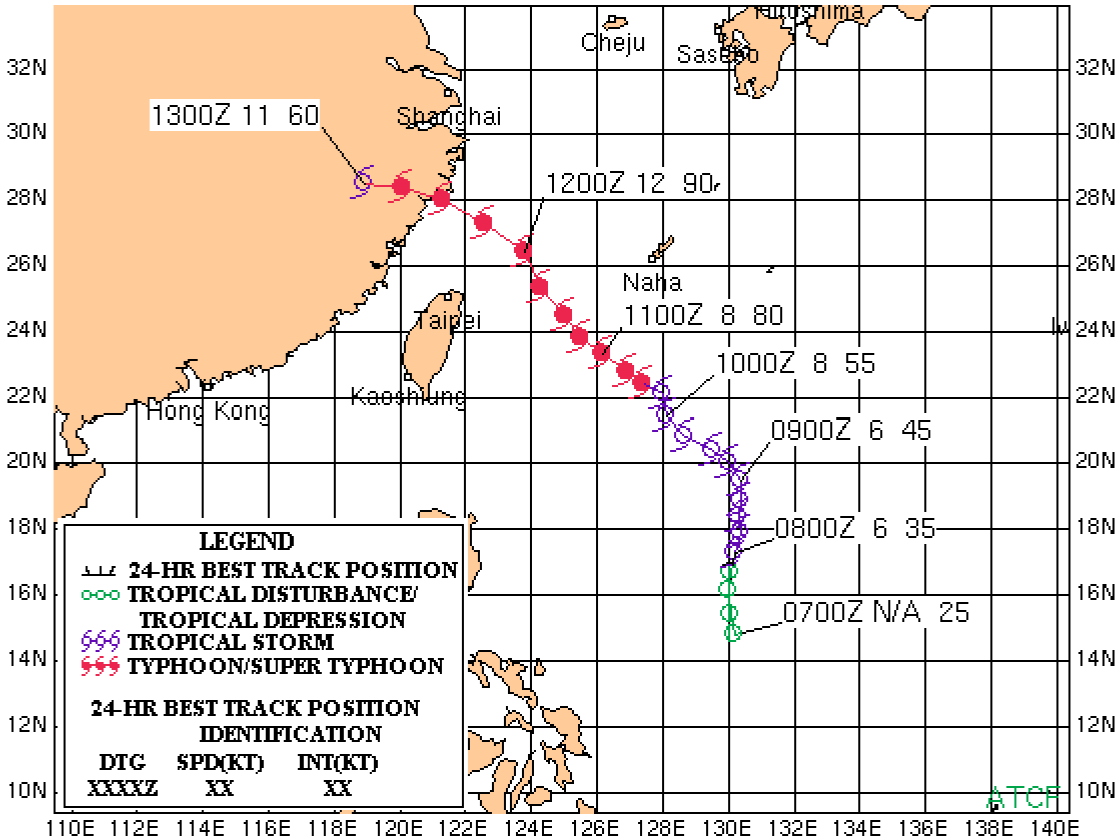
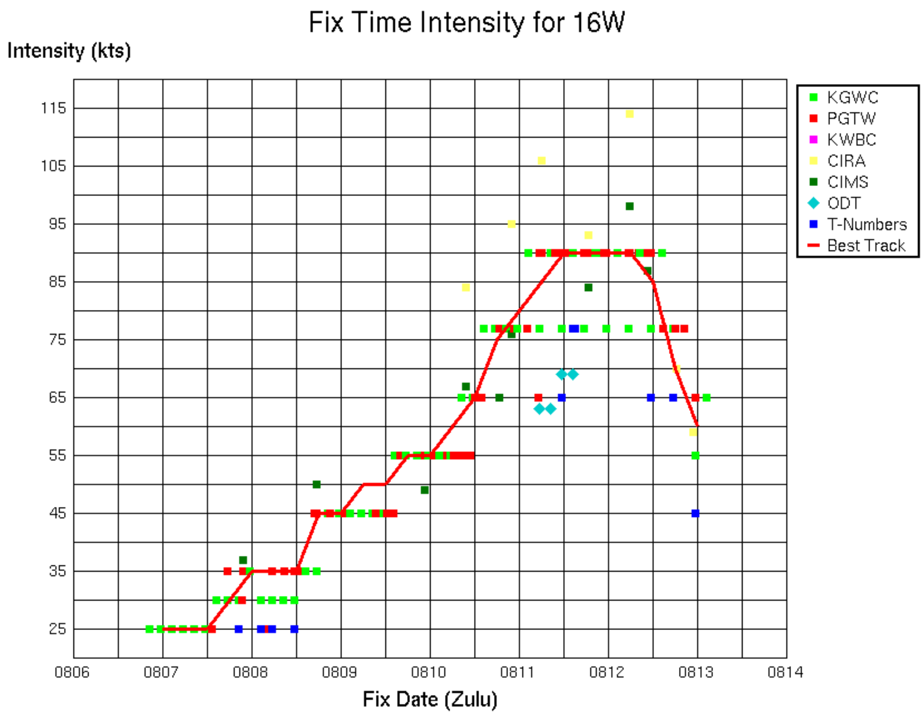


Figure 1-16W-3. 120240Z August 2004 MODIS true-color image of TY 16W (Rananim), approaching the east coast of China with an intensity of 90 knots.

TYPHOON 16W (RANANIM)
07-13 AUG 2004





Tropical Storm (TS) 17W (Malakas)

First Poor : 0600Z 10 Aug 04

First Fair : 1700Z 10 Aug 04

First TCFA : N/A

First Warning : 1800Z 10 Aug 04

Last Warning : 0600Z 12 Aug 04, Dissipated over water

Max Intensity : 35 kts, gust to 45 kts

Landfall : None

Total Warnings : 7

Remarks:

1) Tropical Storm (TS) 17W formed approximately 665 nm northwest of Wake Island bordering the baroclinic zone. Enhanced infrared and microwave satellite imagery indicated that TS 17W was subtropical in nature. The cyclone rapidly tracked northwest along the northern periphery of the subtropical ridge. TS 17W achieved a maximum intensity of 35 kts as the system tracked in an environment of moderate vertical wind shear and cooler sea surface temperatures. The cyclone moved rapidly into a more unfavorable environment, entrained cold dry air and completed transition to an extratropical low 72 hours after the first warning was issued.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TS 17W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04081006		23.5N	154.3E	15																
04081012		24.4N	155.6E	20																
04081018	1	25.5N	156.8E	25	32	28	16	91	169				0	-5	0	10	15			
04081100	2	26.8N	158.1E	35	5	47	21	39	126				0	5	15	20	20			
04081106	3	28.0N	159.6E	35	0	12	58	111	104				0	5	15	15	15			
04081112	4	29.3N	161.0E	35	0	51	102	147					0	5	5	15				
04081118	5	30.6N	162.3E	35	0	58	108	128					0	5	15	15				
04081200	6	31.7N	163.3E	30	21	44	105						5	5	15					
04081206	7	32.4N	164.7E	30	13	26	46						5	10	10					
04081212		33.0N	166.4E	30																
04081218		33.1N	168.5E	25																
04081300		33.5N	170.9E	25																
04081306		34.8N	173.1E	25																
			AVERAGE		10	38	65	103	133				1	6	11	15	17			
			BIAS										1	4	11	15	17			
			# CASES		7	7	7	5	3				7	7	7	5	3			

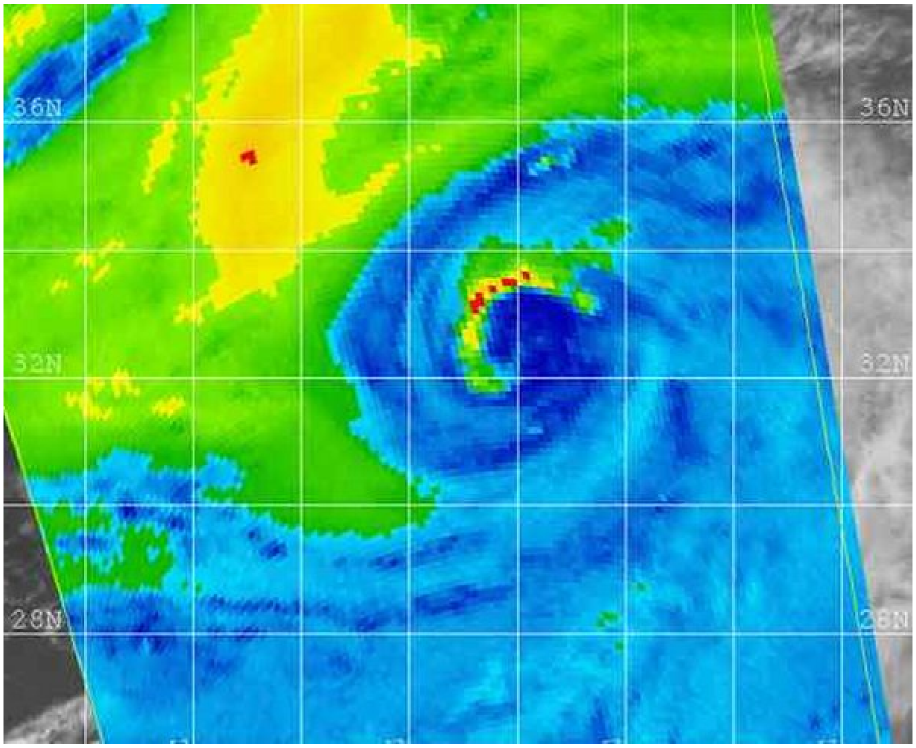


Figure 1-WP17-1. 120949Z August 2004 SSM/I microwave satellite image of TS 17W (Malakas), reveals a partially exposed low-level circulation center tracking above 32N near the end of the systems life. At this time, the system had a peak intensity of 35 knots.

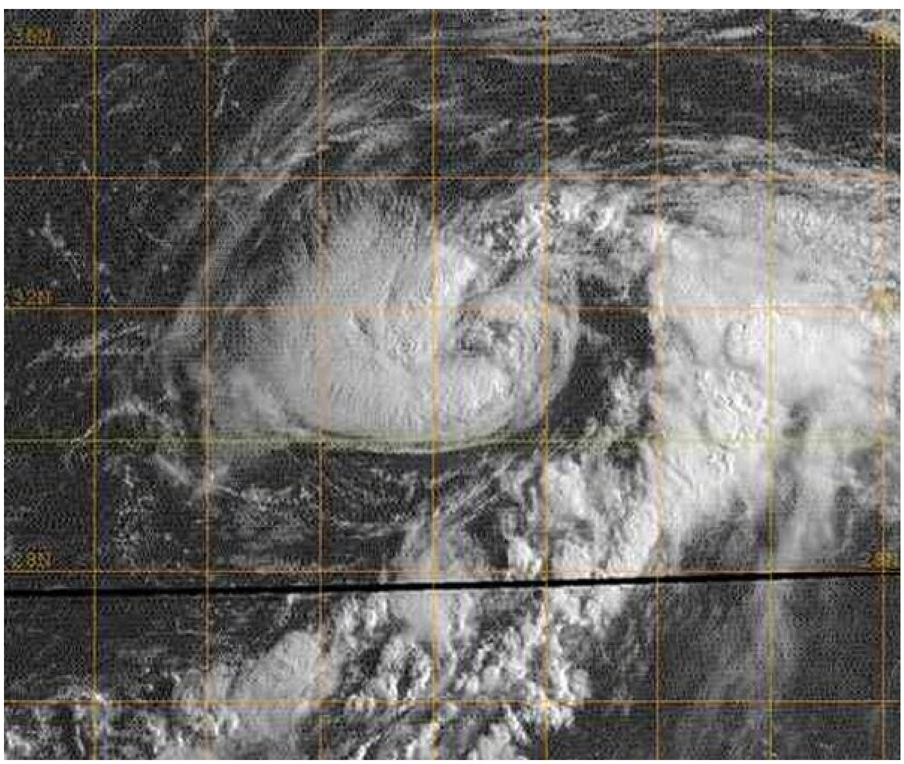
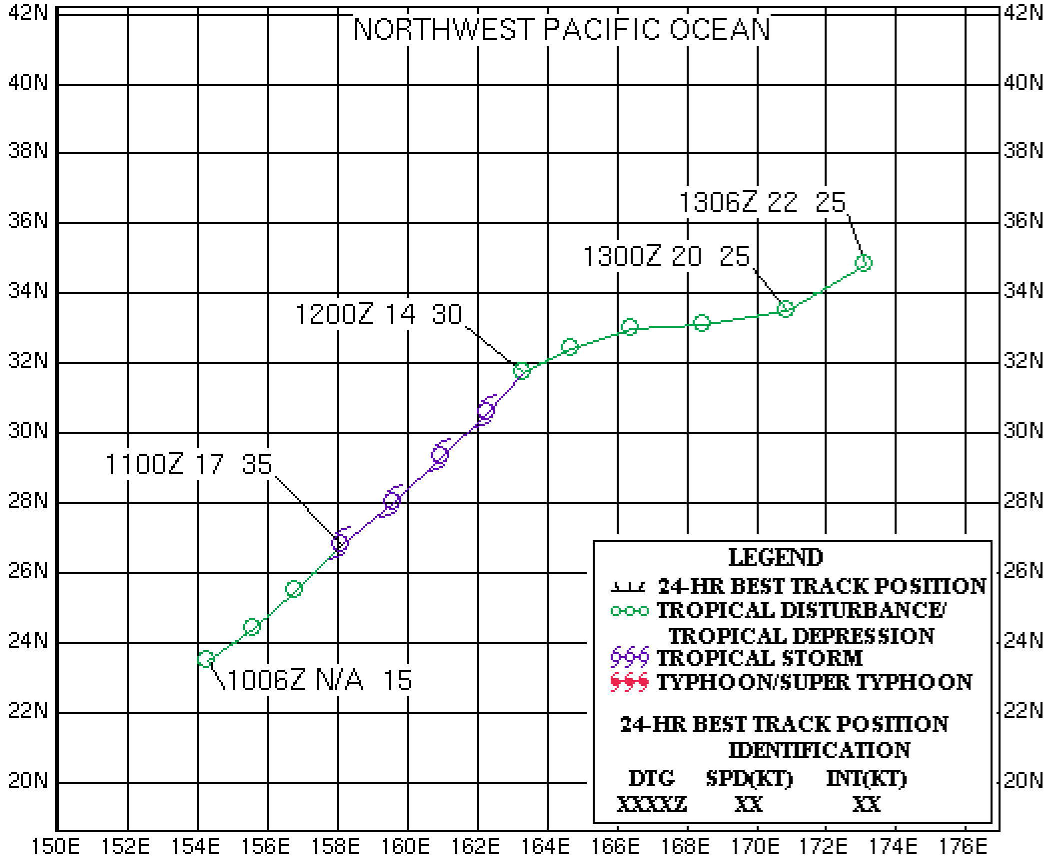
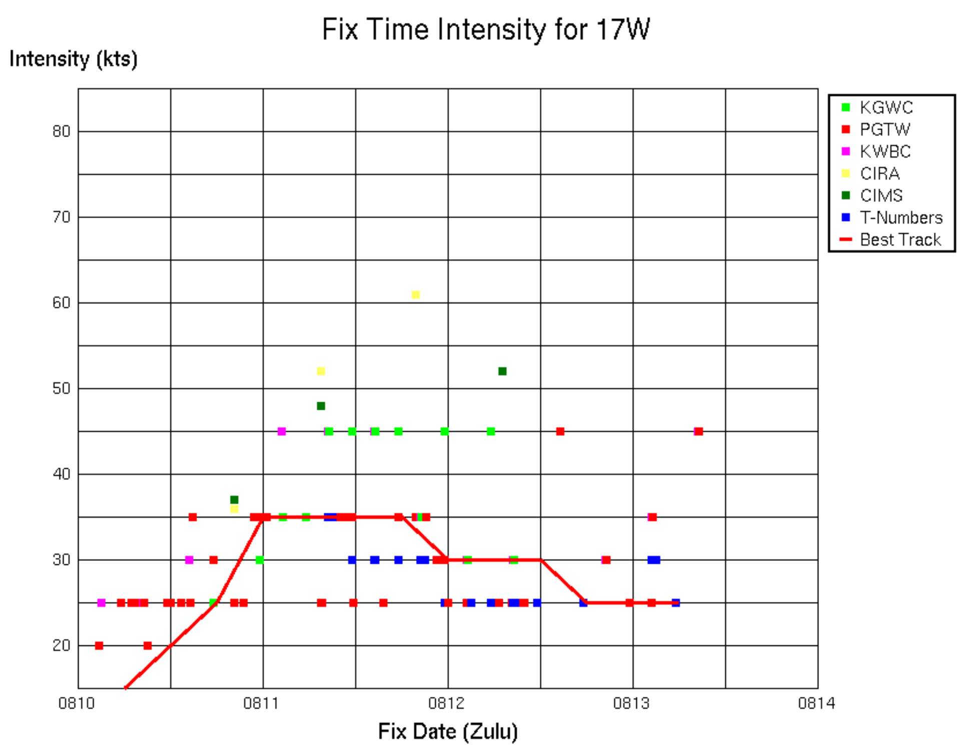


Figure 1-WP17-2. 112001Z August 2004 Goes-9 visible satellite image of TS 17W (Malakas), at this time, the systems low-level circulation center remained fairly organized with the majority of the associated deep convection to the west of the systems center. Peak intensity at this time was 35 knots.

TROPICAL STORM 17W (MALAKAS)
10-13 AUG 2004





Typhoon (TY) 18W (Megi)

First Poor : 2200Z 11 Aug 04

First Fair : N/A

First TCFA : 2300Z 13 Aug 04

First Warning : 0000Z 14 Aug 04

Last Warning : 1200Z 19 Aug 04, Extra-tropical

Max Intensity : 65 kts, gusts to 80 kts

Landfall : None

Total Warnings : 23

Remarks:

1) Typhoon (TY) 18W developed from an area of convection located 260 nm west of Guam. The low level circulation that initially developed was weak and difficult to track. Three relocations of the cyclone were made before the first warning was issued approximately 150 nm northwest of Guam. Over the next couple of days, TY 18W tracked west-northwest under the influence of a mid-level ridge located northeast. On 16 Aug, TY 18W strengthened into a tropical storm and turned more poleward in response to a weakness in the ridge. Around 1200Z on 17 Aug, the cyclone passed approximately 75 nm to the southwest of Okinawa and maximum winds reported by Kadena AB at passage was 52 kts. On 18 Aug, TY 18W entered the East China Sea, weakened to 65 kts, crested the axis of the steering ridge and began to track northeast. TY 18W then passed between Cheju Island and the South Korean peninsula, accelerated northeastward into the Sea of Japan where it began to interact with the midlatitude westerlies and transitioned into an extra-tropical low on 19 Aug.

2) TY 18W lashed southern Japan and southeastern South Korea, killing 13 people in 3 days. Most of the deaths in Japan came from floods and mudslides from heavy rains. Over 700 Japanese were evacuated from their homes, while 2,400 South Koreans were left homeless. Kunsan AB reported no damage, while Kadena AB evacuated 7 RC/KC-135s and 1 C-130. No other damage to military installations was reported.

Statistics for JTWC on TY 18W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04081318		14.5N	144.1E	25																
04081400	1	15.3N	142.9E	25	18	52	166	254	329	334			0	5	15	25	25	20		
04081406	2	16.3N	141.9E	25	40	155	240	350	452	372			0	5	15	20	20	20		
04081412	3	16.9N	140.2E	25	36	113	198	300	330	336			0	5	10	15	15	0		
04081418	4	17.2N	138.3E	25	32	25	121	199	138	139			0	0	0	-5	-5	-20		
04081500	5	17.7N	136.5E	25	12	55	126	104	50	243			0	5	0	0	-5	-15		
04081506	6	18.1N	135.0E	25	29	74	99	29	119	337			0	-5	-5	-10	-10	-25		
04081512	7	18.1N	133.5E	25	43	123	116	111	165	363			0	0	0	-10	-15	-20		
04081518	8	18.2N	132.2E	30	12	56	132	204	255	510			0	-5	-5	-5	-15	-15		
04081600	9	18.3N	131.3E	30	18	25	119	192	214	616			0	0	-5	-10	-15	0		
04081606	10	18.7N	130.3E	35	29	78	156	198	231	664			0	-5	-5	-20	-20	-10		
04081612	11	20.0N	129.5E	35	17	80	128	137	219	708			5	-5	-10	-15	-10	5		
04081618	12	21.5N	128.9E	40	30	91	120	154	286	779			5	5	-5	-5	0	10		
04081700	13	23.2N	127.9E	45	11	29	43	64	146				0	0	-5	0	10			
04081706	14	24.8N	127.0E	45	8	12	26	66	83				0	-10	-10	-10	-5			
04081712	15	26.3N	126.2E	55	5	60	69	20	97				0	-5	0	5	0			
04081718	16	27.7N	125.5E	60	8	43	86	88	172				0	0	0	-5	-20			
04081800	17	28.7N	125.0E	65	15	47	49	129					0	0	5	0				
04081806	18	30.1N	125.4E	65	5	73	103	154					0	0	0	-10				
04081812	19	31.3N	126.4E	65	7	61	112						0	5	10					
04081818	20	33.0N	127.8E	65	7	75	124						0	5	-5					
04081900	21	35.5N	129.6E	55	11	48							5	10						
04081906	22	37.6N	132.3E	55	0	13							0	-5						
04081912	23	39.6N	134.3E	45	79								5							
04081918		40.8N	138.1E	55																
			AVERAGE		21	63	117	153	205	450			1	4	6	9	12	13		
			BIAS										1	0	0	-2	-3	-4		
			# CASES		23	22	20	18	16	12			23	22	20	18	16	12		

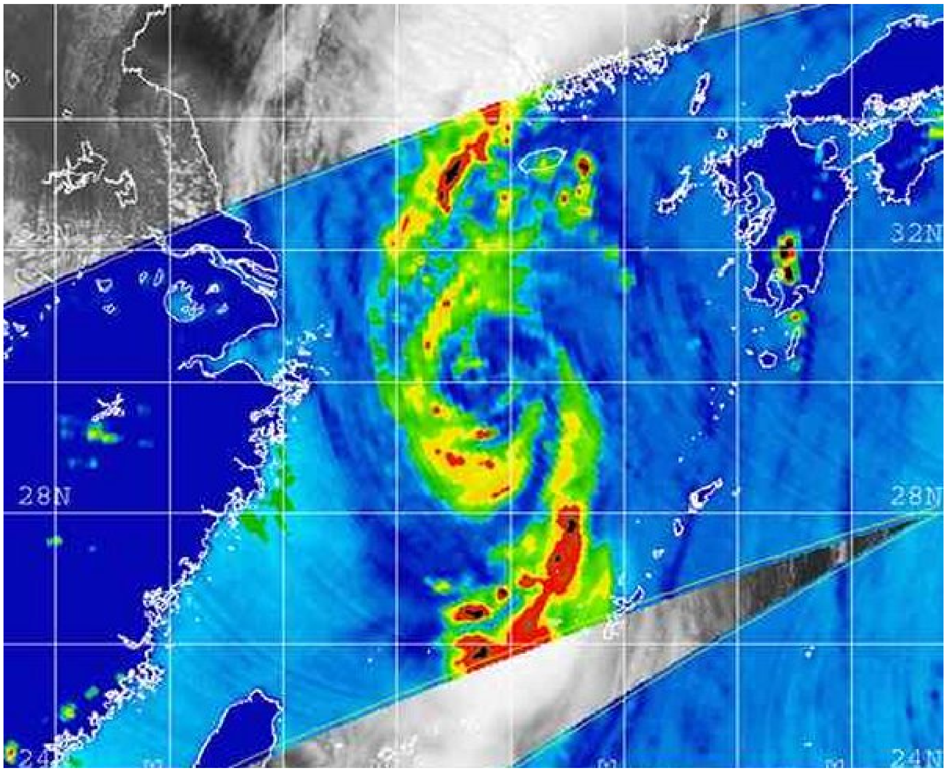


Figure 1-WP18-1. 180552Z August 2004 TRMM satellite image of TY 18W (Megi), located approximately 245NM NW of Okinawa Japan. At this time, the inner eye wall began to collapse as the system started a weakening trend. Peak intensity at the time was 65 knots.

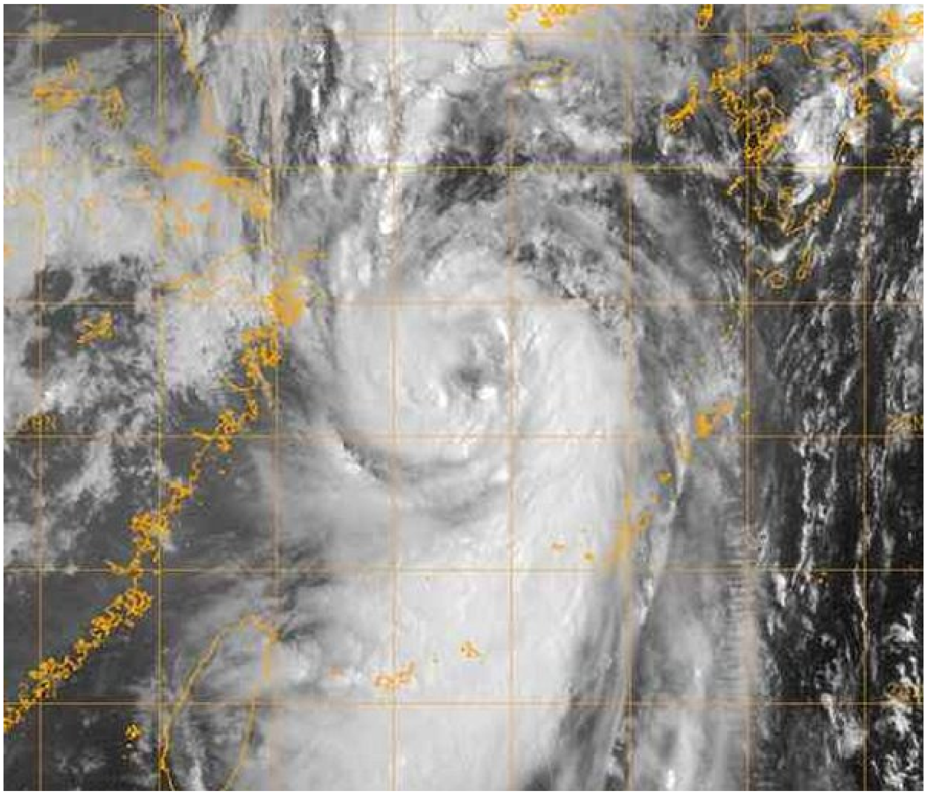
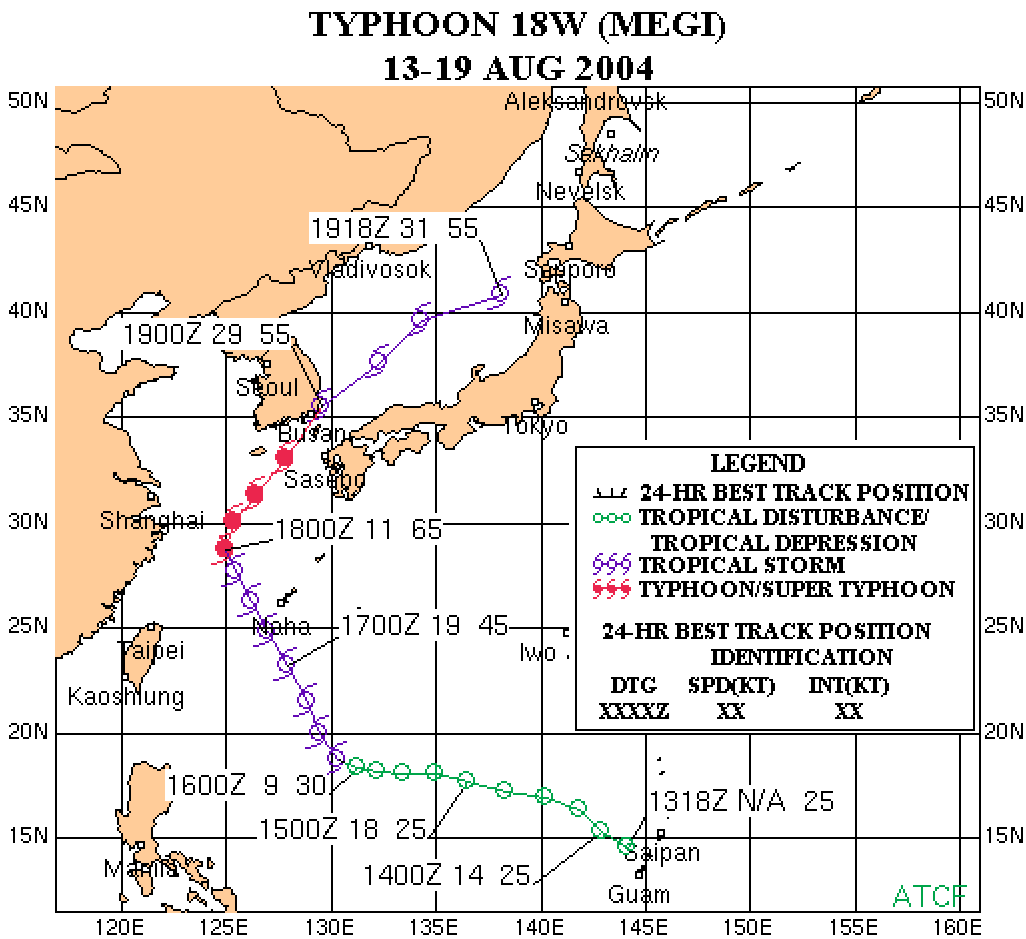
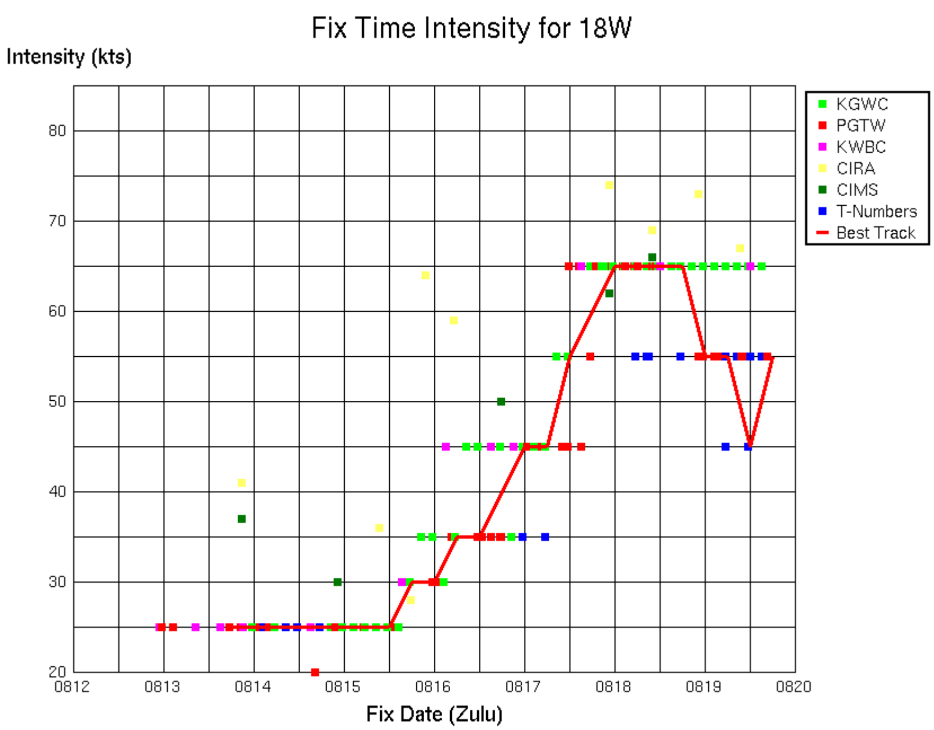


Figure 1-WP18-2. 180001Z August 2004 Goes-9 visible image of TY 18W (Megi), at this time, the systems low-level circulation center was located approximately 280NM southwest of Kyushu. The visible satellite imagery reveals a ragged coud filled eye witha peak intensity of 65 knots.


TYPHOON 18W (MEGI)
13-19 AUG 2004
LEGEND
24-HR BEST TRACK POSITION
TROPICAL DISTURBANCE/ TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON/SUPER TYPHOON
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
1918Z 31 55
1900Z 29 55
1800Z 11 65
1700Z 19 45
1600Z 9 30
1500Z 18 25
1400Z 14 25
1318Z N/A 25
Aleksandrovsk
Sakhalin
Nevelsk
Vladivosok
Sapporo
Misawa
Seoul
Busan
Tokyo
Sasebo
Shanghai
Naha
Iwo
Taipei
Kaoshiung
Saipan
Guam
Manila
ATCF
50N
45N
40N
35N
30N
25N
20N
15N
120E
125E
130E
135E
140E
145E
150E
155E
160E


Fix Time Intensity for 18W
Intensity (kts)
KGWC
PGTW
KWBC
CIRA
CIMS
T-Numbers
Best Track
80
70
60
50
40
30
20
0812
0813
0814
0815
0816
0817
0818
0819
0820
Fix Date (Zulu)

Super Typhoon (STY) 19W (Chaba)

First Poor : N/A

First Fair : 0000Z 18 Aug 04

First TCFA : 1430Z 18 Aug 04

First Warning : 1800Z 18 Aug 04

Last Warning : 0600Z 31 Aug 04, Extra-tropical

Max Intensity : 155 kts, gusts to 190 kts

Landfall : Near City of Kushikino, Kyushu Japan

Near Hikari, Honshu Japan

Near Shizunai, Hokkaido Japan

Total Warnings : 51

Remarks:

1) Super Typhoon (STY) 19W formed east of Kwajalein on 17 Aug and tracked westward under the influence of the low-mid level ridge located north and east of the area. STY 19W intensified steadily and the first warning was issued by 1800Z on 18 Aug. The system intensified at a climatological rate and continued to track westward along the southern periphery of the ridge through 21 Aug. Dual outflow channels developed after 21 Aug and allowed the cyclone to intensify rapidly and reach a maximum intensity of 155 kts approximately 75 nm northwest of Guam. A passing longwave trough caused a shift of the track to the northwest and provided for continuation of enhanced outflow which allowed STY 19W to maintain super typhoon strength through 0600Z on 26 Aug. The longwave trough then propagated eastward and caused the mid-level steering ridge to strengthen and shift the track of TY 19W slowly westward for a couple of days. Another longwave trough subsequently moved off the east coast of China causing the track to shift poleward towards Kyushu on 29 Aug STY 19W made landfall near city of Kushikino on the southwest coast of Kyushu at approximately 0000Z on 30 Aug when Aburatsu station, on the coast, measured winds at 108 kts. STY 19W began to accelerate northeastward across Kyushu and onto Honshu near Hikari. STY 19W crossed southwestern Honshu and entered the Sea of Japan where it began to transition into an extra-tropical low. STY 19W, then a tropical storm, skimmed the northern edge of Honshu before crossing into Hokkaido near Shizunai and the system became an extra-tropical low around 0600Z on 31 Aug.

2) Japan news sources confirmed 7 deaths and 5,900 people evacuated due to heavy flooding on Honshu.

Statistics for JTWC on STY 19W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04081700		9.3N	172.3E	15																
04081706		9.7N	170.8E	15																
04081712		10.2N	169.4E	15																
04081718		10.5N	167.9E	20																
04081800		10.9N	166.4E	20																
04081806		11.1N	165.0E	25																
04081812		11.4N	163.9E	25																
04081818	1	12.0N	163.0E	30	21	38	43	67	95	159			0	-5	-10	-10	-5	-25		
04081900	2	12.4N	162.0E	30	21	30	40	62	81	185			0	-10	-15	-15	-10	-35		
04081906	3	12.9N	161.0E	40	23	48	92	134	156	187	203	255	0	-5	0	0	0	-40	-75	-65
04081912	4	13.3N	160.0E	45	29	52	88	110	146	200	210	283	0	-5	-5	0	-5	-50	-75	-60
04081918	5	13.7N	158.9E	55	18	29	30	63	117	233	308	351	-5	-5	-5	-5	-20	-70	-80	-80
04082000	6	14.1N	157.8E	60	26	29	38	84	146	251	343	399	0	0	10	0	-15	-70	-70	-70
04082006	7	14.4N	156.7E	60	18	60	104	146	192	268	341	447	0	0	5	-10	-35	-70	-65	-60
04082012	8	14.5N	155.4E	65	6	54	102	160	203	318	470	657	0	10	5	-10	-35	-65	-60	-60
04082018	9	14.6N	154.2E	65	13	66	103	153	198	246	329	555	0	5	-10	-30	-55	-65	-70	-60
04082100	10	14.3N	153.0E	65	26	48	99	140	186	242	299	548	5	0	-10	-35	-60	-60	-60	-45
04082106	11	14.2N	151.7E	70	13	29	67	96	138	166	315	566	0	-15	-30	-40	-40	-30	-30	-35
04082112	12	14.2N	150.3E	75	5	17	48	83	94	108	235	517	0	-10	-30	-50	-40	-25	-35	-25
04082118	13	14.2N	148.9E	90	13	42	60	79	87	73	102	335	0	-15	-40	-45	-35	-30	-30	-20
04082200	14	14.2N	147.5E	95	13	35	81	107	122	113	134	310	0	-20	-45	-40	-35	-30	-15	-10
04082206	15	14.3N	146.4E	115	8	38	76	89	101	82	137	329	-5	-30	-30	-25	-20	-25	-20	-10
04082212	16	14.5N	145.4E	125	6	37	58	76	83	46	69	271	0	-20	-15	-20	-20	-30	-15	-25
04082218	17	14.9N	144.6E	145	13	18	0	11	65	30	60	390	10	5	10	20	15	20	30	20
04082300	18	15.2N	143.7E	155	5	29	57	103	126	103	47	202	0	0	5	20	15	25	35	15
04082306	19	15.7N	142.8E	155	8	17	24	67	81	81	97	234	0	-15	-20	-35	-20	-20	-15	-40
04082312	20	16.3N	142.0E	155	5	13	46	67	61	47	53	152	0	-10	-10	-25	-30	-15	-30	-40
04082318	21	16.9N	141.2E	155	0	29	62	68	58	13	77	245	-5	0	-10	0	-5	0	-25	-25
04082400	22	17.4N	140.3E	155	5	39	61	63	66	12	80	264	-5	0	-15	-15	-5	10	-15	-20
04082406	23	18.1N	139.6E	150	6	29	39	39	21	48	147	282	0	-10	-5	-20	-5	0	-25	-30
04082412	24	18.8N	139.0E	145	18	42	38	21	16	52	152	227	-5	-15	-15	-5	0	-5	-20	-20
04082418	25	19.6N	138.6E	155	13	13	21	13	26	5	126	192	-5	5	-5	5	10	0	-5	-15
04082500	26	20.4N	138.1E	150	8	18	5	12	36	33	54	104	0	0	15	25	30	0	0	-10
04082506	27	21.2N	137.6E	140	0	6	13	5	5	61	109	80	5	-5	10	15	25	0	0	-5
04082512	28	22.0N	137.0E	145	5	13	19	29	60	120	146	137	0	10	20	25	20	5	10	5
04082518	29	22.8N	136.6E	145	5	13	19	13	56	73	8	404	0	15	15	25	5	0	5	15
04082600	30	23.5N	136.1E	130	8	34	43	25	36	74	61	583	10	25	25	20	5	10	20	35
04082606	31	24.2N	135.7E	125	6	26	44	39	66	12	97	275	0	0	10	-10	-15	-5	-5	-5
04082612	32	24.9N	135.3E	115	8	32	37	40	29	42	115	193	0	0	-5	-15	-10	0	-10	-5
04082618	33	25.6N	135.0E	115	8	5	8	19	42	84	153		-5	5	-15	-15	-15	-5	-5	

04082700	34	26.2N	134.8E	105	8	12	8	26	55	78	293		0	0	-15	-10	-10	0	5	
04082706	35	26.6N	134.6E	100	5	22	32	5	29	103	514		0	-20	-25	-20	-20	-10	0	
04082712	36	26.9N	134.3E	105	6	24	25	24	22	168	504		-5	-25	-20	-20	-20	-5	10	
04082718	37	27.1N	134.1E	115	5	12	20	21	36	144			0	0	0	5	10	-10		
04082800	38	27.3N	133.8E	115	5	0	12	12	36	156			0	5	5	15	15	5		
04082806	39	27.4N	133.4E	115	12	43	44	38	62	285			0	0	0	10	-15	-10		
04082812	40	27.6N	132.7E	110	6	12	16	30	111	322			0	5	10	5	-10	0		
04082818	41	27.8N	132.0E	110	5	11	17	52	109				0	0	5	0	-5			
04082900	42	28.2N	131.2E	105	5	10	13	58	202				0	5	-5	-10	-10			
04082906	43	28.7N	130.5E	105	5	16	12	44	133				-5	-5	-5	-20	-10			
04082912	44	29.4N	130.0E	95	0	5	20	90	144				0	-10	-15	-10	-5			
04082918	45	30.3N	129.8E	95	7	39	71	179					-5	-10	-20	-10				
04083000	46	31.6N	130.2E	90	6	42	128	146					-5	-5	-15	-5				
04083006	47	33.4N	131.3E	85	6	45	153						-5	-20	-10					
04083012	48	34.9N	133.1E	75	7	75	156						-10	-5	-5					
04083018	49	37.1N	135.7E	70	4	103							-10	0						
04083100	50	40.1N	139.2E	55	18	309							0	0						
04083106	51	43.1N	143.1E	50	21								0							
04083112		46.8N	144.9E	40																
			AVERAGE		10	36	50	65	89	126	188	326	2	8	13	17	18	22	29	31
			BIAS										-1	-4	-7	-8	-11	-18	-22	-25
			# CASES		51	50	48	46	44	40	34	30	51	50	48	46	44	40	34	30

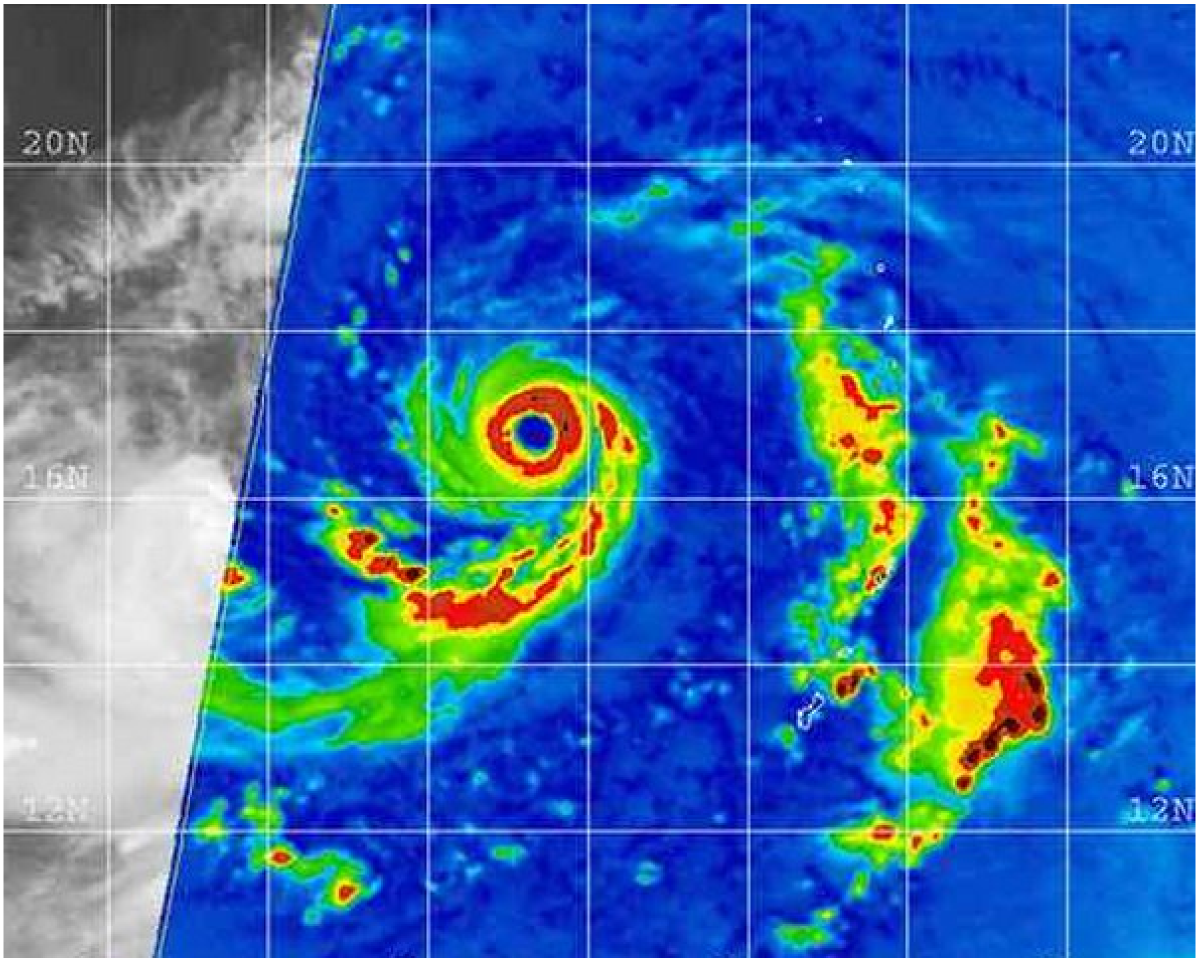


Figure 1-WP19-1. 231603Z August 2004 AMSR-E microwave image of STY 19W (Chaba), at this time, the system was approximately 275NM northwest of Guam with a peak intensity of 155 knots.

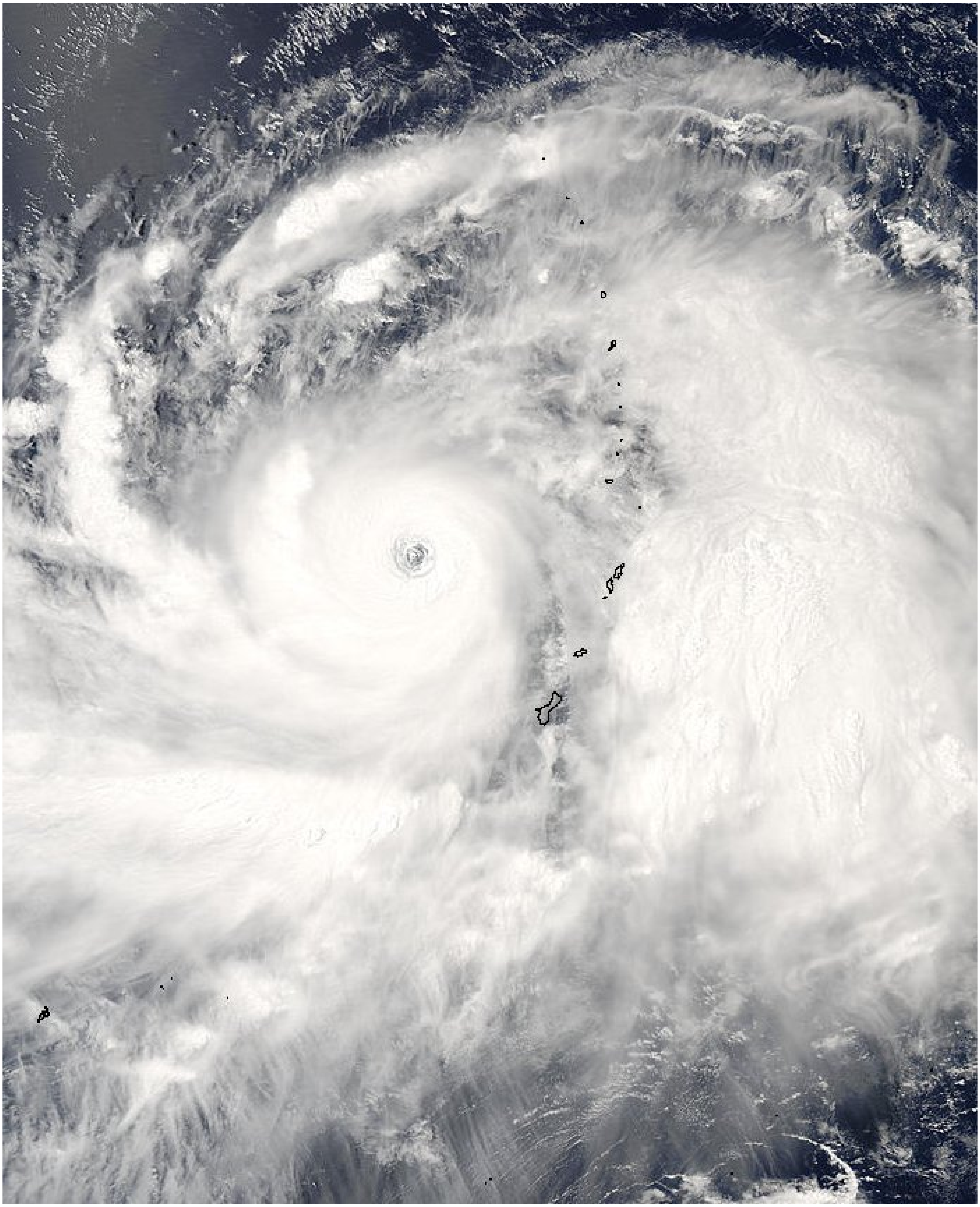


Figure 1-WP19-2. 230350Z August 2004 MODIS true-color image of STY 19W (Chaba), approximately 370 nm northwest of Guam with an intensity of 155 knots.

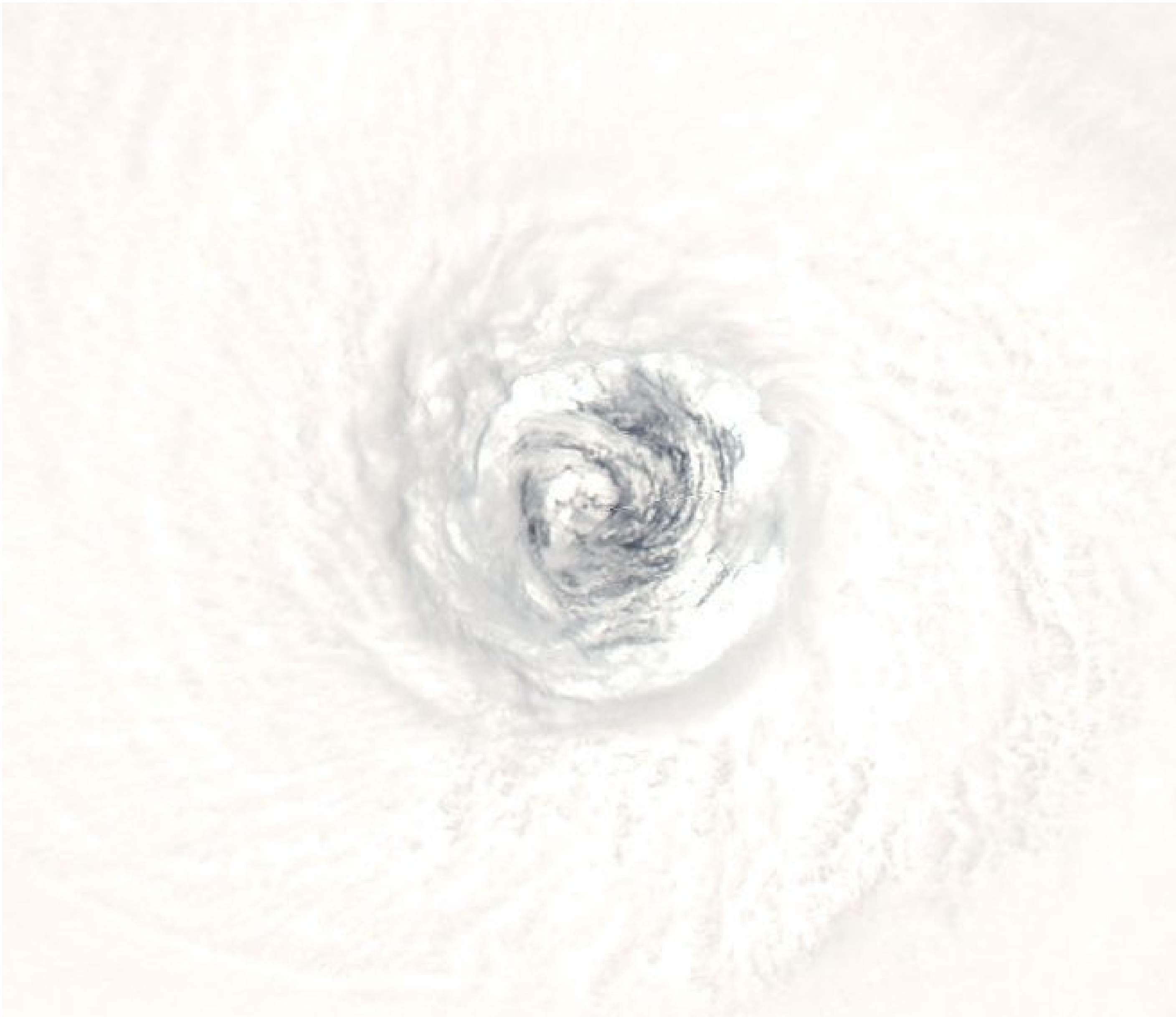
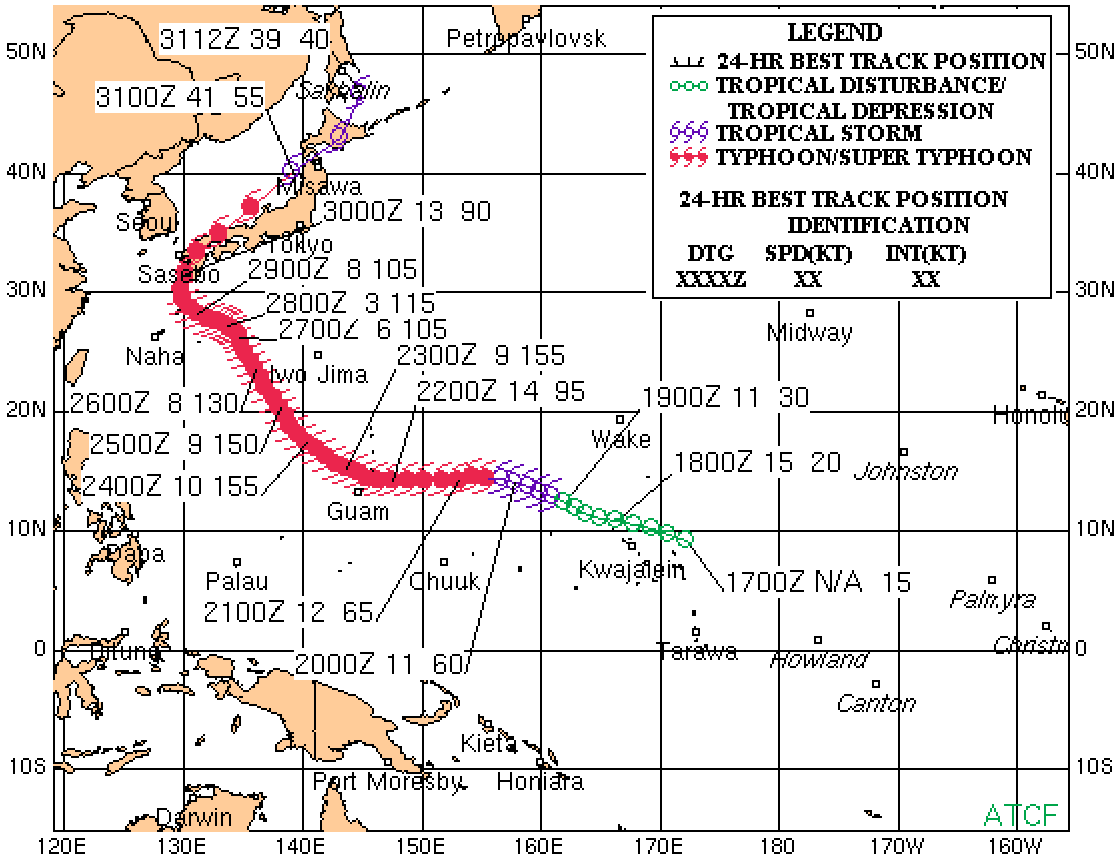
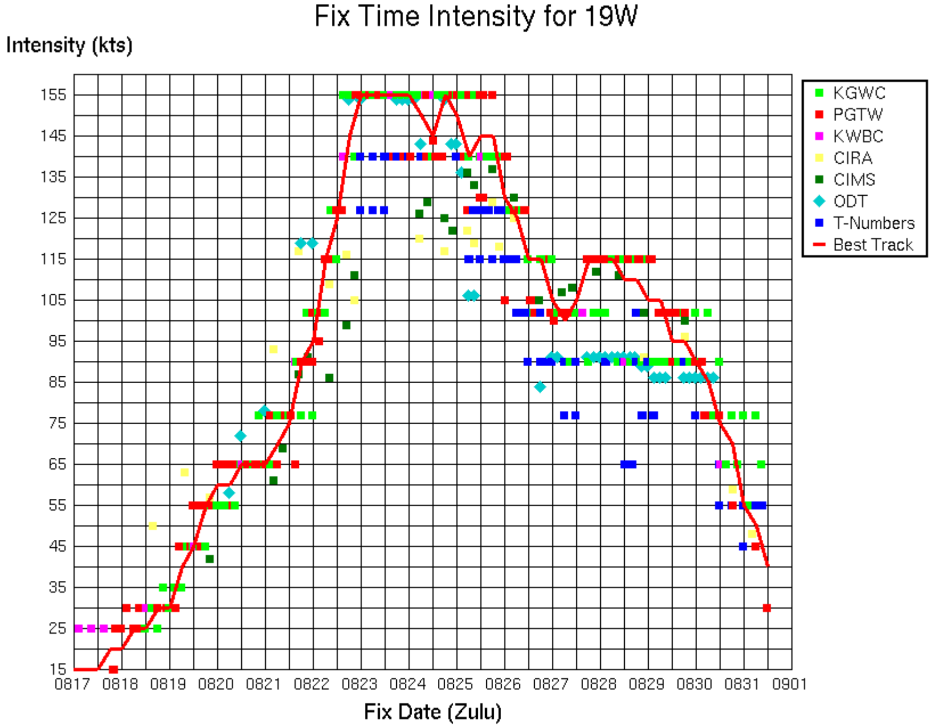


Figure 1-WP19-3. 230350Z August 2004 MODIS true-color image depicting eye detail in STY 19W (Chaba), approximately 370 nm northwest of Guam with an intensity of 155 knots.

SUPER TYPHOON 19W (CHABA)
19 -26 AUG 2004



Fix Time Intensity for 19W



Typhoon (TY) 20W (Aere)

First Poor : 0600Z 13 Aug 04

First Fair : 0300Z 15 Aug 04

First TCFA : 2200Z 15 Aug 04

First Warning : 1200Z 19 Aug 04

Last Warning : 1200Z 26 Aug 04, Dissipated over land

Max Intensity : 85 kts, gusts to 105 kts

Landfall : Hanjiang, China

Total Warnings : 29

Remarks:

1) Typhoon (TY) 20W initially formed as a tropical disturbance on 13 Aug, approximately 145 nm west of Pohnpei. The cyclone strengthened to 35 kts on 20 Aug as an upper level low, which was initially inhibiting intensification, moved away and then began enhancing outflow. The cyclone also changed track at this time and began moving more northwestward around the western periphery of the subtropical ridge located east of the Marianas Islands. TY 20W achieved typhoon strength on 22 Aug and remained at this intensity for approximately 36 hours. Once the system reached maximum intensity of 85 kts, it began to track westward under the influence of the subtropical ridge over western China. The system tracked just north of Taiwan on 25 Aug and made landfall into China at about 1200Z on that day. Due to increased friction and lack of surface inflow, the cyclone rapidly weakened and dissipated by 26 Aug at 1200Z.

2) Reports from Shanghai indicate damage was heavy with 8,270 houses destroyed and over 46,000 hectares of farmland ruined. The Fujian Water Resources Department reported that six reservoirs were badly damaged and 50 dams had been breached. Additionally, 937,000 people were moved to safety while a neighboring province evacuated 249,000.

Statistics for JTWC on TY 20W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04081718		9.4N	146.5E	20																
04081800		9.2N	144.7E	20																
04081806		9.9N	143.0E	20																
04081812		10.5N	141.3E	20																
04081818		10.7N	139.8E	20																
04081900		10.9N	138.3E	25																
04081906		11.2N	136.8E	25																
04081912	1	12.1N	136.2E	25	13	32	48	76	142	242			0	-5	-10	-20	-25	-20		
04081918	2	13.2N	136.0E	30	16	76	66	100	144	245			0	-5	-10	-15	-20	-5		
04082000	3	14.2N	135.8E	35	46	79	53	59	97	220	349	733	0	-5	-10	-20	-15	-5	-20	-25
04082006	4	15.2N	135.9E	40	0	35	75	113	151	282	465	970	-5	-10	-10	-15	-10	0	-10	-15
04082012	5	16.0N	135.3E	45	23	39	82	144	186	267	364	809	0	-5	-10	0	5	5	-5	10
04082018	6	16.7N	134.5E	50	8	34	81	130	184	289	339	689	5	10	10	15	45	35	25	55
04082100	7	17.5N	133.8E	55	11	53	100	151	201	288	354	596	0	0	10	20	35	20	15	55
04082106	8	18.2N	132.8E	55	18	18	59	86	122	215	399	700	10	5	10	30	25	25	15	55
04082112	9	18.9N	131.8E	65	12	29	45	64	87	188	333	539	0	5	10	25	20	20	25	65
04082118	10	19.6N	130.8E	65	8	42	53	64	87	129	257		0	5	20	20	15	10	30	
04082200	11	20.3N	129.7E	65	8	29	47	47	58	121	287		0	5	15	10	5	0	35	
04082206	12	21.0N	128.7E	65	6	13	16	38	54	80	223		0	15	10	5	5	-15	20	
04082212	13	21.6N	127.8E	65	12	12	5	12	36	118	221		0	10	5	0	0	-5	25	
04082218	14	22.2N	127.0E	55	8	13	12	19	8	121			10	0	-5	-5	-10	5		
04082300	15	22.8N	126.2E	60	12	23	13	8	30	142			-5	-5	-10	-10	-15	0		
04082306	16	23.3N	125.5E	65	11	28	33	24	19	89			0	0	0	-15	-25	0		
04082312	17	23.8N	125.0E	70	13	38	56	60	69	45			-5	-5	-20	-40	-40	-5		
04082318	18	24.4N	124.5E	75	5	13	26	30	40				0	0	-10	-15	-5			
04082400	19	24.9N	124.0E	80	8	16	12	28	58				-5	-10	-15	-10	-10			
04082406	20	25.3N	123.5E	80	0	13	5	53	78				0	-15	-15	0	10			
04082412	21	25.5N	122.9E	85	10	17	38	89	97				0	-10	-5	5	20			
04082418	22	25.6N	122.2E	90	5	5	49	70					-5	-5	-5	0				
04082500	23	25.6N	121.4E	90	16	65	97	93					-10	-5	0	10				
04082506	24	25.6N	120.4E	85	5	64	90						-10	-5	5					
04082512	25	25.3N	119.2E	75	0	45	42						-10	-15	5					
04082518	26	24.7N	118.1E	65	8	8							0	10						
04082600	27	24.2N	117.2E	60	34	42							-5	5						
04082606	28	23.9N	116.4E	40	26								5							
04082612	29	23.8N	115.6E	30	0								0							
			AVERAGE		12	33	48	68	93	181	326	719	3	6	9	13	17	10	20	40
			BIAS										-1	-1	-1	-1	0	4	14	29
			# CASES		29	27	25	23	21	17	11	7	29	27	25	23	21	17	11	7

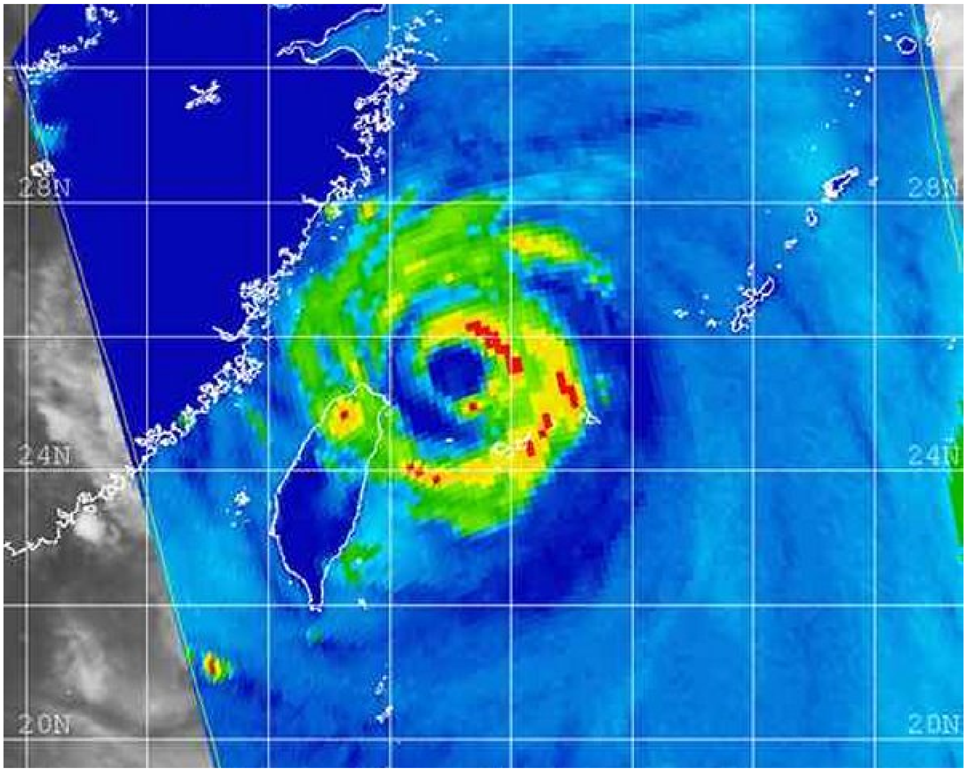


Figure 1-WP20-1. 241042Z August 2004 SSM/I satellie image of TY 20W (Aere), at this time, the system was approximately 65NM northeast of Taiwan with a peak intensity of 80 knots.

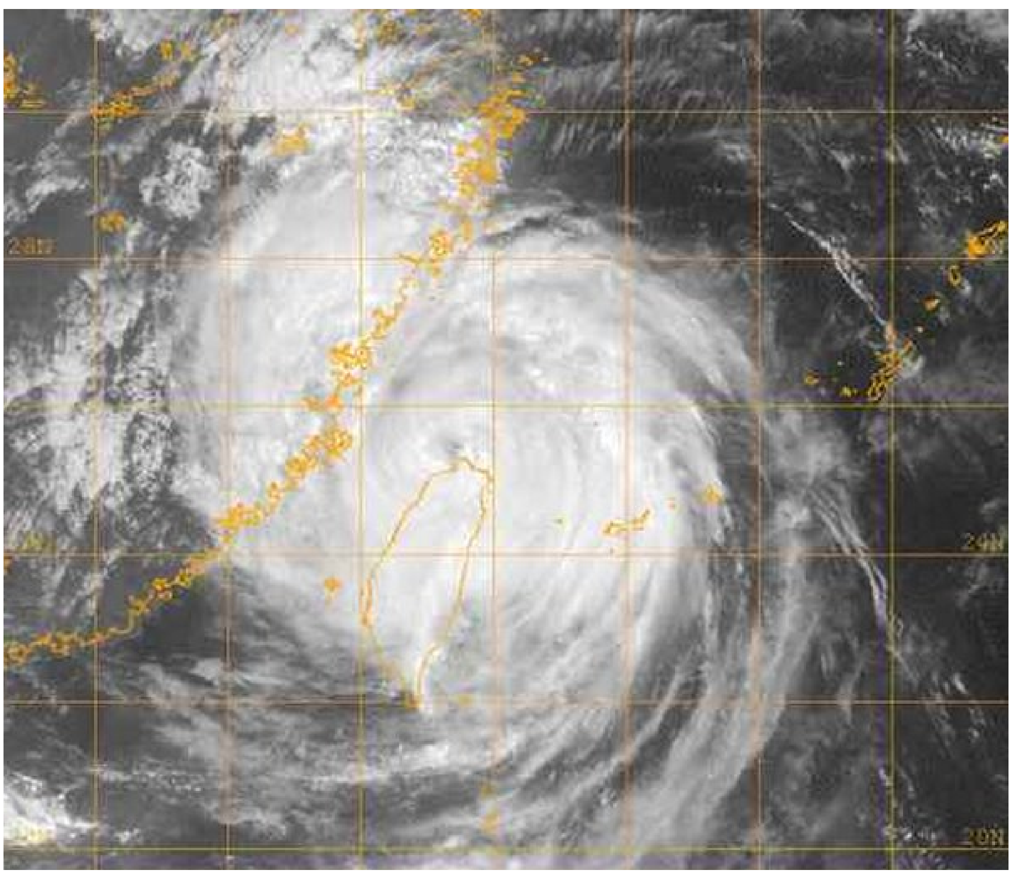


Figure 1-WP20-2. 250102Z August 2004 Goes-9 visible satellite image of TY 20W (Aere), reveals a ragged cloud filled eye approximately 6NM north of Taiwan with a peak intensity of 85 knots.

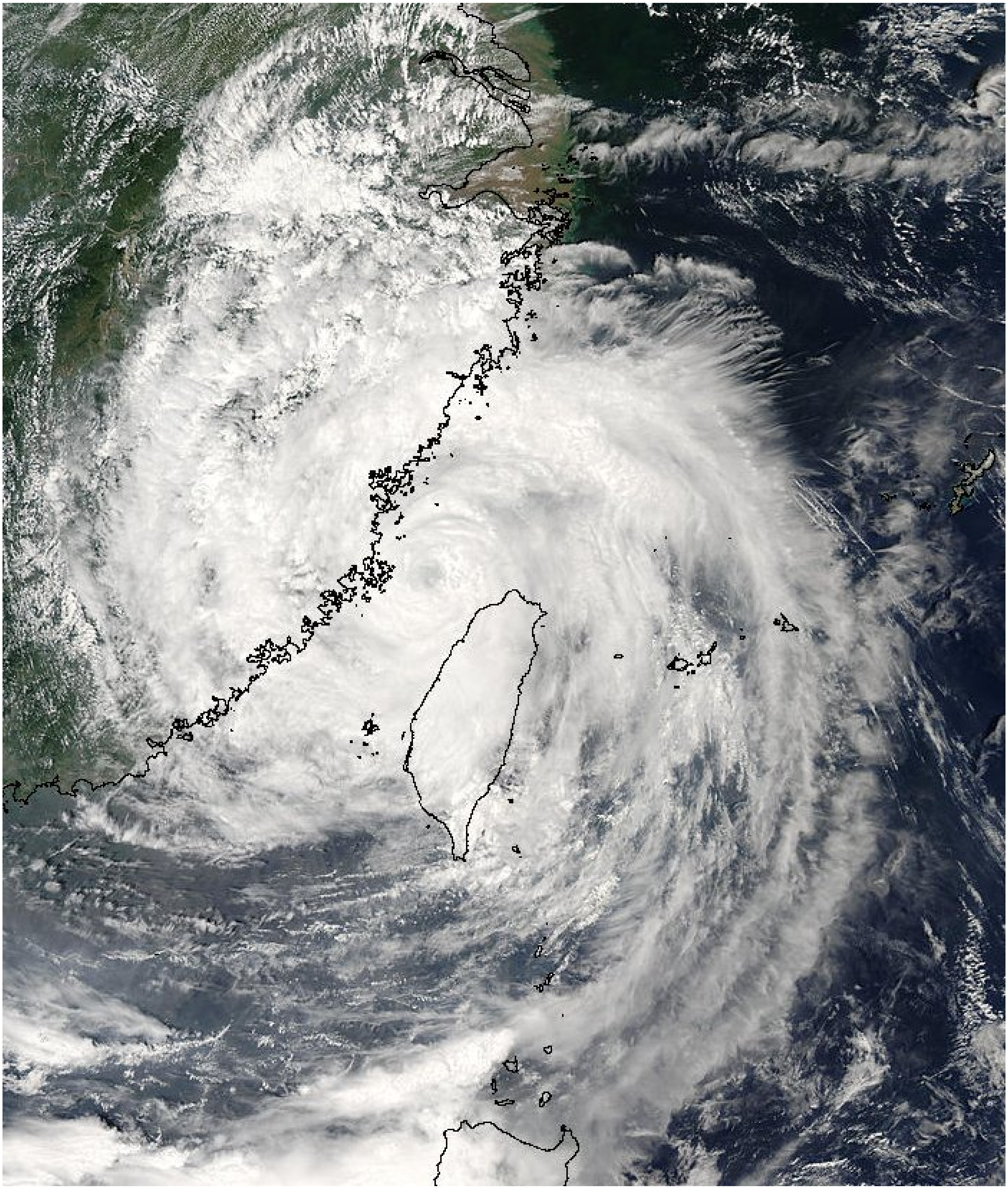
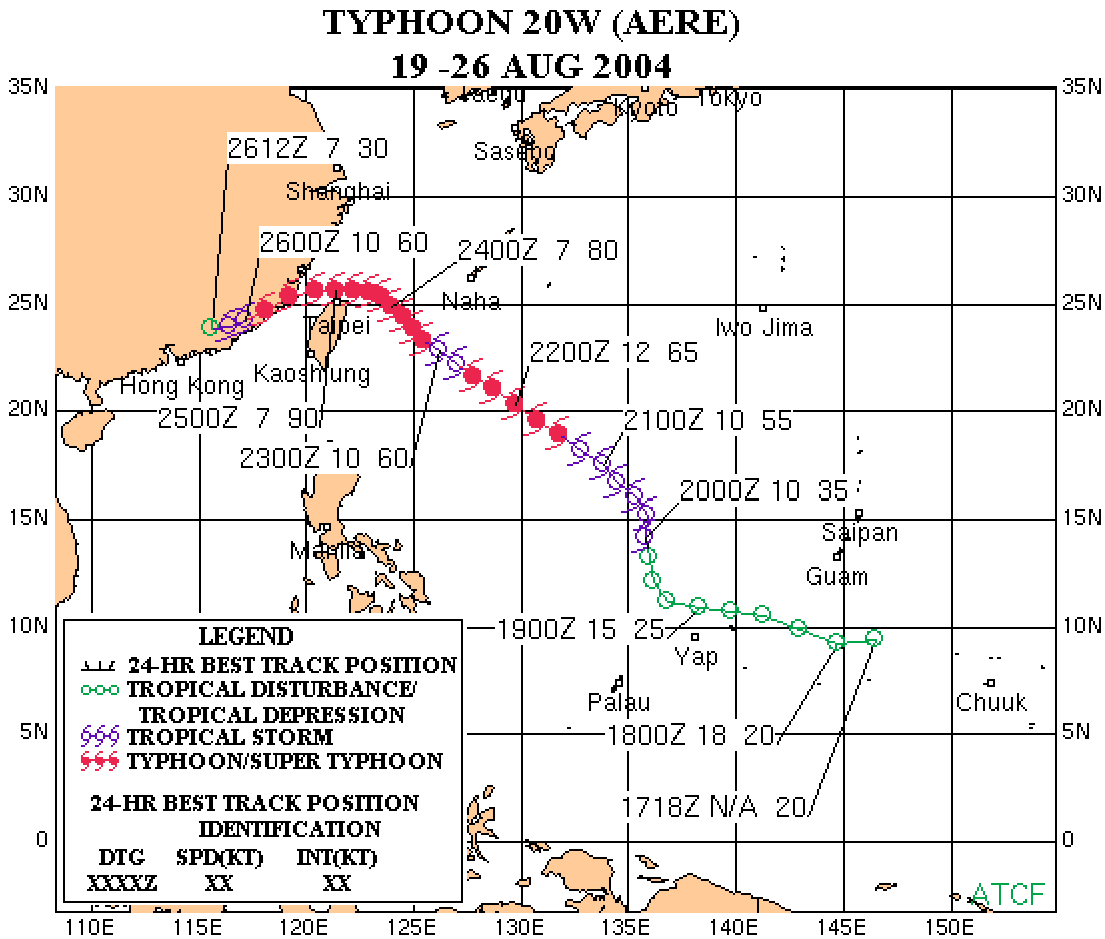
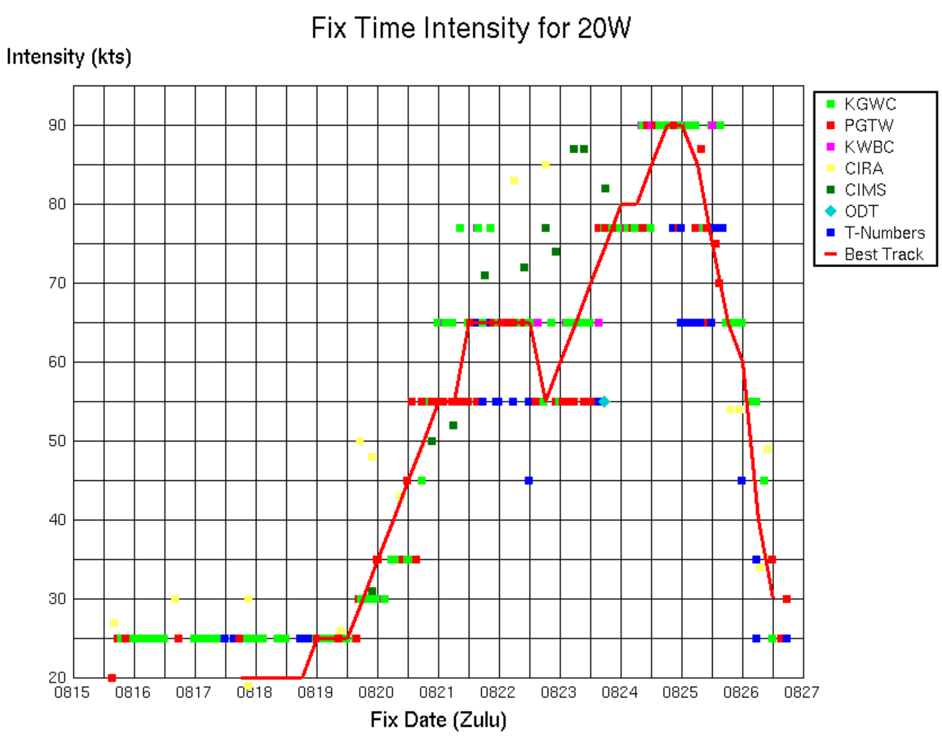


Figure 1-WP20-3. 250520Z August 2004 MODIS true-color image of TY 20W (Aere), approaching the east coast of China with an intensity of 75 knots.



TYPHOON 20W (AERE)
19 -26 AUG 2004
35N
30N
25N
20N
15N
10N
5N
0
110E
115E
120E
125E
130E
135E
140E
145E
150E
2612Z 7 30
Shanghai
2600Z 10 60
2400Z 7 80
Naha
Taipei
Kaoshiung
Hong Kong
2500Z 7 90
2300Z 10 60
2200Z 12 65
2100Z 10 55
2000Z 10 35
Iwo Jima
Saipan
Guam
Manila
1900Z 15 25
Yap
Palau
1800Z 18 20
1718Z N/A 20
Chuuk
Tokyo
Kyoto
Sasebo
LEGEND
24-HR BEST TRACK POSITION
TROPICAL DISTURBANCE/ TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON/SUPER TYPHOON
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
ATCF



Fix Time Intensity for 20W
Intensity (kts)
90
80
70
60
50
40
30
20
0815
0816
0817
0818
0819
0820
0821
0822
0823
0824
0825
0826
0827
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
ODT
T-Numbers
Best Track

Tropical Storm (TS) 21W

First Poor : 0600Z 24 Aug 04

First Fair : 1500Z 25 Aug 04

First TCFA : 2130Z 25 Aug 04

First Warning : 0600Z 26 Aug 04

Last Warning : 0000Z 28 Aug 04, Dissipated over water

Max Intensity : 30 kts, gusts to 40 kts

Landfall : None

Total Warnings : 9

Remarks:

1) Tropical Storm (TS) 21W initially developed as a tropical disturbance approximately 650 nm east of Saipan on 24 Aug. The disturbance tracked slowly westward until 26 Aug when it was upgraded to a tropical depression. At 1800Z on 26 Aug the system achieved tropical storm strength. TS 21W only remained at tropical storm strength for 12 hours before weakening as it became under the influence of linear to confluent flow from the northeast associated with the outflow from TD 19W. A 270325Z Aug AMSU microwave satellite imagery indicated TS 21W had become fully exposed with the deep convection displaced to the west over Guam. TS 21W continued to track west-northwestward along the southern periphery of the steering ridge to the north and dissipated as a tropical cyclone over water.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TS 21W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04082506		13.0N	154.0E 15																	
04082512		13.0N	153.6E 15																	
04082518		13.1N	153.1E 20																	
04082600		13.3N	152.5E 20																	
04082606	1	13.5N	151.9E 25	31	63	92	148	151				0	0	0	5	20				
04082612	2	13.7N	151.3E 30	52	68	107	144					0	5	10	15					
04082618	3	13.9N	150.7E 30	13	42	115	171					5	10	10	25					
04082700	4	14.2N	150.0E 30	13	72	151						5	10	15						
04082706	5	14.6N	149.3E 30	41	121	182						5	0	10						
04082712	6	15.2N	148.4E 30	39	115							0	0							
04082718	7	15.7N	147.6E 30	18	81							0	5							
04082800	8	16.0N	146.3E 25	8								0								
04082806	9	15.9N	145.4E 20	16								0								
			AVERAGE	26	81	129	155	151				2	4	9	15	20				
			BIAS									2	4	9	15	20				
			# CASES	9	7	5	3	1				9	7	5	3	1				

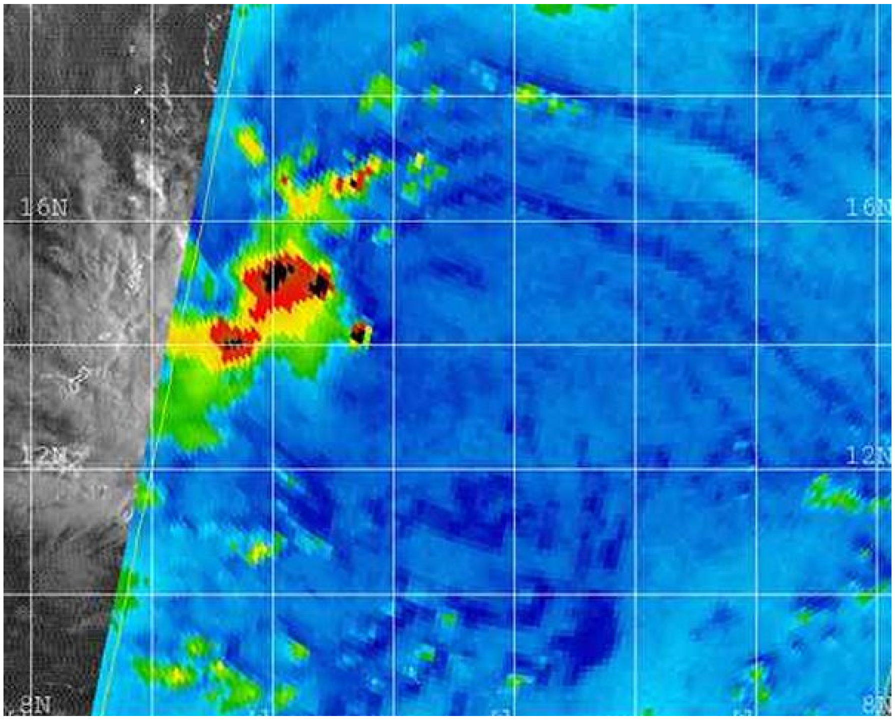


Figure 1-WP21-1. 262025Z August 2004 SSM/I microwave image of TS 21W (No Name), at this time the systems low-level circulation center is partially exposed to the east of the associated deep convection. During this time the system was tracking westward toward Guam with a peak intensity at the time of 35 knots.

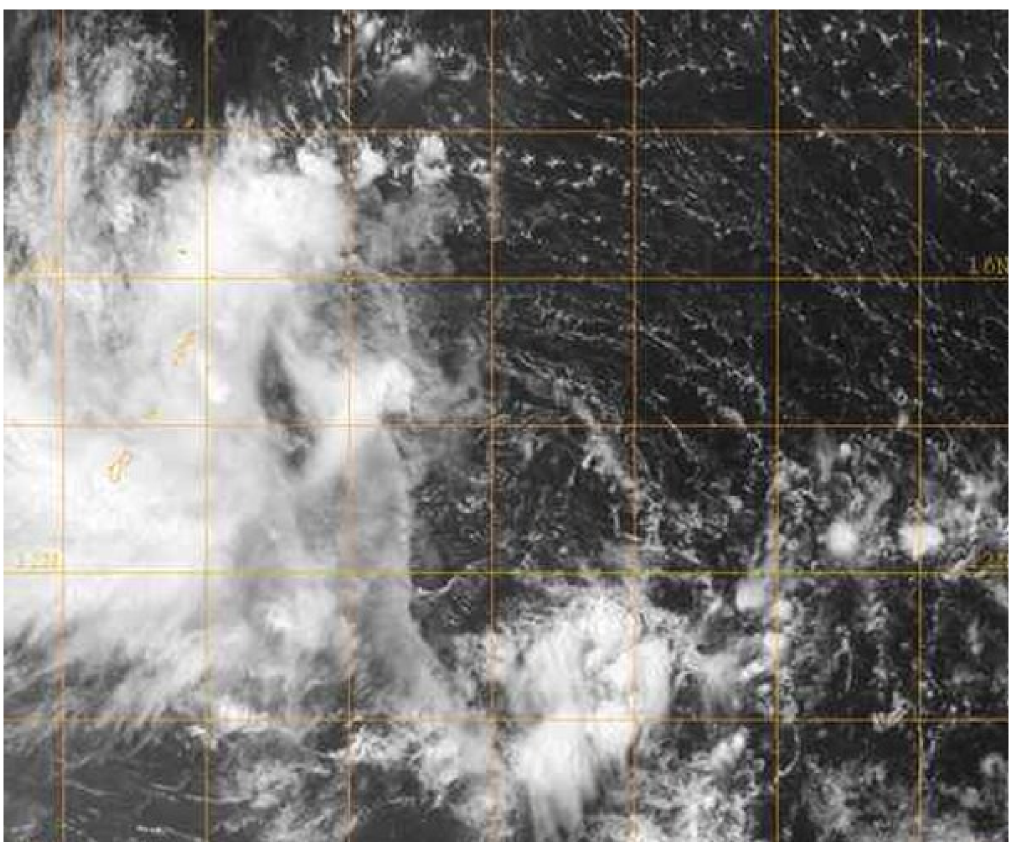
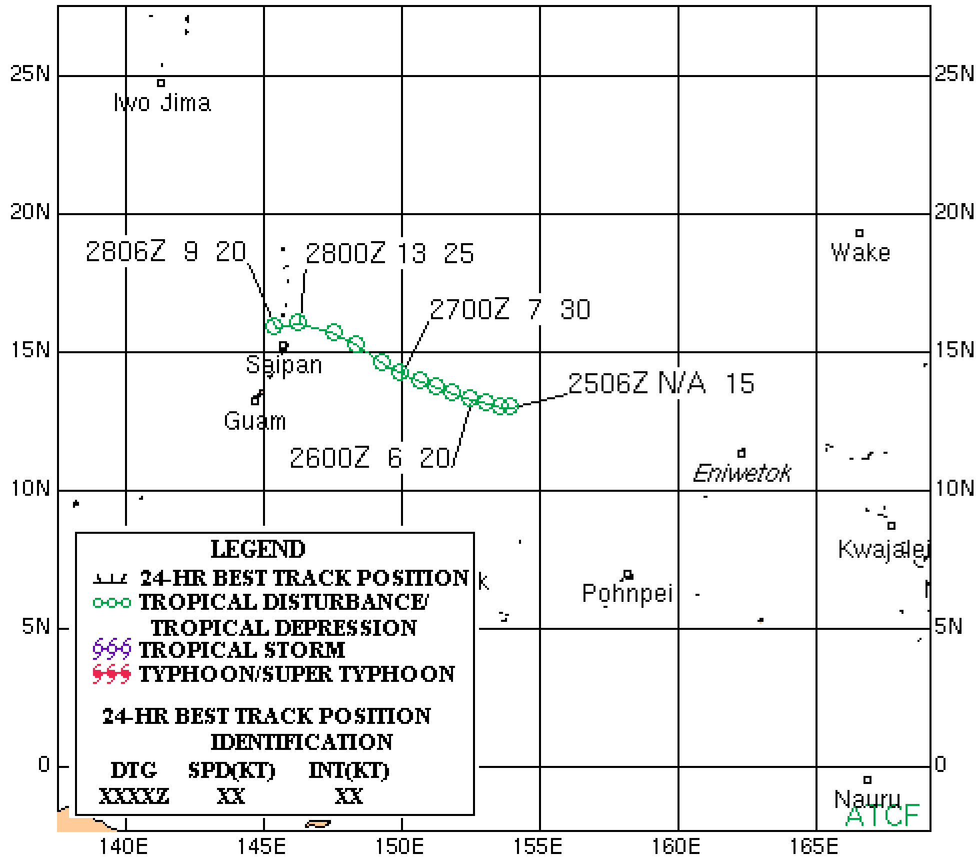
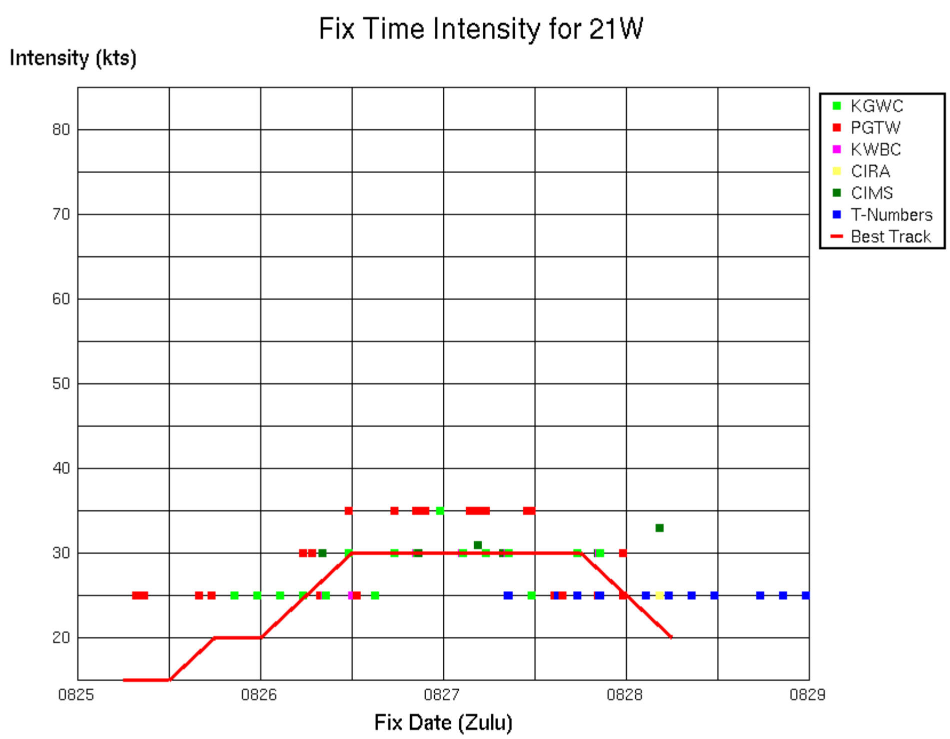


Figure 1-WP21-2. 270413Z August 2004 Goes-9 visible image of TS 21W (No Name), at this time the system was located approximately 255NM northeast of Guam with a peak intensity of 35 knots.

TROPICAL STORM 21W
26 -28 AUG 2004





Super Typhoon (STY) 22W (Songda)

First Poor : 0600Z 26 Aug 04

First Fair : 1100Z 26 Aug 04

First TCFA : 1130Z 27 Aug 04

First Warning : 1200Z 27 Aug 04

Last Warning : 1800Z 07 Sep 04, Extra-tropical

Max Intensity : 125 kts, gusts to 150 kts

Landfall : None

Total Warnings : 46

Remarks:

1) Typhoon (TY) 22W initially developed as a tropical disturbance east-northeast of Kwajalein. The cyclone tracked westward along the southern periphery of the subtropical ridge as it intensified at near a climatologtical rate. By 0600Z on 28 Aug, the cyclone began to move west-northwestward towards Okinawa. 24 hours later the system intensified to typhoon strength and continued to track west-northwestward along the southern periphery of the subtropical steering ridge and reached maximum intensity of 125 kts at 1200z on 04 Sep. Approximately 18 to 24 hours later the cyclone tracked over central Okinawa with maximum wind speeds of 115 kts. TY 22W crested the ridge axis and shifted to a north-northeast track towards western Kyushu with a maximum intensity of 90 kts. After TY 22W entered the Sea of Japan it rapidly began to weaken due to a passing major shortwave trough. By 1800Z on 07 Sep, the cyclone became embedded in the mid-latitude westerly flow as an extra-tropical low.

2) Reports from Japan indicate infrastructure damage, with tens of thousands left without electrical power, and more than 700 people injured, 24 dead and another 15 missing.

Statistics for JTWC on STY 22W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04082600		10.8N	170.9E	20																
04082606		10.8N	170.2E	20																
04082612		10.6N	169.5E	20																
04082618		10.6N	168.8E	20																
04082700		10.4N	168.1E	25																
04082706		10.7N	167.4E	30																
04082712	1	10.9N	166.6E	30	16	13	34	19	21	33			-5	-10	-15	-15	-10	-10		
04082718	2	11.1N	165.8E	35	13	32	42	19	66	139	232	347	0	-15	-10	-15	-10	-15	-35	-25
04082800	3	11.4N	164.9E	45	0	19	30	77	121	179	211	349	-5	-10	-10	-10	-15	-30	-35	-20
04082806	4	12.0N	163.9E	55	13	36	79	122	154	204	213	341	0	15	15	20	20	-15	-15	0
04082812	5	12.4N	162.9E	55	13	48	84	123	168	196	245	324	5	15	20	20	15	-20	-15	0
04082818	6	12.8N	161.6E	55	0	30	63	105	138	135	86	134	5	5	15	15	10	-20	-15	0
04082900	7	13.2N	160.2E	60	0	23	54	92	121	90	29	56	0	5	10	5	-10	-25	-15	-5
04082906	8	13.7N	158.7E	65	6	18	35	49	69	18	59	117	5	10	10	10	-10	-10	-10	-20
04082912	9	14.2N	157.2E	65	6	21	42	51	48	25	73	136	5	5	5	-5	-15	-10	-10	-15
04082918	10	14.6N	155.7E	70	0	18	38	60	66	11	56	131	0	0	0	-20	-15	-10	-10	-20
04083000	11	15.0N	154.3E	75	6	18	31	30	46	36	84	139	0	-5	-15	-25	-15	-5	-10	-20
04083006	12	15.4N	152.9E	80	8	27	27	19	16	99	183	290	-5	0	-20	-15	-10	-10	-15	-25
04083012	13	15.7N	151.5E	85	8	24	46	36	13	95	194	356	0	-10	-20	-15	-10	-5	-5	-25
04083018	14	16.0N	150.5E	90	0	6	26	69	58	84	157	268	5	-15	-10	-5	0	0	-10	-25
04083100	15	16.3N	149.5E	105	0	30	63	74	62	106	186	305	0	-10	-5	0	-5	-10	-25	-35
04083106	16	16.7N	148.5E	120	6	38	95	85	72	91	130	114	0	0	5	5	10	5	-25	-30
04083112	17	17.4N	147.7E	125	11	31	18	56	62	56	99	92	0	5	5	5	5	5	-25	-25
04083118	18	17.9N	146.8E	125	8	48	58	57	56	118	129	134	5	10	5	15	10	0	-20	-5
04090100	19	18.6N	146.1E	125	16	54	67	79	71	102	130	80	0	0	0	0	-5	-10	-20	-10
04090106	20	19.7N	145.2E	125	12	85	96	105	92	71	138	241	0	0	5	5	0	-15	-10	0
04090112	21	20.2N	143.7E	125	11	6	16	8	6	81	220	329	0	5	5	5	5	-20	-10	5

04090118	22	20.8N	142.3E	125	0	34	31	26	28	115	226	429	0	10	5	0	-5	-25	-10	0
04090200	23	21.2N	141.0E	120	8	8	13	8	43	132	258	543	0	0	-5	-5	-15	-20	-10	-5
04090206	24	21.5N	139.8E	115	13	31	42	16	64	176	303	739	-5	0	0	-5	-15	0	20	25
04090212	25	21.8N	138.5E	115	8	29	33	54	132	252	416	1100	-10	-5	5	-5	-15	-5	0	5
04090218	26	21.9N	137.4E	115	0	0	21	81	128	257	513	1439	-5	0	-5	-20	-20	-5	0	30
04090300	27	22.0N	136.3E	115	0	6	55	115	165	295	613	1522	-5	0	-10	-20	-15	-5	-5	30
04090306	28	22.2N	135.2E	115	5	11	62	97	142	253	772		0	-5	-20	-20	-15	0	0	
04090312	29	22.3N	134.1E	110	8	34	87	122	177	309	1053		10	5	-10	-5	-5	5	15	
04090318	30	22.8N	133.2E	115	11	67	102	150	193	369	1226		5	-5	-10	0	5	15	50	
04090400	31	23.3N	132.1E	115	5	48	96	152	211	415	1025		5	-5	0	0	5	10	45	
04090406	32	24.0N	131.2E	125	12	25	53	98	114	413			-5	-5	0	5	10	10		
04090412	33	24.5N	130.4E	125	5	21	54	79	105	570			0	5	5	10	15	25		
04090418	34	25.0N	129.6E	125	5	19	51	72	96	537			0	5	10	15	10	35		
04090500	35	25.6N	129.0E	115	8	36	62	73	111	499			5	5	10	15	5	25		
04090506	36	26.2N	128.3E	115	5	11	20	37	229				0	5	10	10	5			
04090512	37	27.0N	127.9E	110	0	21	42	101	379				0	5	10	5	15			
04090518	38	27.6N	127.1E	105	10	24	28	134	342				5	10	10	5	30			
04090600	39	28.4N	127.1E	100	7	24	44	238	238				0	5	-5	5	20			
04090606	40	29.2N	126.9E	95	5	12	126	350					0	0	-5	20				
04090612	41	30.0N	127.4E	90	11	40	220	268					0	-10	5	10				
04090618	42	31.1N	128.0E	90	6	50	192						0	-10	10					
04090700	43	32.6N	129.4E	90	20	149	100						0	5	15					
04090706	44	35.3N	132.2E	85	7	127							0	25						
04090712	45	38.8N	135.9E	70	7	81							0	10						
04090718	46	42.0N	140.0E	45	40								0							
04090800		44.7N	140.2E	45																
			AVERAGE		8	34	60	88	114	187	309	387	2	6	9	10	11	12	16	16
			BIAS										0	1	0	0	-1	-5	-8	-8
			# CASES		46	45	43	41	39	35	30	26	46	45	43	41	39	35	30	26

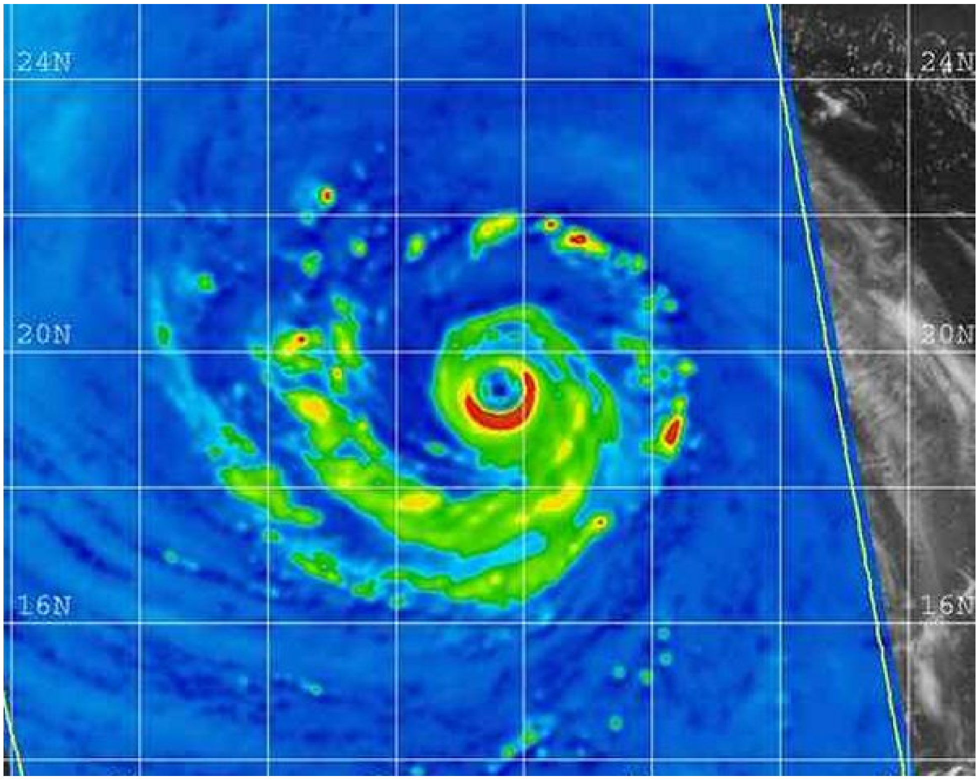


Figure 1-WP22-1. 010345Z September 2004 AMSR-E microwave image of STY 22W (Songda), reveals a very symmetrical system with the intense deep convection south of a small pinhole eye. At this time, the system was located approximately 325NM North of Guam with a peak intensity of 125 knots.

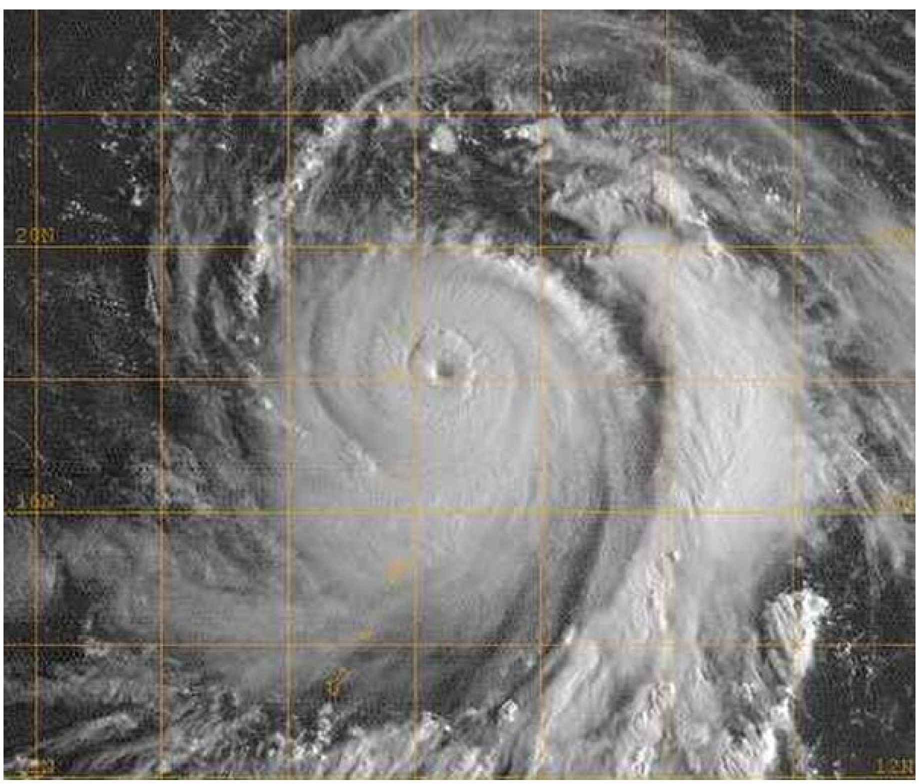


Figure 1-WP22-2. 312101Z August 2004 Goes-9 visible satellite image of STY 22W (Songda), reveals a very symmetrical system with a small pinhole eye. At this time the peak intensity was 130 knots.

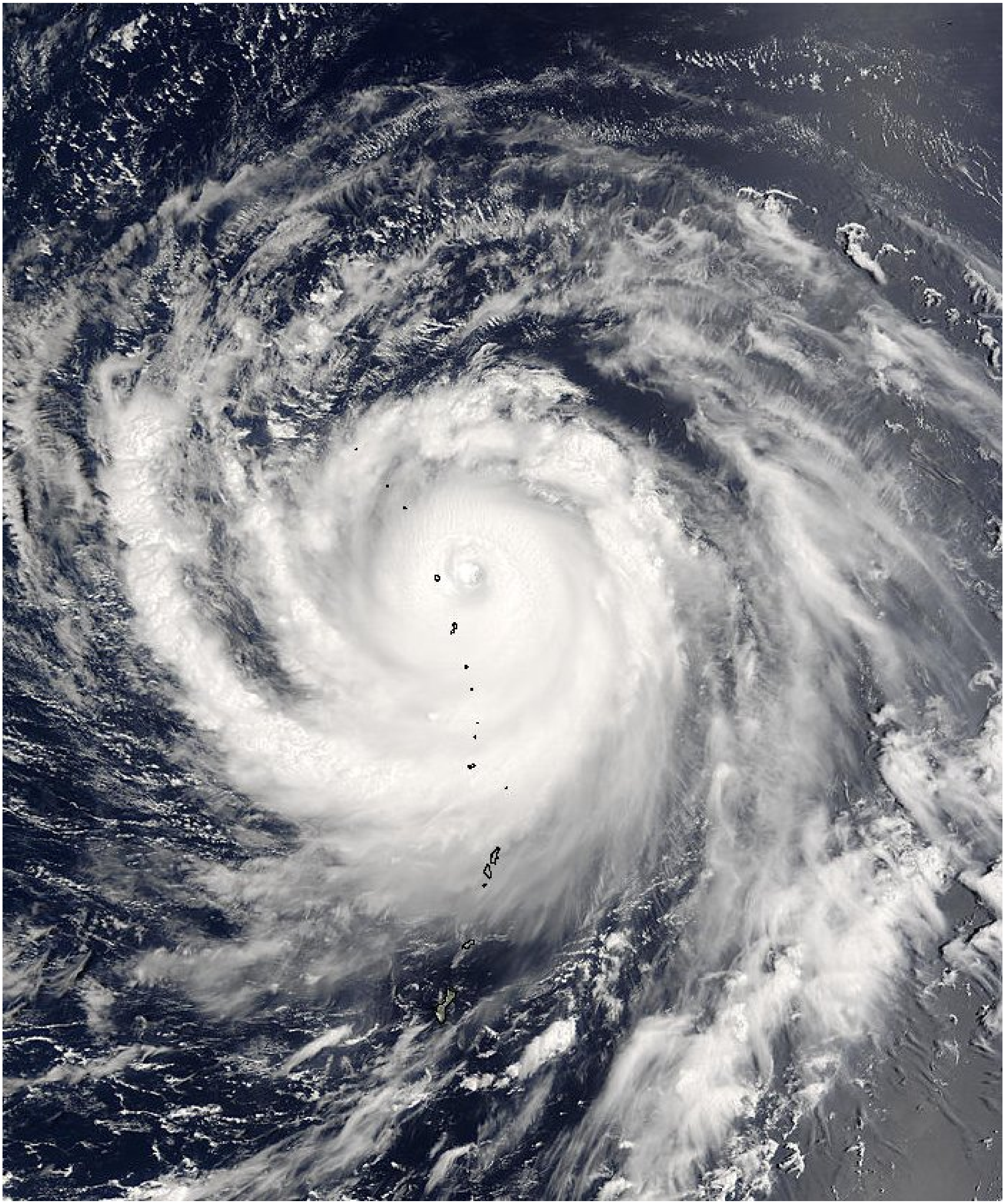


Figure 1-22W-3. 010040Z September 2004 MODIS true-color image of TY 22W (Songda), located approximately 320 nm north of Guam with an intensity of 125 knots.

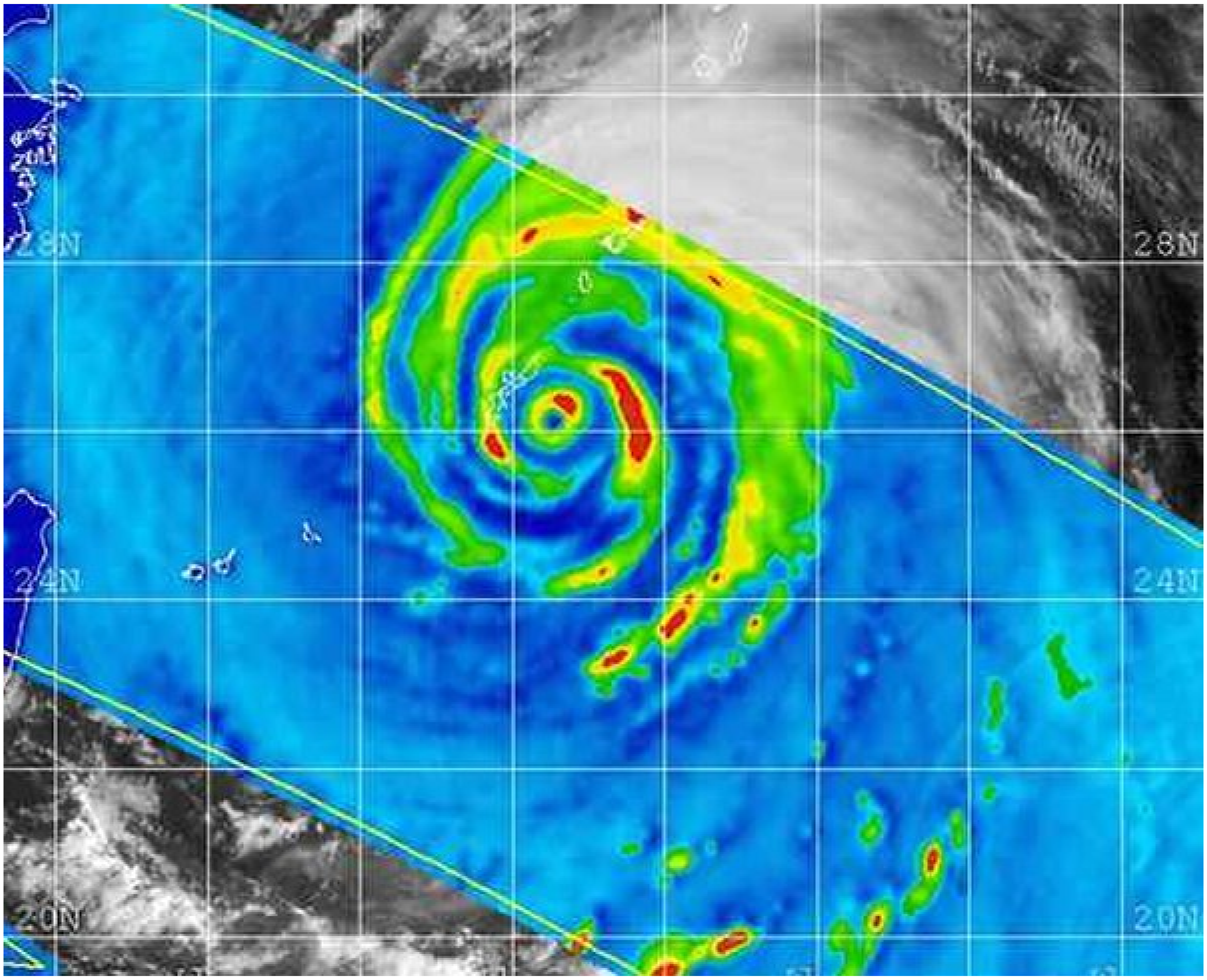
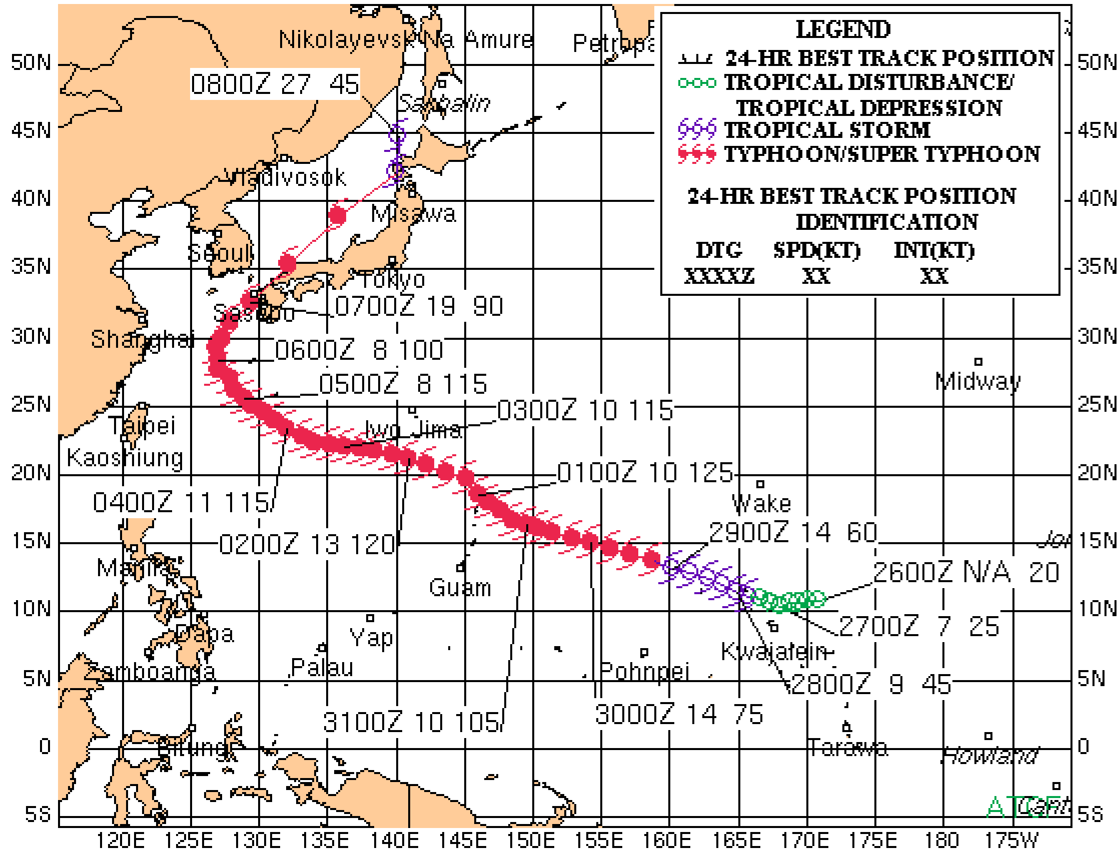
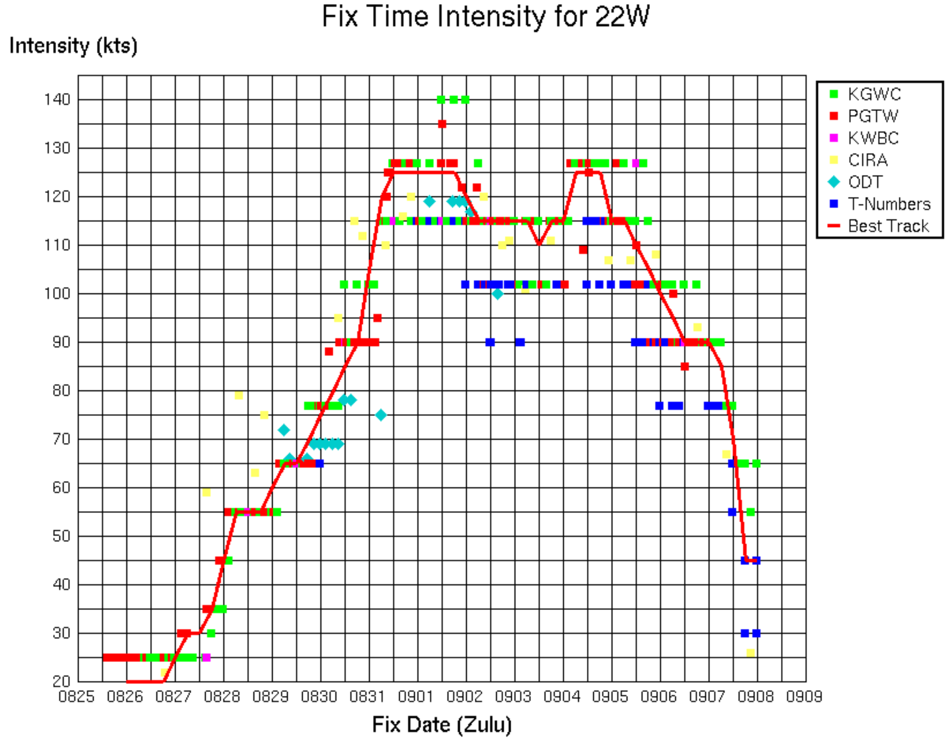


Figure 1-WP22-4. 050216Z September 2004 TRMM microwave image of STY 22W (Songda), at this time, the system was located approximately 45NM southeast of Okinawa Japan. Imagery suggests a possible concentric eyewall pattern with the inner eyewall being well defined while the outer eyewall is broken on the southeastern side. Peak intensity at this time was 120 knots.

SUPER TYPHOON 22W (SONGDA)
27 AUG 2004 -07 SEP 2004



Fix Time Intensity for 22W



Tropical Storm (TS) 23W (Sarika)

First Poor : N/A

First Fair : 0600Z 04 Sep 04

First TCFA : 1730Z 04 Sep 04

First Warning : 1800Z 04 Sep 04

Last Warning : 1800Z 07 Sep 04, Dissipated over water

Max Intensity : 60 kts, gusts to 75 kts

Landfall : N/A

Total Warnings : 13

Remarks:

1) Tropical Storm (TS) 23W was first identified as a tropical disturbance east of Saipan, and drifted northwestward as is consolidated in a weak steering environment. Due to the development of dual outflow channels, the cyclone intensified rapidly and was first warned on at 1800Z on 04 September, as it tracked northwestward along the southwestern periphery of a subtropical ridge anchored northeast of the cyclone. The rapid intensification rate persisted for 18 hours due to the development of an eastern outflow channel enhanced by an upper level low to the northeast. As the cyclone tracked rapidly northwestward and the distance increased between the cyclone and the upper level low, the linkage weakened and the intensification rate slowed. TS 23W attained a maximum intensity of 60 kt at 0000Z on 06 September, and maintained that intensity for 30 hours.

The subtropical ridge that provided the steering flow weakened due to a passing mid-latitude trough, receded eastward, and began to track poleward. TS 23W began to weaken as it encountered an environment of increased vertical wind shear and tracked over an abnormally large pool of cool sea surface temperatures that were the result of substantial upwelling and mixing caused by the passage of TY 19W and TY 22W. As TS 23W tracked northward into an increasingly unfavorable environment, strong northeasterly shear caused the low level circulation center to become decoupled from the deep convection. Additionally, outflow was suppressed by an upper level low located just east of the weakening cyclone. TS 24W dissipated over water prior to making landfall in southern Japan.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TS 23W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04090400		14.9N	153.5E	20																
04090406		15.8N	152.7E	25																
04090412		16.4N	151.6E	30																
04090418	1	16.8N	150.1E	35	16	75	109	154	196	343			-5	-20	-20	-15	0	35		
04090500	2	17.4N	148.5E	45	21	62	90	126	197	358			0	5	15	25	35	65		
04090506	3	18.1N	147.2E	55	11	62	103	107	120	312			0	5	10	20	30	50		
04090512	4	18.7N	145.8E	55	5	51	68	53	70				5	5	10	20	30			
04090518	5	19.0N	144.2E	60	6	16	26	42	128				0	5	15	25	35			
04090600	6	19.4N	142.7E	60	13	24	45	57	79				0	0	10	20	30			
04090606	7	19.8N	141.5E	60	16	21	41	33	34				0	5	10	20	25			
04090612	8	20.4N	140.4E	60	53	90	118	108					0	10	20	30				
04090618	9	21.1N	139.3E	55	45	71	97	92					-5	-5	10	15				
04090700	10	22.0N	138.7E	50	39	74	74						0	5	10					
04090706	11	23.0N	138.1E	45	11	43	102						0	5	10					
04090712	12	24.0N	137.9E	35	21	40							0	10						
04090718	13	25.0N	137.6E	30	13	8							0	5						
04090800		26.0N	137.4E	20																
04090806		27.0N	137.3E	20																
			AVERAGE		21	49	79	86	118	338			1	7	13	21	26	50		
			BIAS										0	3	9	18	26	50		
			# CASES		13	13	11	9	7	3			13	13	11	9	7	3		

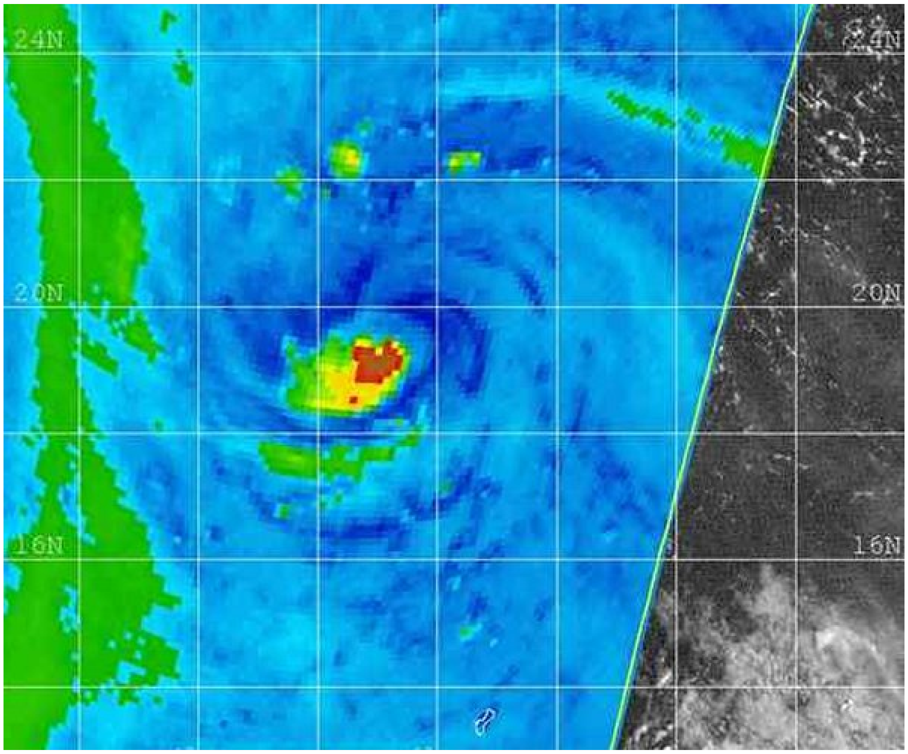


Figure 1-WP23-1. 052201Z September 2004 SSM/I micorwave image of TS 23W (Sarika), reveals the low-level circulation center was partially exposed to the northeast of the associated deep convection. At this time, the system was located northwest of Guam with a peak intensity of 60 knots.

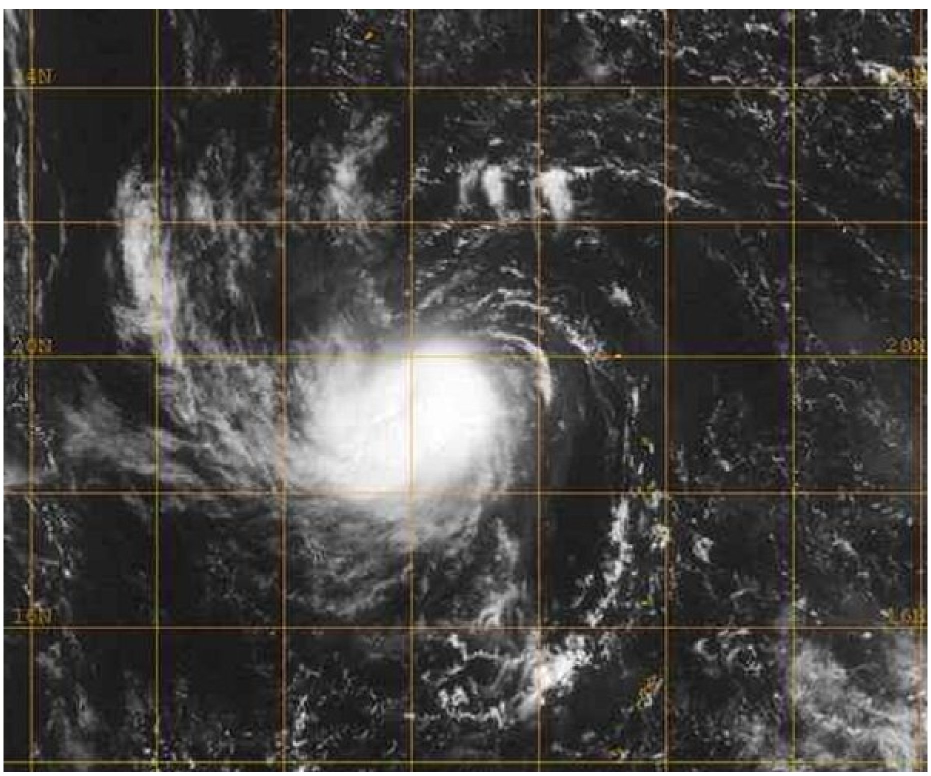
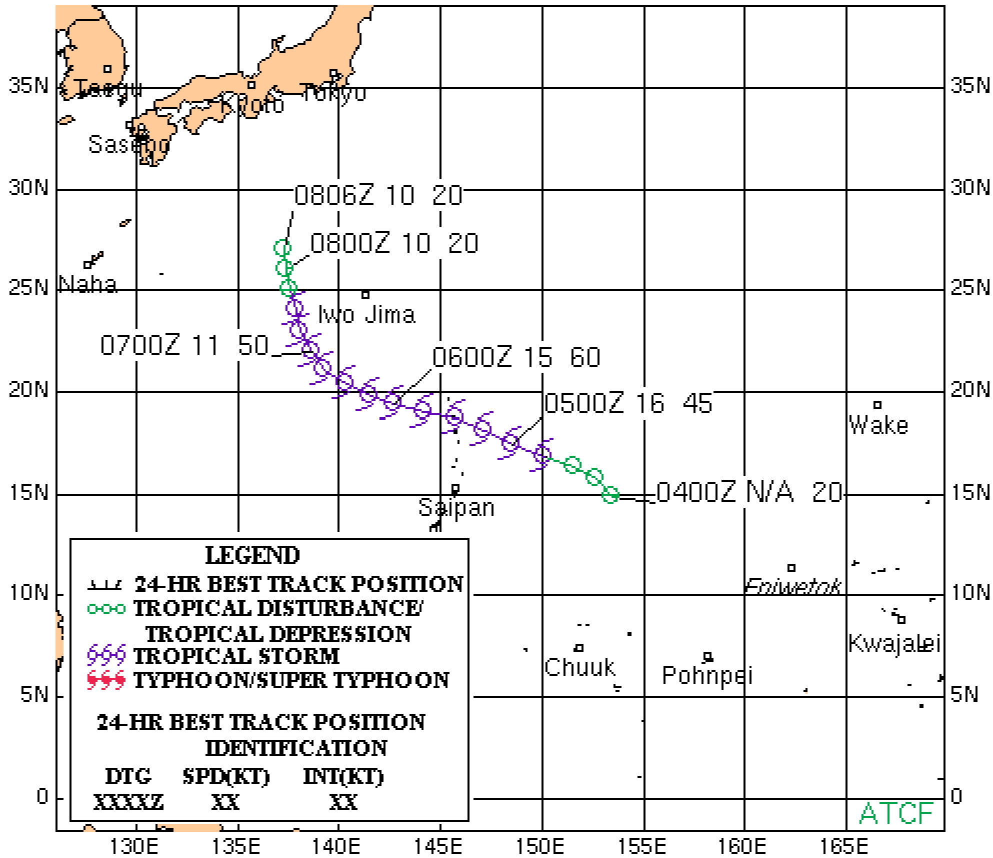
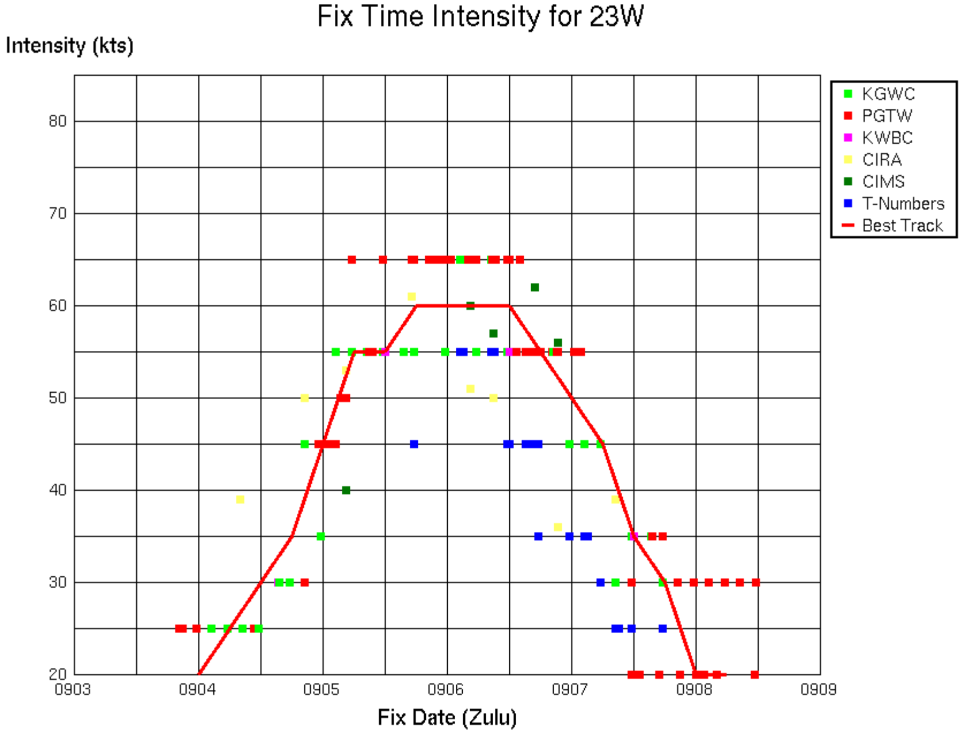


Figure 1-WP23-2. 060102Z September 2004 Goes-9 visible satellite image of TS 23W (Sarika), reveals a very well organized low-level circulation center northwest of Guam with a peak intensity of 60 knots.

TROPICAL STORM 23W (SARIKA)
04 -07 SEP 2004





Tropcial Depression (TD) 24W (Haima)

First Poor : 0230Z 09 Sep 04

First Fair : 1730Z 10 Sep 04

First TCFA : 1900Z 11 Sep 04

First Warning : 1800Z 12 Sep 04

Last Warning : 1800Z 13Sep 04, Dissipated over land

Max Intensity : 35 kts, gusts to 45 kts

Landfall : South of Shanghai, China

Total Warnings : 5

Remarks:

1) Tropical Storm (TS) 24W initially formed along the southwestern coast of Taiwan as a low that disengaged from a frontal system extending over the island. As the low pressure system crossed over central Taiwan it began exhibit tropical features. TS 24W remained a weak system as it tracked poleward along the eastern coast of Taiwan and the first warning was issued at 1800Z on 12 Sep when the system was approximately 100nm north-northeast of Taiwan. As the subtropical steering ridge built westward, TS 24W shifted to a northwestward track towards eastern China and made landfall approximately 200 nm south of Shanghai, China.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TD 24W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04091018		23.0N	119.6E	20																
04091100		23.0N	120.1E	25																
04091106		23.0N	120.8E	25																
04091112		23.5N	121.8E	25																
04091118		24.2N	122.2E	35																
04091200		24.8N	122.2E	35																
04091206		25.5N	122.2E	30																
04091212		26.1N	122.1E	30																
04091218	1	26.7N	121.9E	30	6	45							0	5						
04091300	2	27.3N	121.6E	30	13	44							0	0						
04091306	3	28.0N	120.9E	30	0								0							
04091312	4	28.5N	120.1E	30	7								-5							
			AVERAGE		7	44							1	3						
			BIAS										-1	3						
			# CASES		4	2							4	2						

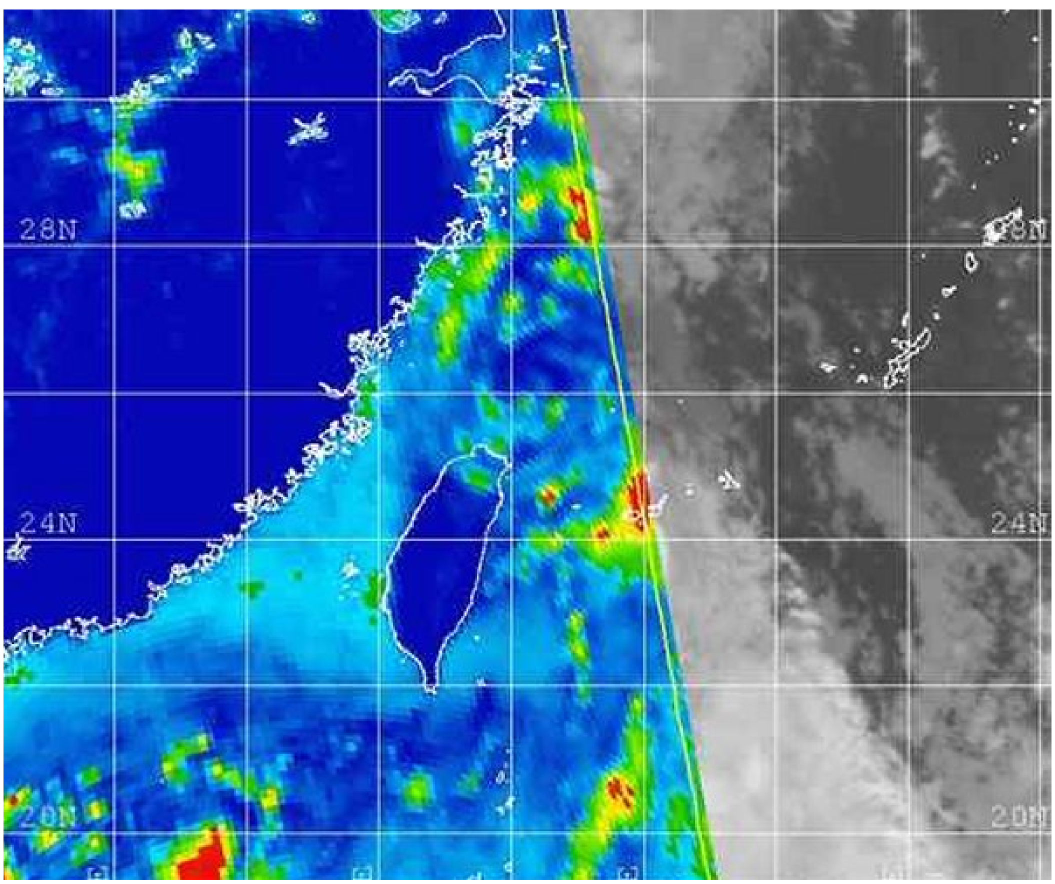
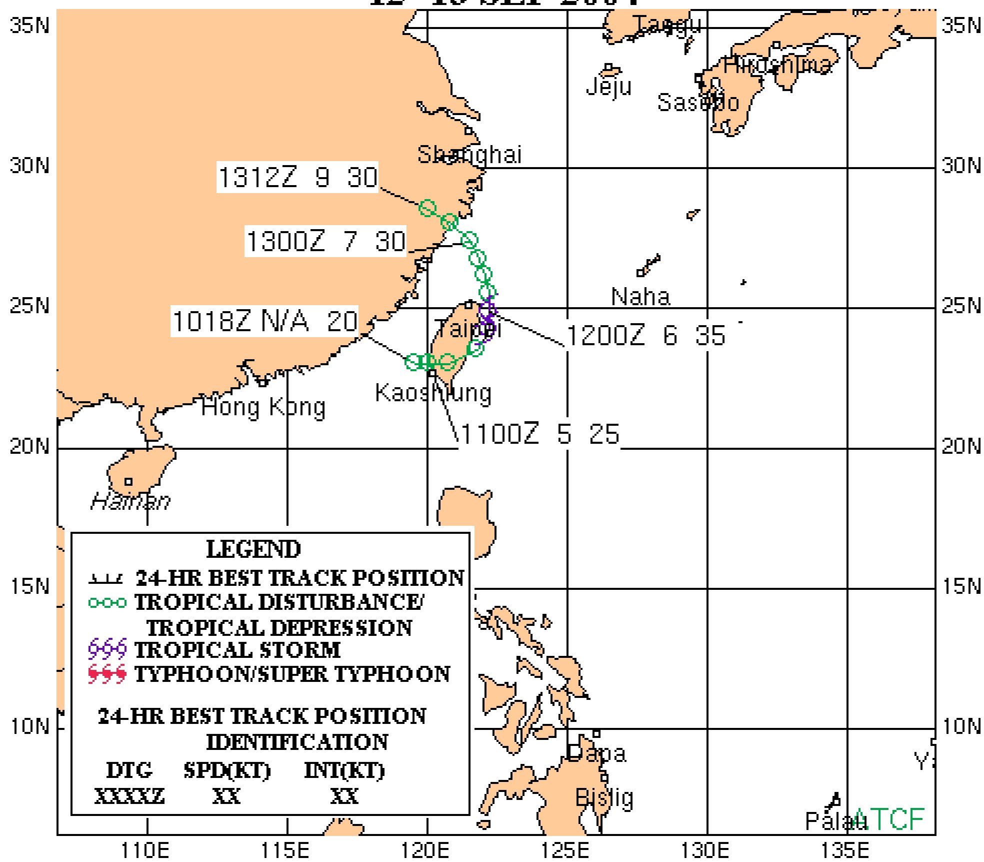
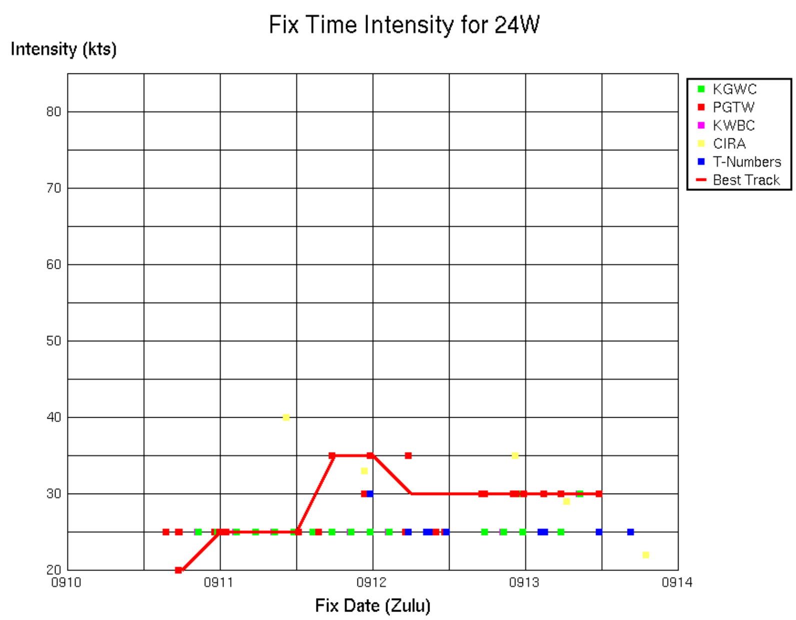


Figure 1-WP24-1. 121112Z September 2004 SSM/I microwave image of TS 24W (Haima), reveals a weak fully exposed low-level circulation center located north of Taiwan with a peak intensity of 30 knots.

TROPICAL DEPRESSION 24W (HAIMA)
12 -13 SEP 2004





Typhoon (TY) 25W Meari

First Poor : 2100Z 18 Sep 04

First Fair : 1300Z 19 Sep 04

First TCFA : 2000Z 19 Sep 04

First Warning : 0000Z 20 Sep 04

Last Warning : 1800Z 29 Sep 04, Extra-tropical

Max Intensity : 125 kts, gusts to 150 kts

Landfall : None

Total Warnings : 40

Remarks:

1) Typhoon (TY) 25W formed approximately 500 nm east of Guam, and initially tracked westward along the southern periphery of the subtropical ridge and passed 65 nm south-southeast of Guam. As the cyclone moved south of Guam, it intensified at a less than climatological rate due to weak upper level diffluence. Around 22 Sep TY 25W shifted to a more northwest track towards a weakness in the subtropical ridge. At the same time TY 25W reached typhoon strength due to enhanced outflow from an upper level low. 24 hours later, as the system continued to move northwestward along the southwestern periphery of the subtropical ridge, a poleward outflow channel became established with an upper level low located to the northeast that contributed to rapid intensification of TY 25W and development of a small eye. By 24 Sep, the system reached maximum intensity of 125 kts and maintained that intensity for 24 hours. TY 25W passed approximately 70 nm south of Okinawa and shifted to a westward track and became quasi-stationary in a break in the subtropical ridge for nearly 24 hours. Subsequently, a shortwave trough over eastern China moved eastward which caused the cyclone to track northeastward. As the system moved northeast it began to weaken due to vertical wind shear. TY 25W made landfall on the southern tip of Kyushu at typhoon strength. The cyclone then continued to weaken as it became embedded into the baroclinic zone and moves across the Kanto Plain into the Sea of Japan. TY 25W then moved across northern Japan, transitioned into an extra-tropical system on 30 Sep and moved into the western Pacific.

2) Reports indicate 18 fatalities and several more missing in Japan, primarily as a result of widespread flooding and mudslides caused by torrential rain. Reports further indicated more than 350 airline flights were cancelled, and train and ferry services were interrupted.

Statistics for JTWC on TY 25W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04100106		14.3N	138.6E	15																
04100112		14.4N	138.0E	15																
04100118		14.7N	137.5E	15																
04100200		15.1N	137.1E	15																
04100206		15.7N	136.9E	15																
04100212		16.1N	136.4E	15																
04100218		16.1N	135.8E	15																
04100300		16.0N	135.2E	15																
04100306		16.2N	134.6E	15																
04100312		16.7N	134.3E	20																
04100318		16.3N	134.1E	25																
04100400	1	16.6N	134.6E	30	18	17	87	180	233	337			0	0	5	0	0	-15		
04100406	2	17.0N	134.3E	35	8	63	124	123	85	95	219	845	0	10	10	10	0	-25	-70 -	35
04100412	3	17.4N	134.3E	35	36	93	149	142	115	102	318	971	0	5	5	0	-15	-50	-75 -	15
04100418	4	17.8N	134.4E	35	36	80	115	127	145	127	385	1033	0	0	0	-10	-15	-60	-55	35
04100500	5	18.4N	134.4E	35	24	62	78	87	111	93	463		0	0	-5	-20	-15	-60	-40	
04100506	6	19.0N	134.8E	45	12	43	72	81	87	88	556		0	5	0	-5	-10	-55	-15	
04100512	7	19.6N	134.5E	45	11	62	73	95	92	74	644		0	0	-10	-5	-35	-55	5	
04100518	8	20.1N	134.0E	50	11	36	67	142	227	174	490		0	-5	-5	-10	-50	-65	-5	
04100600	9	20.5N	133.4E	55	0	26	106	192	252	86			0	-10	-5	-30	-60	-70		
04100606	10	20.7N	132.7E	65	0	18	45	76	120	168			-5	-10	-15	-45	-60	-40		
04100612	11	21.0N	132.1E	75	8	45	37	24	84	459			-5	0	-25	-45	-55	-15		
04100618	12	21.4N	131.6E	75	5	29	13	77	131	503			0	-10	-45	-60	-60	15		
04100700	13	21.8N	130.9E	80	5	8	45	115	201				-5	-35	-60	-65	-60			
04100706	14	22.2N	130.6E	90	5	39	89	184	345				0	-35	-50	-50	-30			
04100712	15	22.7N	130.6E	115	5	53	105	259	466				0	-20	-25	-25	5			
04100718	16	23.2N	130.9E	130	5	45	67	141	401				-5	-10	-15	-5	20			
04100800	17	23.8N	131.4E	140	0	29	73	241					0	-10	-30	-10				
04100806	18	25.1N	132.3E	140	8	53	162	372					0	-5	5	20				

04100812	19	27.0N	133.2E	140	5	49	209						0	0	20					
04100818	20	28.9N	134.5E	135	5	70	272						0	-20	-10					
04100900	21	31.6N	136.0E	130	6	112							-15	-15						
04100906	22	34.3N	138.2E	105	4	113							-15	10						
04100912	23	36.9N	141.5E	85	5								-10							
04100918	24	39.1N	145.5E	55	12								-5							
			AVERAGE		10	52	99	148	193	192	439	950	3	10	17	23	31	44	38	28
			BIAS										-3	-7	-13	-20	-28	-41	-36	-5
			# CASES		24	22	20	18	16	12	7	3	24	22	20	18	16	12	7	3

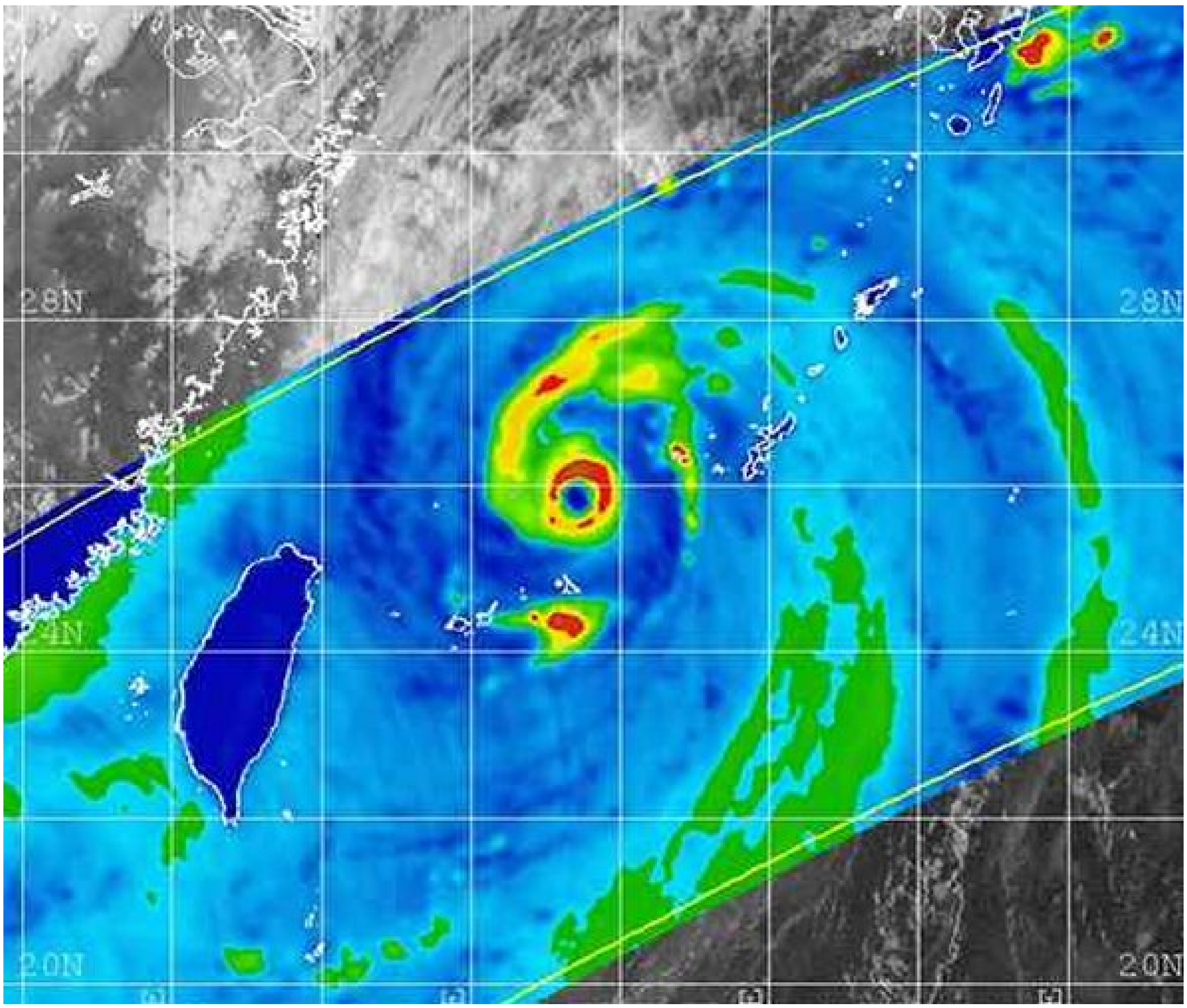


Figure 1-WP25-1. 260905Z September 2004 TRMM microwave image of TY 25W (Meari), reveals a pinhole eye located approximately 128nm to the west of Okinawa Japan. At this time the system had a peak intensity of 90 knots.

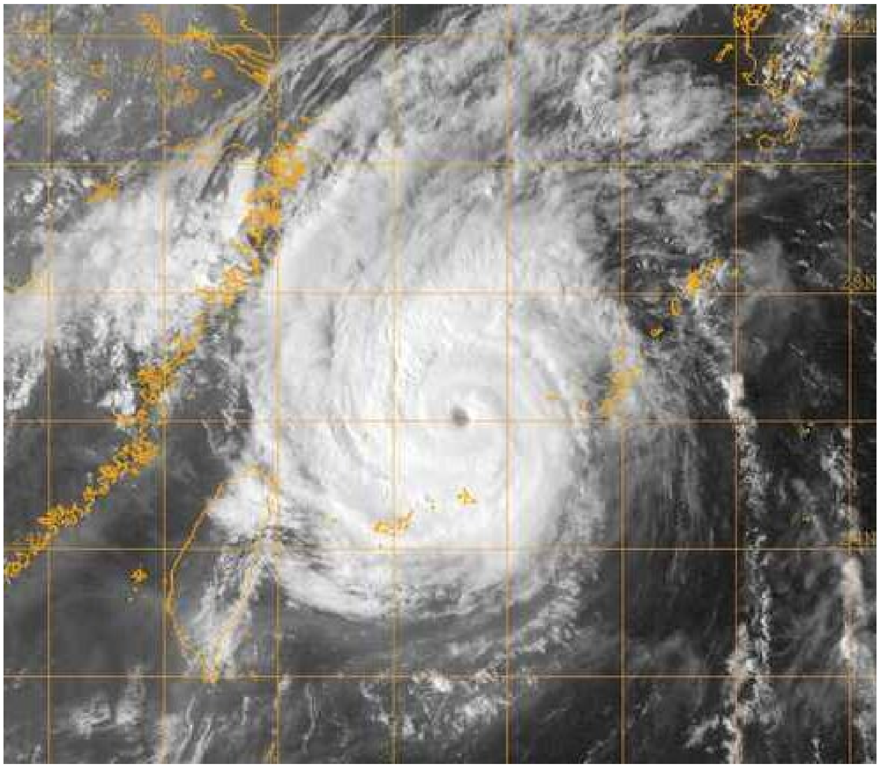


Figure 1-WP25-2. 270702Z September 2004 Goes-9 visible satellite image of TY 25W (Meari), reveals a well defined eye located approximately 130NM west of Okinawa Japan with a peak intensity of 105 knots.

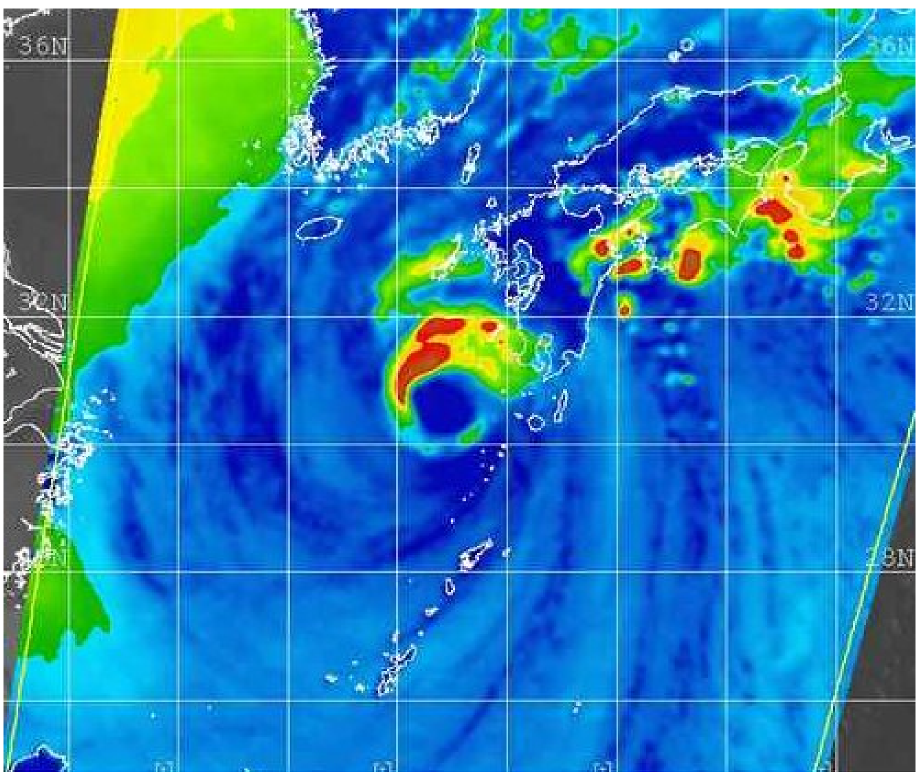
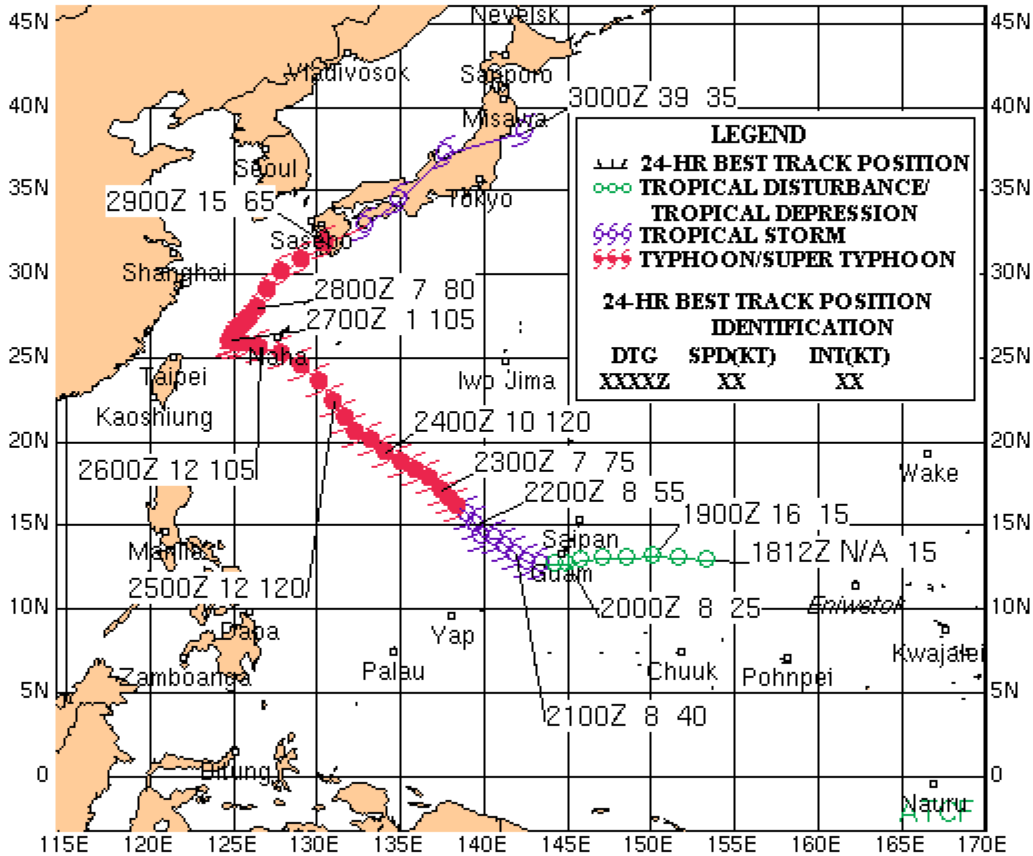
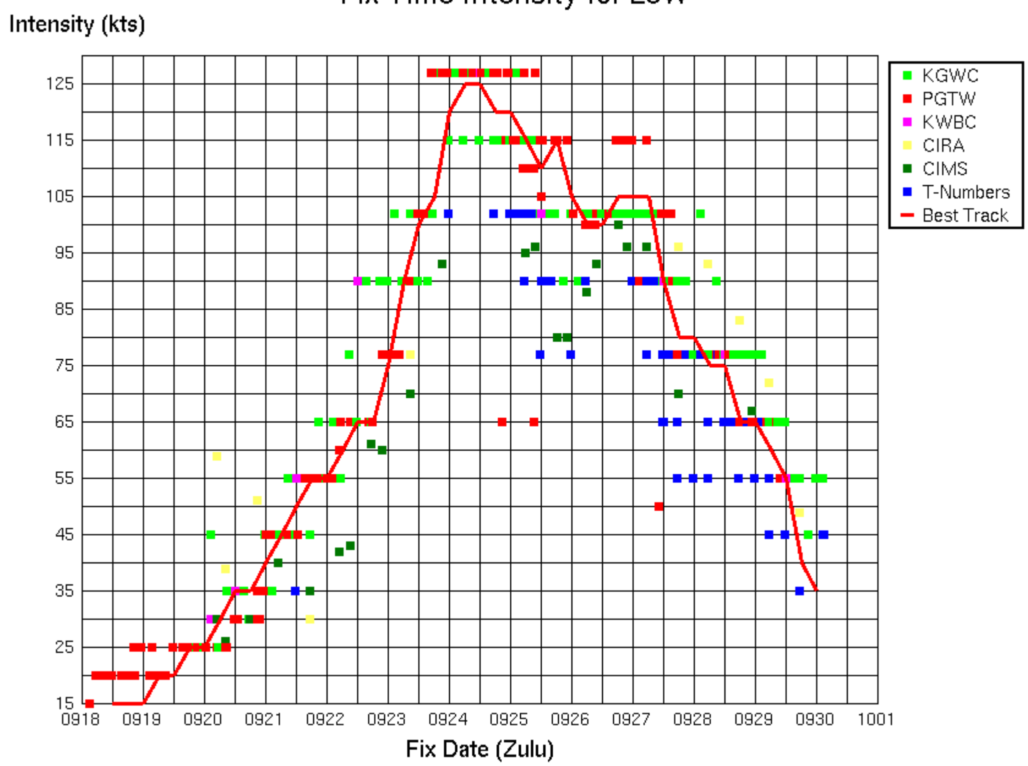


Figure 1-WP25-3. 281713Z September 2004 AMSR-E microwave image of TY 25W (Meari), reveals a very large eye with the deepest convection on the northwest side. At this time, the system was located approximately 152nm to the southwest of Sasebo Japan with a peak intensity of 70 knots

TYPHOON 25W (MEARI)
20 -29 SEP 2004



Fix Time Intensity for 25W



Super Typhoon (STY) 26W (Ma-on)

First Poor : 0600Z 29 Sep 04

First Fair : 2330Z 01 Oct 04

First TCFA : 1830Z 03 Oct 04

First Warning : 0000Z 04 Oct 04

Last Warning : 1800Z 09 Oct 04, Extra-tropical

Max Intensity : 140 kts, gusts to 170 kts

Landfall : None

Total Warnings : 24

Remarks:

1) Super Typhoon (STY) 26W formed approximately 100 nm west-northwest of Saipan and initially drifted westward in the tropical easterly flow, as it slowly organized. Starting around 1800Z on 30 Sep, a series of passing shortwave troughs and ridges yielded a stair-step pattern for the cyclone track. The cyclone was first warned on at 0000Z on 04 Oct, when it was approximately 700 nm south-southeast of Okinawa, Japan. The initial steering environment was weak with the dominant flow provided by the mid-level anticyclone anchored to the northeast. The cyclone tracked northward for 36 hours toward a weakness in the steering ridge caused by a mid-latitude trough propagating eastward across the East China Sea. After the trough had passed the sub-tropical ridge to the east began to build westward, steering the cyclone westward again before a final turn poleward along the western extent of the ridge. STY 26W rapidly intensified as it approached the ridge axis due to weak vertical wind shear, strong poleward outflow, and warm sea surface temperatures. The cyclone attained super typhoon intensity shortly after cresting the ridge axis at 1800Z on 07 Oct. As STY 26W began interacting with the mid-latitude westerlies, dual outflow channels developed, allowing the cyclone to reach its maximum intensity of 140 kts. This intensity was maintained for 18 hours as the system tracked northeastward. The cyclone subsequently began to weaken due to interaction with the baroclinic zone, the mid-latitude westerlies, and cooler sea surface temperatures. At 0000Z on 09 Oct, the cyclone began to undergo extra-tropical transition, while accelerating northeastward. The cyclone made landfall on the Izu Peninsula in Shizuoka Prefecture, Japan, shortly after 0600Z on 09 Oct. Despite encountering the Japanese terrain, the system intensified during its extra-tropical transition as it tracked northeastward across the Kanto Plain along the leading edge of a deep trough that was propagating eastward across the Sea of Japan. The final warning was issued on STY 26W at 1800Z on 09 Oct, approximately 330 nm northeast of Tokyo, Japan.

2) Flooding and mudslides associated with the landfall and subsequent passage of STY26W across the Kanto Plain were reported in Japanese newspapers. Transportation systems serving Tokyo and the surrounding area, including domestic and international flights and the "Shinkansen" bullet trains, were paralyzed due to the flooding and mudslides. Six people were reported dead, along with five missing.

Statistics for JTWC on STY 26W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04100106		14.3N	138.6E	15																
04100112		14.4N	138.0E	15																
04100118		14.7N	137.5E	15																
04100200		15.1N	137.1E	15																
04100206		15.7N	136.9E	15																
04100212		16.1N	136.4E	15																
04100218		16.1N	135.8E	15																
04100300		16.0N	135.2E	15																
04100306		16.2N	134.6E	15																
04100312		16.7N	134.3E	20																
04100318		16.3N	134.1E	25																
04100400	1	16.6N	134.6E	30	18	17	87	180	233	337			0	0	5	0	0	-15		
04100406	2	17.0N	134.3E	35	8	63	124	123	85	95	219	845	0	10	10	10	0	-25	-70 -	35
04100412	3	17.4N	134.3E	35	36	93	149	142	115	102	318	971	0	5	5	0	-15	-50	-75 -	15
04100418	4	17.8N	134.4E	35	36	80	115	127	145	127	385	1033	0	0	0	-10	-15	-60	-55	35
04100500	5	18.4N	134.4E	35	24	62	78	87	111	93	463		0	0	-5	-20	-15	-60	-40	
04100506	6	19.0N	134.8E	45	12	43	72	81	87	88	556		0	5	0	-5	-10	-55	-15	
04100512	7	19.6N	134.5E	45	11	62	73	95	92	74	644		0	0	-10	-5	-35	-55	5	
04100518	8	20.1N	134.0E	50	11	36	67	142	227	174	490		0	-5	-5	-10	-50	-65	-5	
04100600	9	20.5N	133.4E	55	0	26	106	192	252	86			0	-10	-5	-30	-60	-70		
04100606	10	20.7N	132.7E	65	0	18	45	76	120	168			-5	-10	-15	-45	-60	-40		
04100612	11	21.0N	132.1E	75	8	45	37	24	84	459			-5	0	-25	-45	-55	-15		
04100618	12	21.4N	131.6E	75	5	29	13	77	131	503			0	-10	-45	-60	-60	15		
04100700	13	21.8N	130.9E	80	5	8	45	115	201				-5	-35	-60	-65	-60			
04100706	14	22.2N	130.6E	90	5	39	89	184	345				0	-35	-50	-50	-30			

04100712	15	22.7N	130.6E	115	5	53	105	259	466				0	-20	-25	-25	5			
04100718	16	23.2N	130.9E	130	5	45	67	141	401				-5	-10	-15	-5	20			
04100800	17	23.8N	131.4E	140	0	29	73	241					0	-10	-30	-10				
04100806	18	25.1N	132.3E	140	8	53	162	372					0	-5	5	20				
04100812	19	27.0N	133.2E	140	5	49	209						0	0	20					
04100818	20	28.9N	134.5E	135	5	70	272						0	-20	-10					
04100900	21	31.6N	136.0E	130	6	112							-15	-15						
04100906	22	34.3N	138.2E	105	4	113							-15	10						
04100912	23	36.9N	141.5E	85	5								-10							
04100918	24	39.1N	145.5E	55	12								-5							
			AVERAGE		10	52	99	148	193	192	439	950	3	10	17	23	31	44	38	28
			BIAS										-3	-7	-13	-20	-28	-41	-36	-5
			# CASES		24	22	20	18	16	12	7	3	24	22	20	18	16	12	7	3

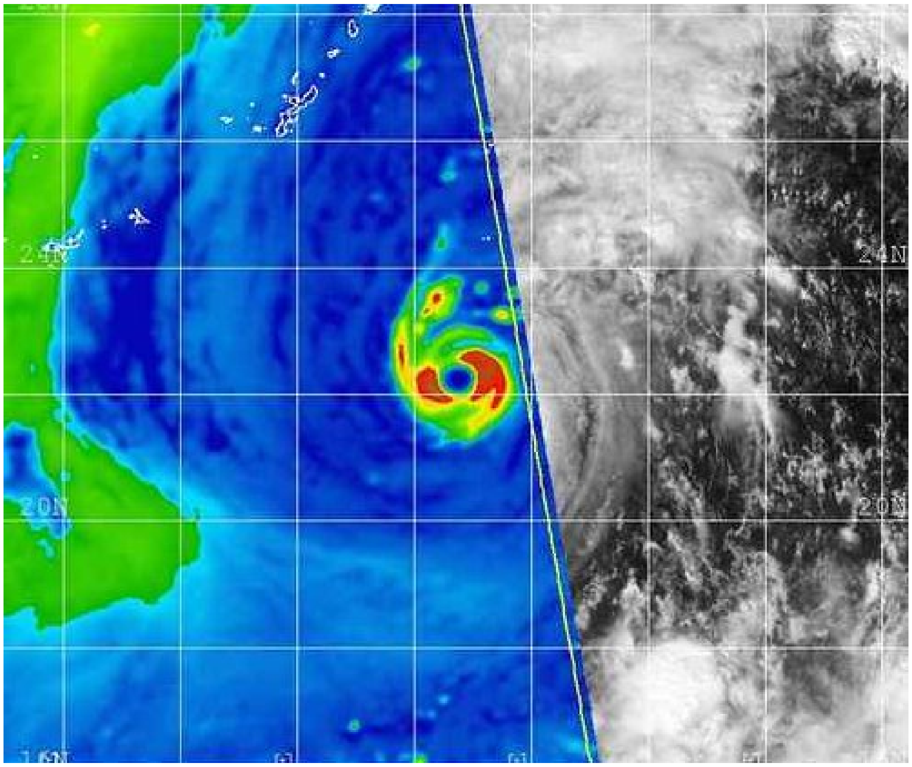


Figure 1-WP26-1. 070500Z October 2004 AMSR-E microwave image of STY 26W (Ma-on), reveals a relatively small system with a very well defined eye located approximately 300nm to the southeast of Okinawa Japan with a peak intensity of 90 knots.

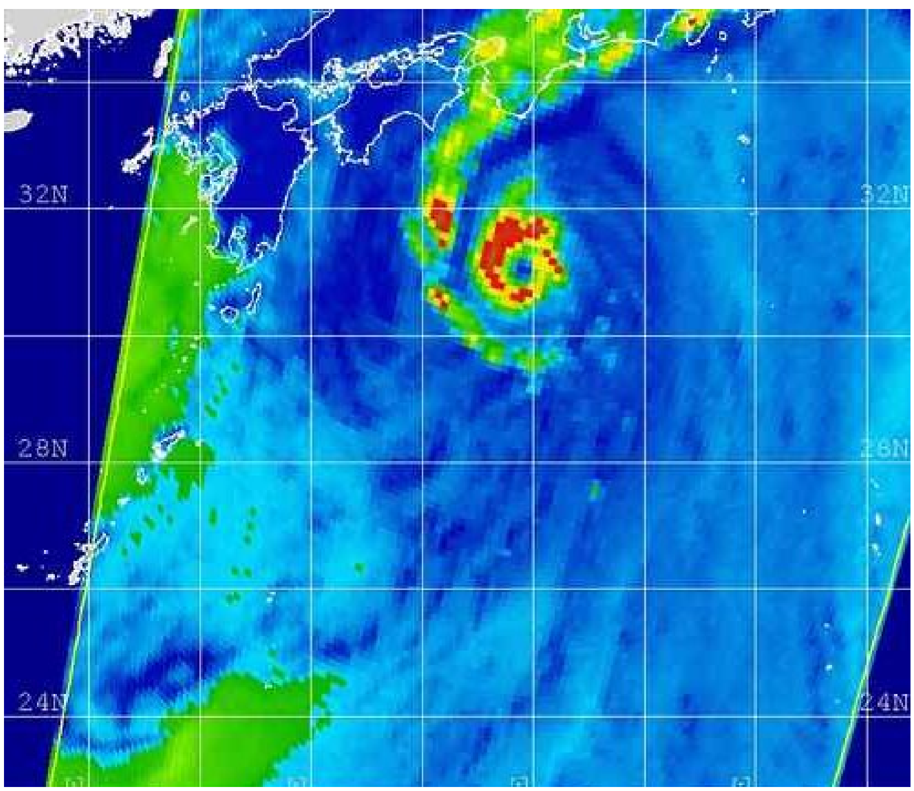


Figure 1-WP26-2. 082228Z October 2004 SSM/I microwave image of STY 26W (Ma-on), reveals a ragged eye located approximately 315NM to the southwest of Tokyo Japan with a peak intensity of 135 knots. Shortly before this time, the system had just went through an eyewall replacement cycle.

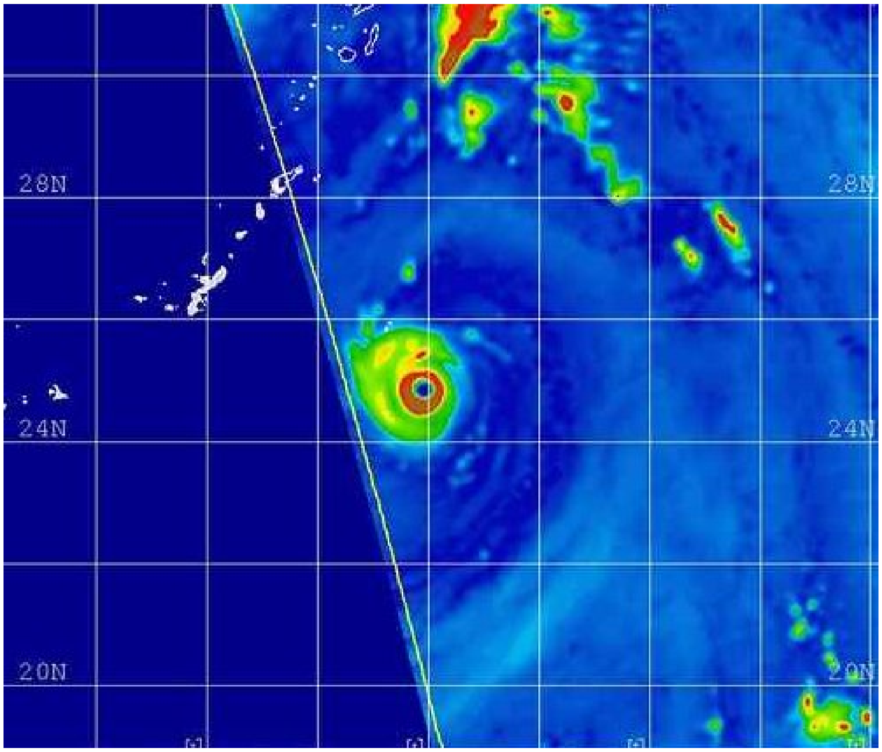


Figure 1-WP26-3. 080405Z October 2004 AMSR-E microwave image of STY 26W (Ma-on), reveals a very tiny system with a well-defined eye located to the southeast of Okinawa Japan with a peak intensity of 140 knots.

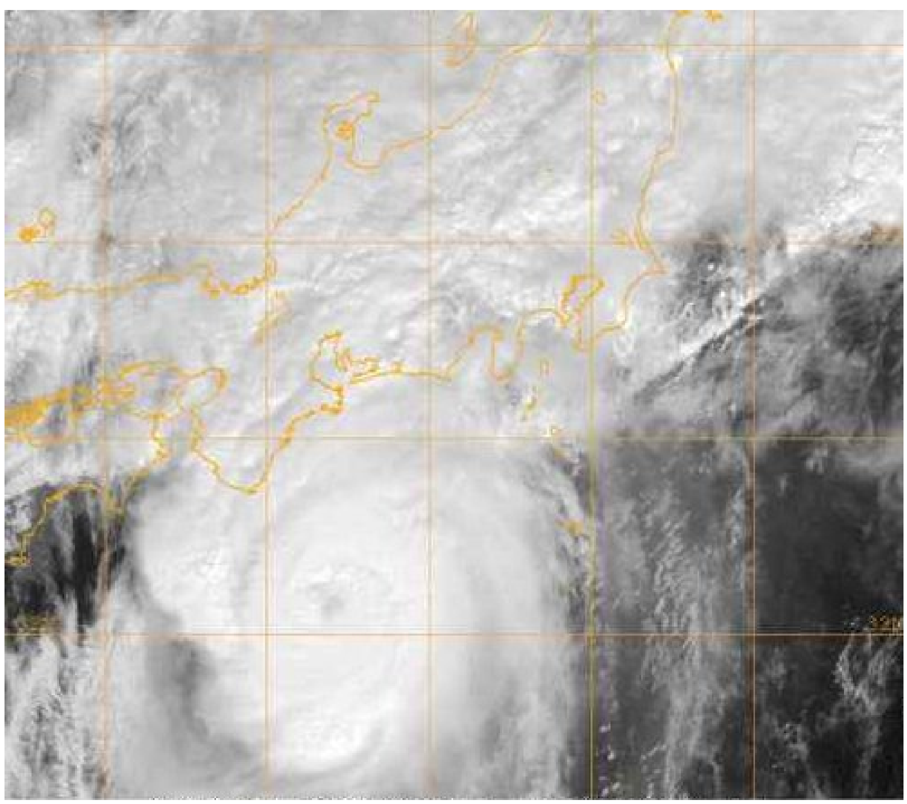
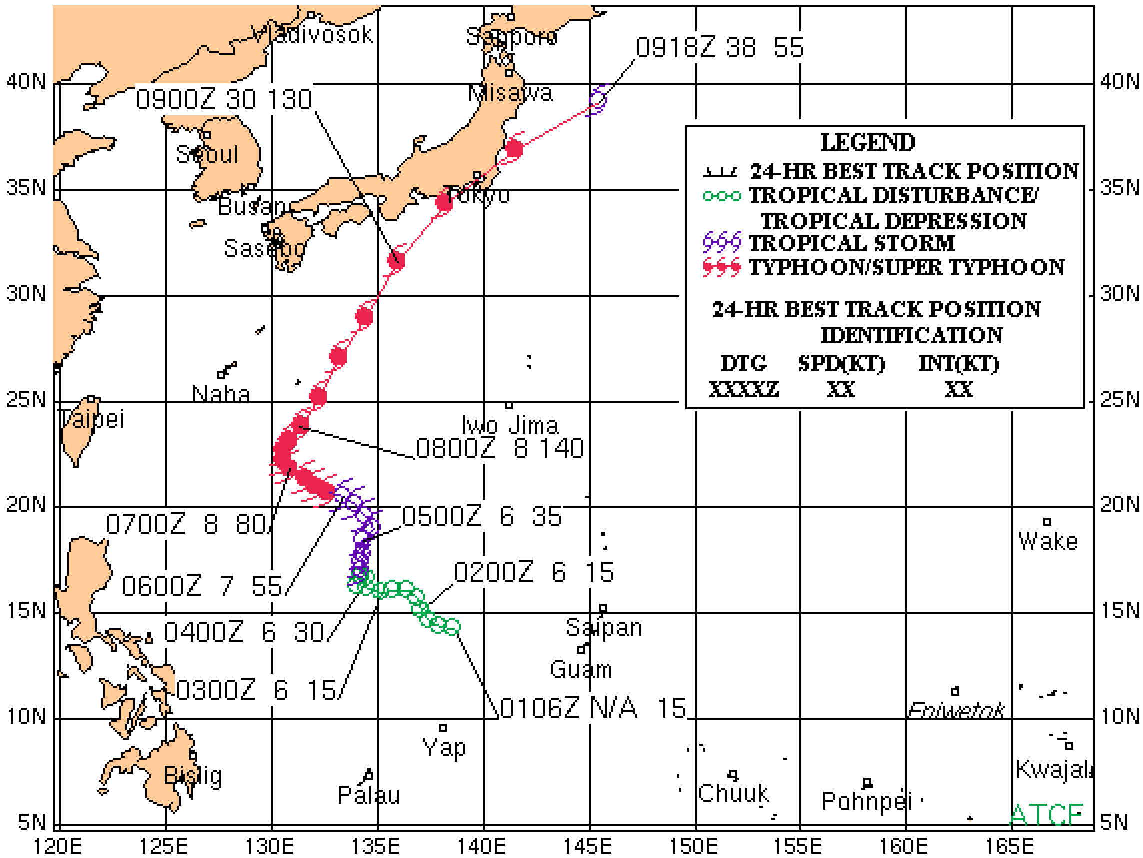
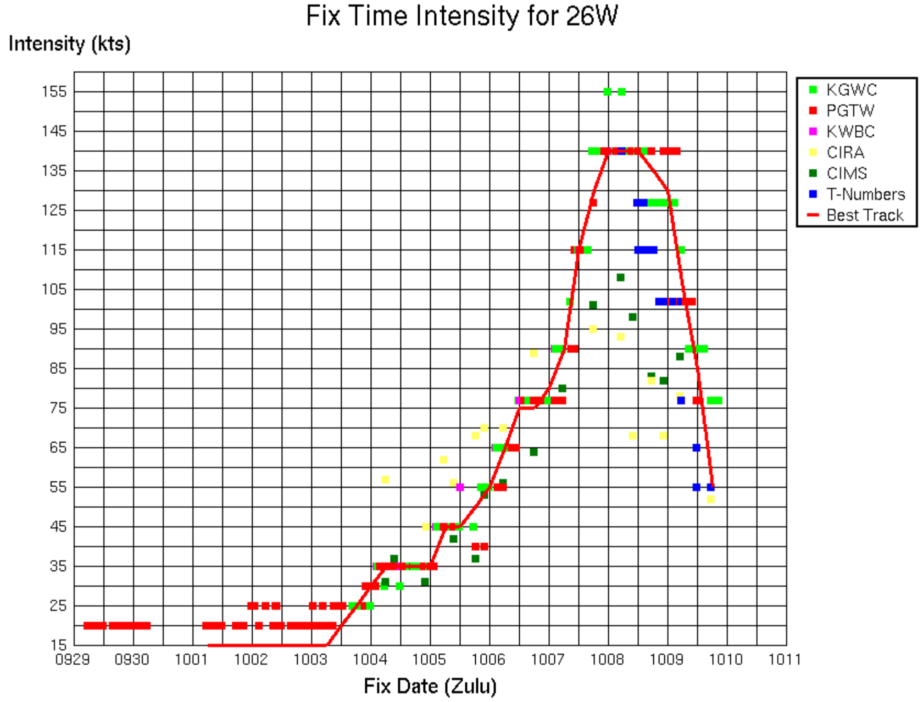


Figure 1-WP26-4. 090125Z October 2004 Goes-9 visible satellite image of STY 26W (Ma-on), at this time, the system had a ragged cloud filled eye located approximately 215NM to the southwest of Tokyo Japan with a peak intensity of 90 knots.

SUPER TYPHOON 26W (MA-ON)
04 -09 OCT 2004



Fix Time Intensity for 26W



Typhoon (TY) 27W (Tokage)

First Poor : 0030Z 10 Oct 04

First Fair : 2200Z 11 Oct 04

First TCFA : 0000Z 12 Oct 04

First Warning : 1200Z 12 Oct 04

Last Warning : 1800Z 20 Oct 04, Extra-tropical

Max Intensity : 125 kts, gusts to 150 kts

Landfall : Shikoku, Japan

Total Warnings : 34

Remarks:

1) Typhoon (TY) 27W formed approximately 40 nm northwest of Pohnpei and initially moved northwest in response to a mid-level ridge centered to the northeast. The first warning was issued on 12 Oct at 1200Z as the system began to develop and move more westward towards Guam while developing at a climatological rate. Subsequently, the cyclone passed appoximately 25 nm north of Guam with an intensity of 35 kts, then continued westward for 36 hours before a westward moving shortwave trough weakened the steering ridge and caused the cyclone to move more northward. Additionally, the passing trough enhanced the poleward outflow which allowed TY 27W to attain maximum intensity of 125 kts. After passage of the shortwave trough, the cyclone began to move more northwestward and weaken slightly. A longwave trough moving west out of Asia caused TY 27W to recurve on 18 Oct after 0000Z. As a result of this longwave trough, TY 27W passed approximately 10 nm east of Okinawa, Japan on 19 Oct at approximately 0600Z. Kadena AB reported maximum wind gusts of 63 kts during this passage. After passing Okinawa, the cyclone began to accelerate and weaken significantly before making landfall near the southeast corner of Shikoku, Japan and then making another landfall near Osaka, Japan. TY 27W transitioned rapidly into a baroclinic system as it tracked northeastward and completed extra-tropical transition within 24 hours.

2) Japan Times reported 80 confirmed fatalites caused by flash flooding and mudslides. Over 44,800 homes were reported damaged by winds and flooding with 480,000 people evacuated due to storm impacts on Shikoku and Honshu.

Statistics for JTWC on TY 27W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04101006		7.2N	157.0E	15																
04101012		8.2N	156.3E	15																
04101018		9.2N	155.6E	15																
04101100		10.4N	154.8E	15																
04101106		11.4N	153.7E	15																
04101112		11.7N	152.5E	20																
04101118		12.0N	151.5E	25																
04101200		12.3N	150.5E	25																
04101206		13.0N	149.4E	25																
04101212	1	13.6N	147.5E	30	46	105	168	209	200	238			0	-10	-25	-25	-25	-20		
04101218	2	14.0N	145.5E	35	5	26	80	145	202	229	175	180	0	-10	-20	-15	-10	0	10	30
04101300	3	14.3N	143.8E	45	6	44	152	234	306	289	217	234	0	-10	-10	-10	-10	10	15	45
04101306	4	14.2N	142.0E	55	6	94	153	228	297	304	315	445	-5	-10	-5	-5	0	20	20	45
04101312	5	14.2N	140.4E	65	8	61	93	118	142	114	227	350	-5	0	5	0	20	20	25	35
04101318	6	13.9N	139.0E	75	0	13	32	53	87	57	33	75	0	10	15	25	40	10	10	30
04101400	7	13.6N	138.1E	75	5	21	30	48	97	119	64	173	5	5	5	25	35	5	20	40
04101406	8	13.8N	137.4E	80	8	13	0	13	52	53	86	263	0	0	5	25	25	10	30	40
04101412	9	14.0N	136.6E	85	8	17	13	42	50	61	144	399	-5	-10	0	15	10	10	25	45
04101418	10	14.3N	136.0E	90	8	30	38	86	46	56	145	504	0	0	15	15	10	10	30	45
04101500	11	14.7N	135.5E	100	8	18	34	59	66	98	296	748	0	15	20	10	5	20	40	45
04101506	12	15.1N	135.0E	100	17	21	87	59	51	126	378	872	0	10	10	10	10	20	30	45
04101512	13	15.5N	134.4E	100	0	47	67	73	59	162	429	1037	0	5	0	5	10	20	35	45
04101518	14	16.1N	134.0E	100	18	76	61	67	87	162	450	1075	0	-5	-5	5	5	25	35	55
04101600	15	16.8N	134.1E	105	24	42	59	82	135	156	450		-5	-15	-15	5	10	25	30	
04101606	16	17.7N	134.0E	110	6	64	74	80	112	62	349		0	-5	0	-5	5	10	25	
04101612	17	18.2N	133.2E	120	8	21	51	62	100	91	333		0	5	10	5	5	20	20	
04101618	18	18.6N	132.4E	120	5	8	29	65	85	167	378		0	5	0	15	10	20	25	
04101700	19	19.4N	131.8E	125	21	28	53	69	83	320			0	10	10	10	15	20		
04101706	20	19.7N	130.9E	120	12	17	46	49	66	317			5	5	15	10	10	15		
04101712	21	20.1N	130.0E	115	5	34	55	61	103	430			0	5	5	10	10	15		
04101718	22	20.8N	129.1E	115	8	12	25	12	80	501			0	10	5	5	5	25		
04101800	23	21.7N	128.2E	105	0	19	19	54	149				0	0	10	10	5			
04101806	24	22.2N	127.4E	95	5	0	45	109	167				0	-5	-5	-5	0			
04101812	25	23.0N	126.9E	95	0	37	89	102	152				0	5	5	0	5			
04101818	26	23.8N	126.9E	90	11	42	75	99	246				0	5	5	10	15			
04101900	27	24.8N	127.2E	80	0	41	106	212					0	0	-5	0				
04101906	28	26.0N	128.0E	80	8	46	105	272					-5	-5	0	5				
04101912	29	27.4N	128.9E	70	8	55	151						0	-5	0					
04101918	30	28.9N	130.4E	70	6	44	83						-5	0	0					
04102000	31	31.1N	131.8E	65	23	38							-5	-5						

04102006	32	33.2N	133.5E	55	11	168							0	0						
04102012	33	35.9N	136.7E	50	20								-10							
04102018	34	37.3N	141.1E	40	67								-10							
			AVERAGE		12	41	69	99	124	187	263	489	2	6	8	10	12	16	25	42
			BIAS										-1	0	2	6	8	14	25	42
			# CASES		34	32	30	28	26	22	17	13	34	32	30	28	26	22	17	13

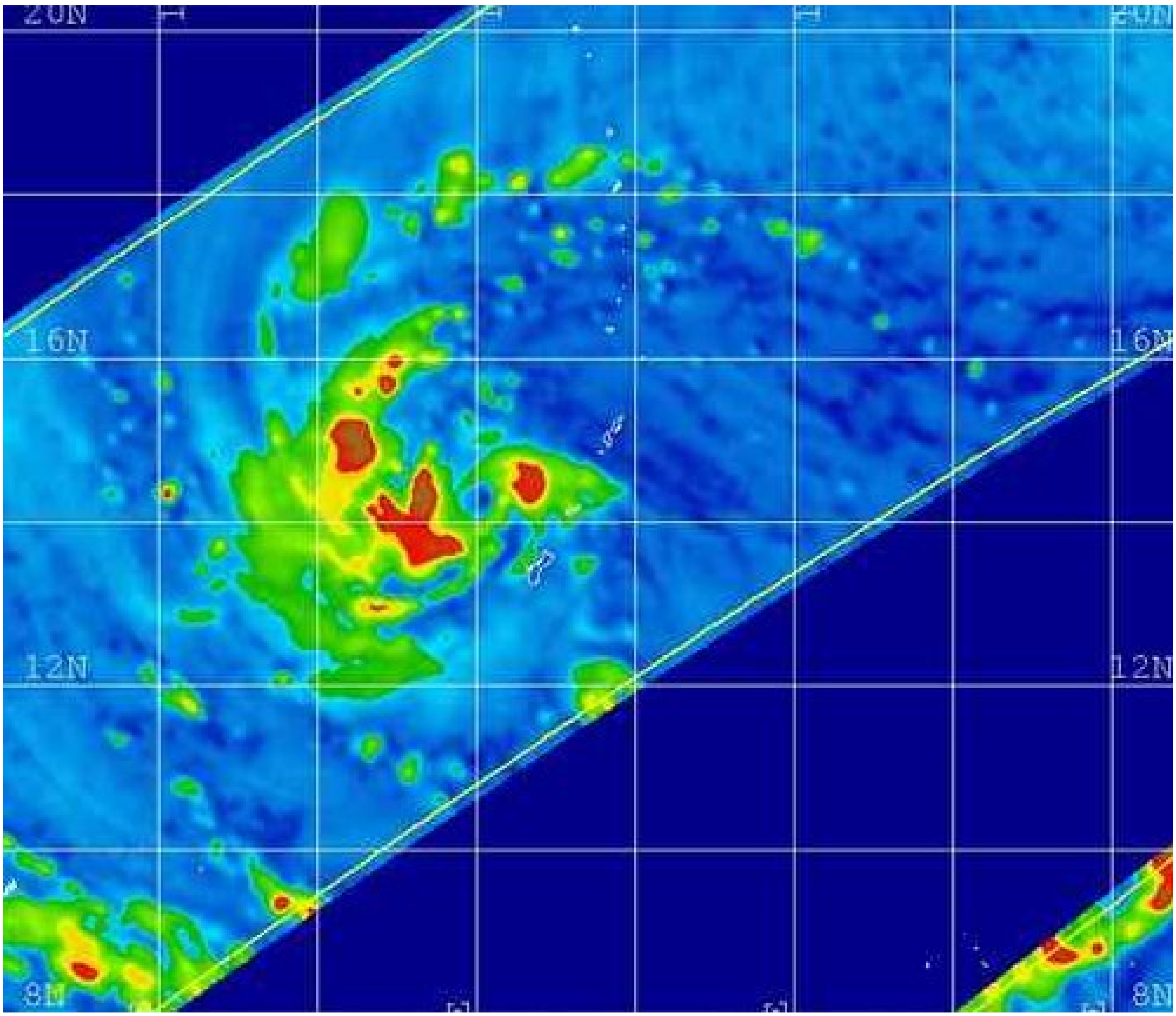


Figure 1-WP27-1. 122219Z October 2004 TRMM microwave image of TY 27W (Tokage), reveals the system was in the early stages of eye formation. At this time, the system was located approximately 55NM to the northwest of Guam with a peak intensity of 45 knots.

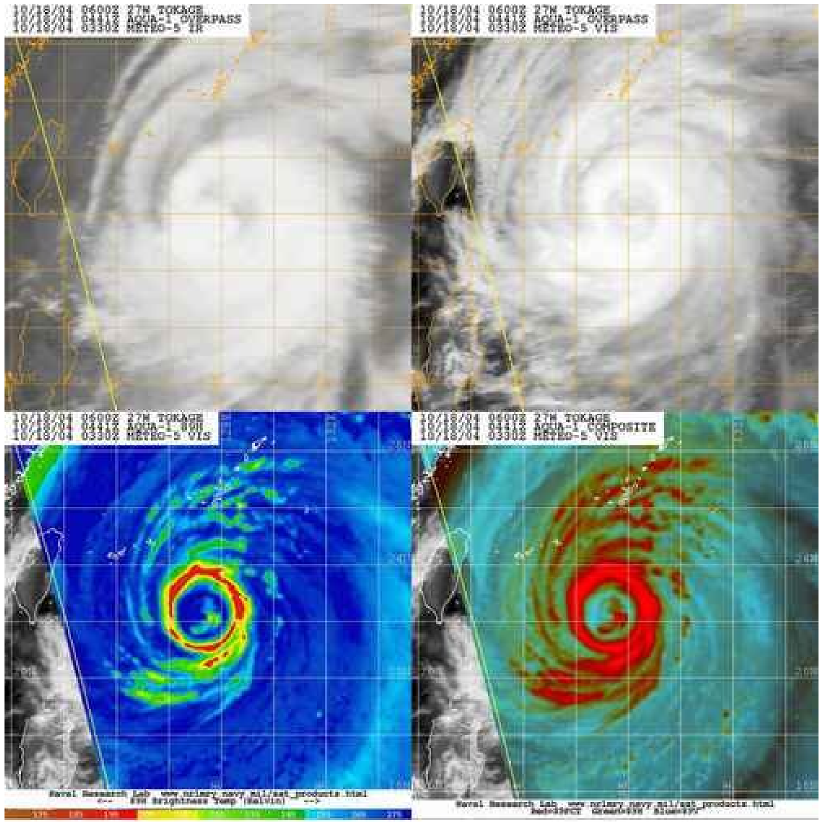


Figure 1-WP27-2. 180441Z October 2004 AMSR-E multi-sensor satellite image of TY 27W (Tokage), reveals the system is in the process of losing its inner eyewall as the system undergoes an eyewall replacement cycle just south of Okinawa Japan. At this time, the outer eyewall remained very intense with the system having an peak intensity of 95 knots.

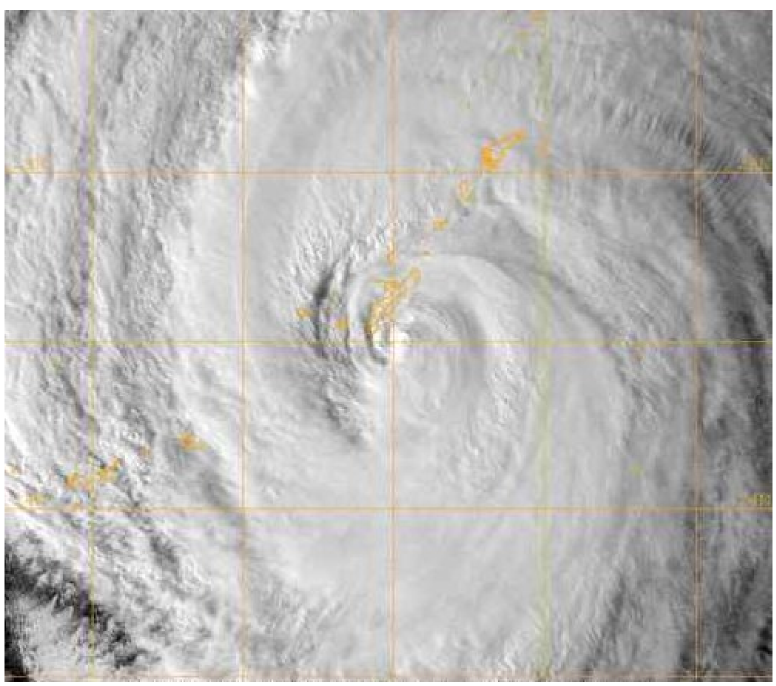
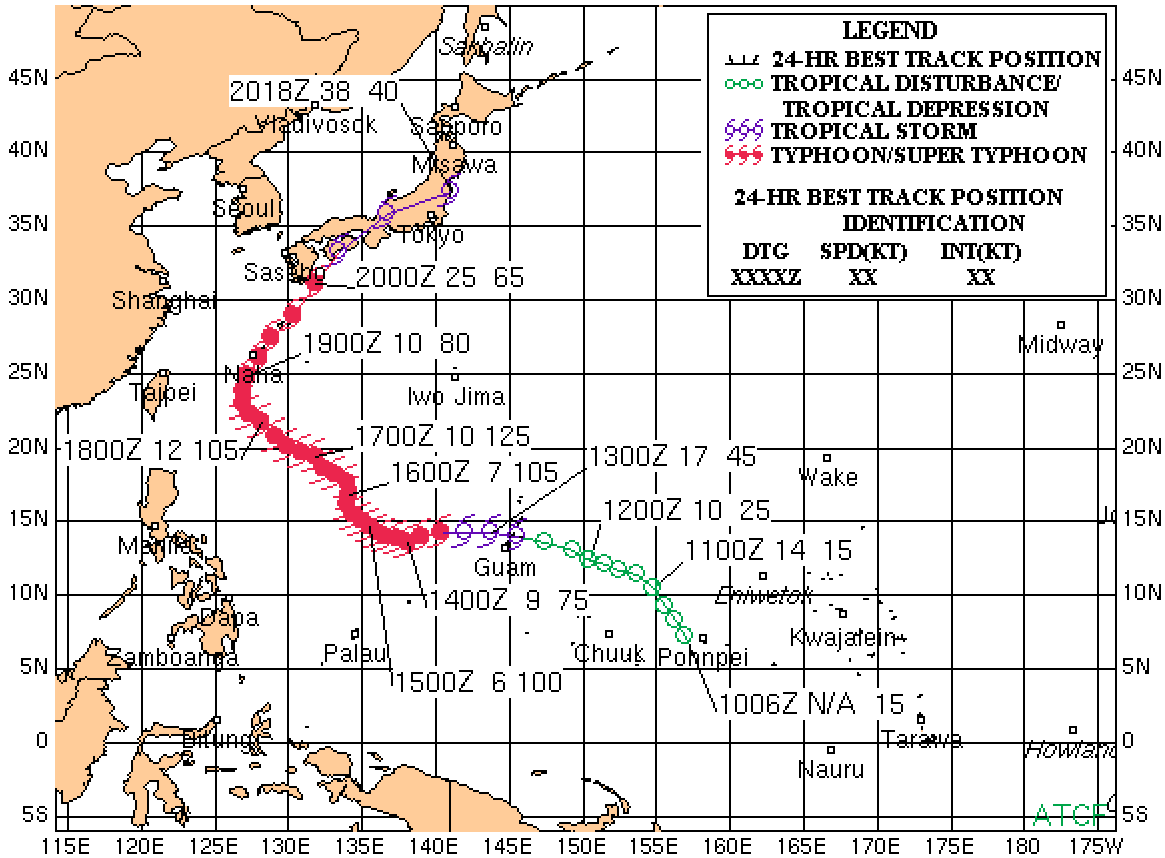
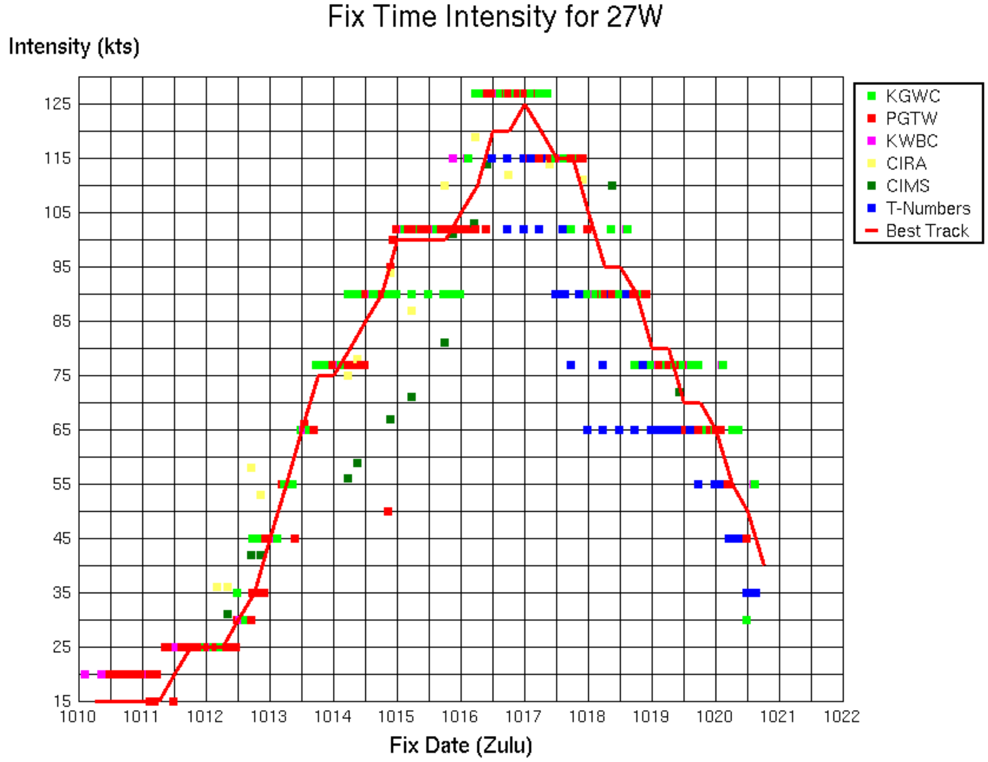


Figure 1-WP27-3. 190702Z October 2004 Goes-9 visible image of TY 27W (Tokage), reveals a slightly cloud filled eye located approximately 15NM to the south of Okinawa Japan with a peak intensity of 75 knots.

TYPHOON 27W (TOKAGE)
12 -20 OCT 2004



Fix Time Intensity for 27W



Typhoon (TY) 28W (Nock-ten)

First Poor : 1730Z 12 Oct 04

First Fair : 0600Z 13 Oct 04

First TCFA : 1430Z 13 Oct 04

First Warning : 0000Z 14 Oct 04

Last Warning : 0000Z 26 Oct 04, Extra-tropical

Max Intensity : 110 kts, gusts to 135 kts

Landfall : None

Total Warnings : 49

Remarks:

1) Typhoon (TY) 28W initially formed as a tropical depression, approximately 190 nm south-southeast of Eniwetok Island on 13 Oct at 1800Z. The first warning was issued six hours later, however, the cyclone was slow to intensify in the first 3 days as an upper level low situated to the west inhibited outflow. TY 28W began tracking westward around the southern periphery of the subtropical steering ridge to the north. The cyclone remained on this track until 19 Oct at 1200Z when it began to track northwestward. TY 28W intensified at a less than climatological rate due to increased vertical wind shear. It reached maximum intensity on 22 Oct due to favorable equatorward outflow, but cooler sea surface temperatures began to weaken the cyclone after 23 OctZ. By 24 Oct at 1200Z, TY 28W began tracking poleward toward a weakness in the ridge and continued to decrease in intensity. By 25 Oct at 1200Z, the cyclone merged with the midlatitude flow of a transient major shortwave trough, and became extra-tropical on 26 Oct at 0000Z.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TY 28W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04101318		8.5N	163.5E	20																
04101400	1	9.2N	162.4E	25	30	68	108	101	82	30			0	5	10	20	30	15		
04101406	2	10.1N	161.4E	30	6	42	40	22	27	53			0	10	15	25	30	20		
04101412	3	10.6N	160.5E	30	12	68	53	42	56	119			0	10	15	25	25	10		
04101418	4	11.1N	160.0E	30	24	73	54	13	34	134			0	10	15	20	20	10		
04101500	5	11.6N	160.1E	30	65	76	67	76	118	230			0	5	10	10	10	5		
04101506	6	11.5N	159.5E	30	52	72	89	104	123	225			0	0	0	0	0	-5		
04101512	7	11.4N	158.8E	30	41	31	59	79	106	214			0	5	0	-5	-10	-10		
04101518	8	11.1N	158.1E	30	95	136	177	212	245	348			0	0	-5	-10	-10	-10		
04101600	9	11.1N	157.4E	30	52	104	126	145	176	328			0	-5	-10	-20	-10	-20		
04101606	10	11.0N	156.5E	35	0	13	19	44	74	171	168	200	0	-5	-5	-5	0	-5	0	10
04101612	11	10.9N	155.6E	40	17	21	34	46	48	36	71	107	0	0	-5	5	0	0	5	20
04101618	12	10.8N	155.0E	45	30	61	64	60	69	103	134	160	0	-5	-5	-5	-5	-5	0	10
04101700	13	10.8N	154.4E	50	11	22	25	42	98	93	99	99	0	-5	0	-5	-5	-5	5	10
04101706	14	10.8N	153.9E	55	13	12	26	64	114	80	129	200	0	-5	-5	-5	-5	0	5	5
04101712	15	10.7N	153.3E	65	8	27	44	89	98	99	131	155	-5	0	-5	0	0	0	15	15
04101718	16	10.5N	152.8E	65	6	22	40	76	78	54	96	144	-5	-5	-5	-5	0	0	5	10
04101800	17	10.4N	152.3E	65	13	36	82	80	73	71	81	159	0	-10	-5	-5	-5	0	0	-10
04101806	18	10.2N	151.7E	70	5	48	97	104	87	107	123	213	5	5	5	15	5	5	-5	-20
04101812	19	10.0N	150.8E	80	8	68	81	109	115	139	144	218	5	10	15	15	15	10	-5	-25
04101818	20	10.0N	149.8E	80	6	49	78	73	84	122	96	83	5	5	15	15	15	10	-5	-25
04101900	21	9.7N	148.6E	85	8	35	59	64	48	121	113	176	0	5	10	15	15	10	-15	-15
04101906	22	9.7N	147.8E	90	11	38	67	60	71	109	114	191	0	10	15	20	25	15	-5	-15
04101912	23	10.0N	147.0E	90	13	17	42	54	88	86	108	143	0	5	15	20	30	15	-5	-15
04101918	24	10.2N	146.1E	90	5	19	34	84	115	99	81	129	0	-5	0	5	15	5	-10	-15
04102000	25	10.7N	145.1E	95	0	30	33	94	105	96	118	150	0	5	10	20	20	0	-10	-5
04102006	26	11.6N	144.1E	95	5	38	89	115	126	162	169	183	0	5	10	15	15	0	-10	5
04102012	27	11.9N	142.7E	95	13	19	83	94	100	152	207	188	0	5	15	15	15	0	-10	20
04102018	28	12.7N	141.7E	95	13	59	94	117	119	200	254	232	0	0	5	5	0	-15	-20	20
04102100	29	13.4N	140.6E	95	5	62	74	79	79	92	175	236	0	5	5	0	-15	-20	-15	20
04102106	30	13.7N	139.4E	95	11	38	46	51	69	147	217	380	0	0	0	0	-15	-20	-10	30
04102112	31	14.1N	138.3E	90	0	18	24	29	57	114	211	598	0	-5	-10	-20	-20	-25	5	30
04102118	32	14.7N	137.4E	95	0	0	18	24	52	120	266		0	-5	-10	-20	-25	-30	10	
04102200	33	15.3N	136.5E	95	0	13	8	13	45	154	347		0	0	-15	-15	-20	-15	15	
04102206	34	15.9N	135.6E	100	8	24	24	18	51	188	372		0	5	-15	-15	-20	-5	30	
04102212	35	16.4N	134.7E	100	5	17	6	33	74	150	355		0	-10	-10	-15	-20	10	30	
04102218	36	16.9N	133.8E	100	0	18	34	74	98	168			0	-10	-10	-15	-20	20		
04102300	37	17.4N	132.3E	110	0	12	38	75	140	279			0	-5	-10	-15	-10	25		
04102306	38	18.0N	130.9E	110	0	21	37	58	115	331			0	0	-5	-10	5	40		
04102312	39	18.6N	129.3E	110	0	26	50	90	120	420			-5	-10	-15	-10	5	25		

04102318	40	19.3N	127.7E	110	0	17	33	86	121				-5	-10	-15	0	15			
04102400	41	20.0N	126.0E	110	0	0	56	84	182				-5	-10	-5	15	20			
04102406	42	20.7N	124.5E	110	6	37	68	100	250				-5	-10	0	15	25			
04102412	43	21.7N	123.2E	110	0	53	74	164	353				-5	0	10	20	25			
04102418	44	22.6N	122.5E	110	8	36	71	223					-10	0	10	25				
04102500	45	24.2N	122.3E	100	0	34	68	206					-10	0	5	10				
04102506	46	25.4N	121.9E	90	8	22	147						-5	5	15					
04102512	47	26.6N	122.5E	75	36	97	198						-10	-10	-5					
04102518	48	27.5N	123.6E	65	22	145							-5	5						
04102600	49	28.4N	126.1E	60	10	77							-5	0						
04102606		29.1N	129.5E	45																
04102612		29.6N	133.0E	45																
			AVERAGE		14	42	63	82	104	152	168	197	2	5	9	12	14	11	10	16
			BIAS										-1	0	1	3	4	2	0	3
			# CASES		49	49	47	45	43	39	26	22	49	49	47	45	43	39	26	22

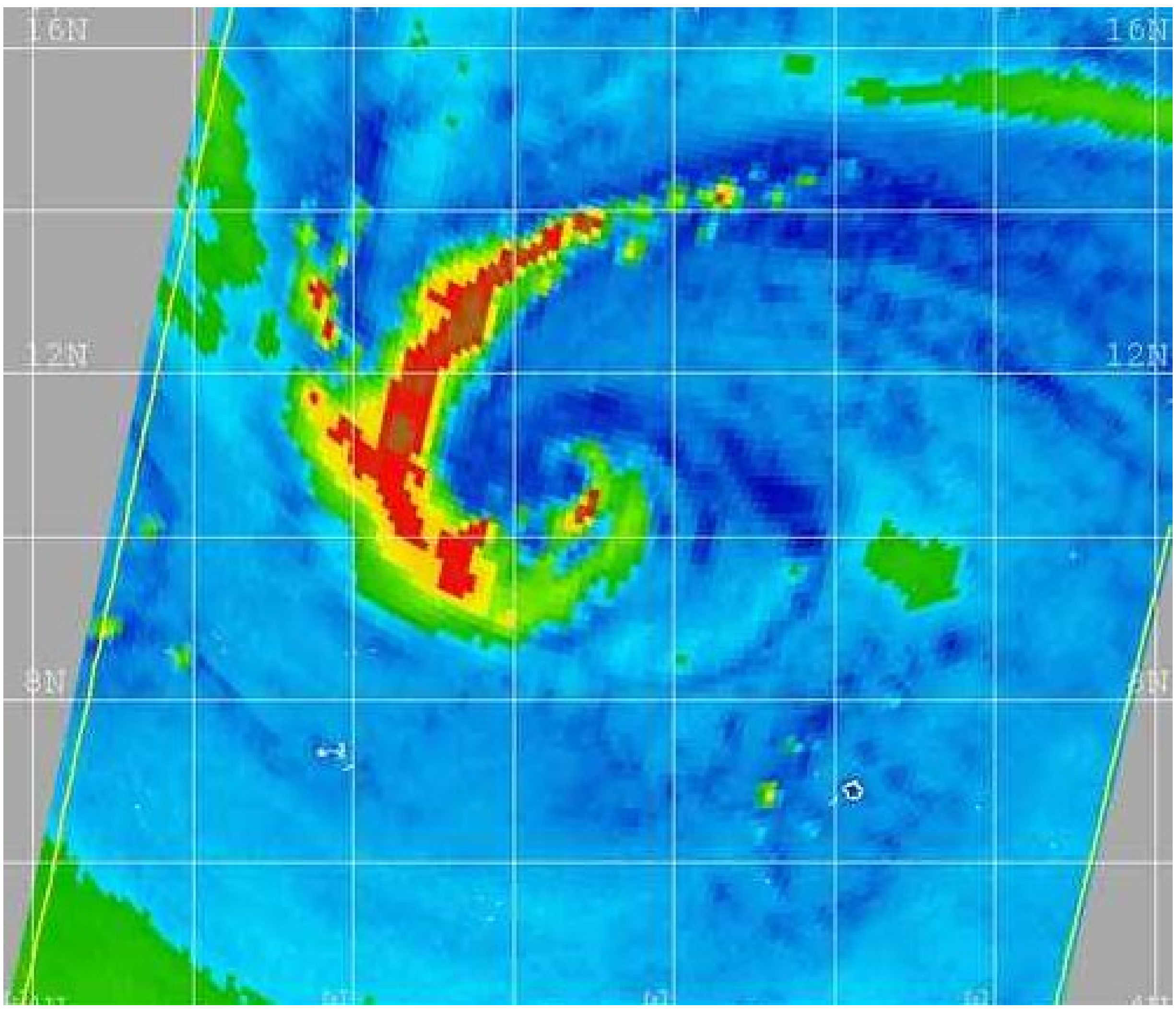


Figure 1-WP28-1. 162012Z October 2004 SSM/I microwave image of TY 28W (Nock-Ten), at this time, the system had a well defined llcc with banding eye characteristics. The most intense convection is associated with the large band to the west. During this time, the system was located approximately 265NM to the northeast of Chuuk with a peak intensity of 45 knots.

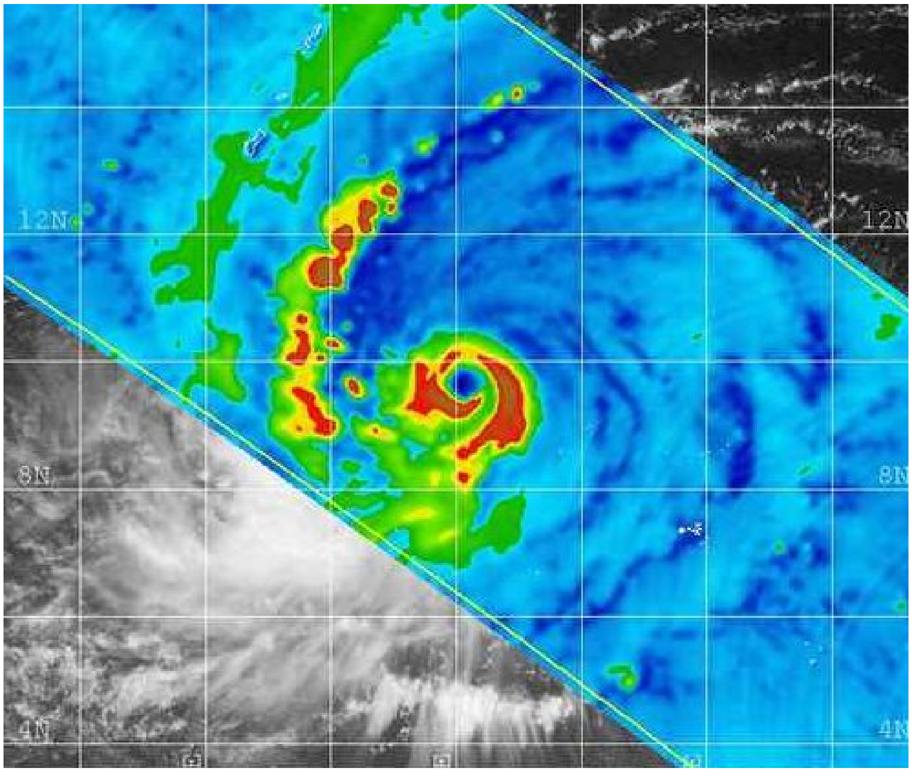


Figure 1-WP28-2. 190415Z October 2004 TRMM microwave image of TY 28W (Nock-Ten), reveals an average size symmetric eye located approximately 305NM to the southeast of Guam with a peak intensity of 90 knots.

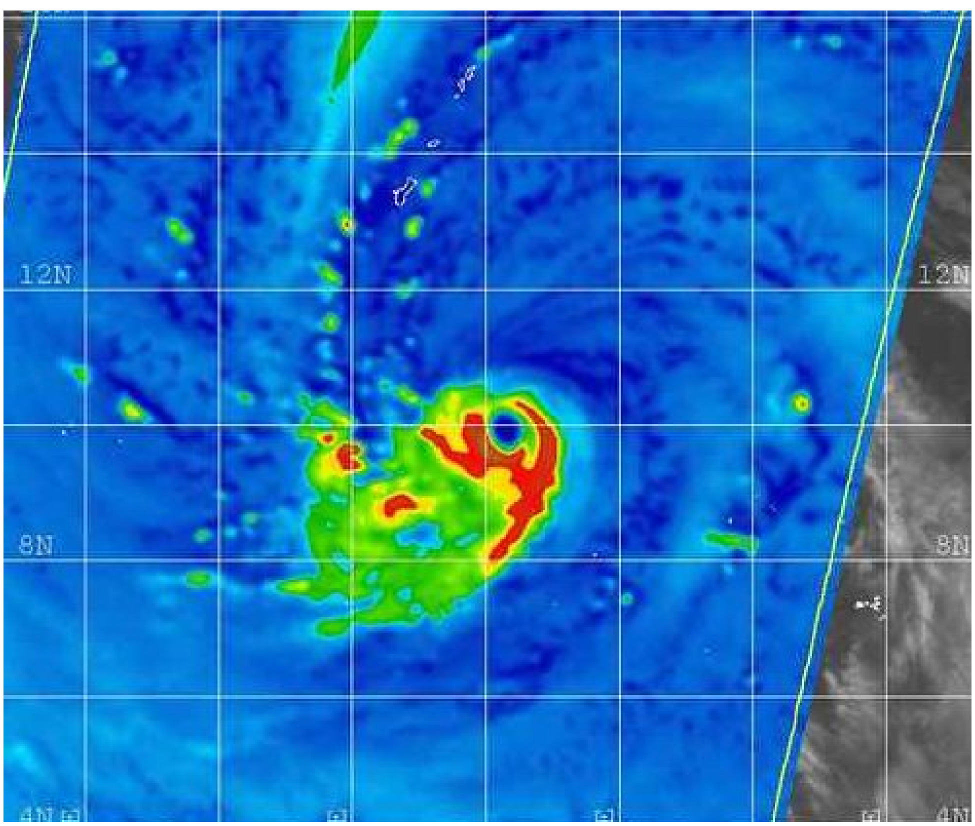


Figure 1-WP28-3. 191558Z October 2004 AMSR-E microwave image of TY 28W (Nock-Ten), reveals a nearly symmetrical eye located approximately 220NM southeast of Guam with a peak intensity of 90 knots.

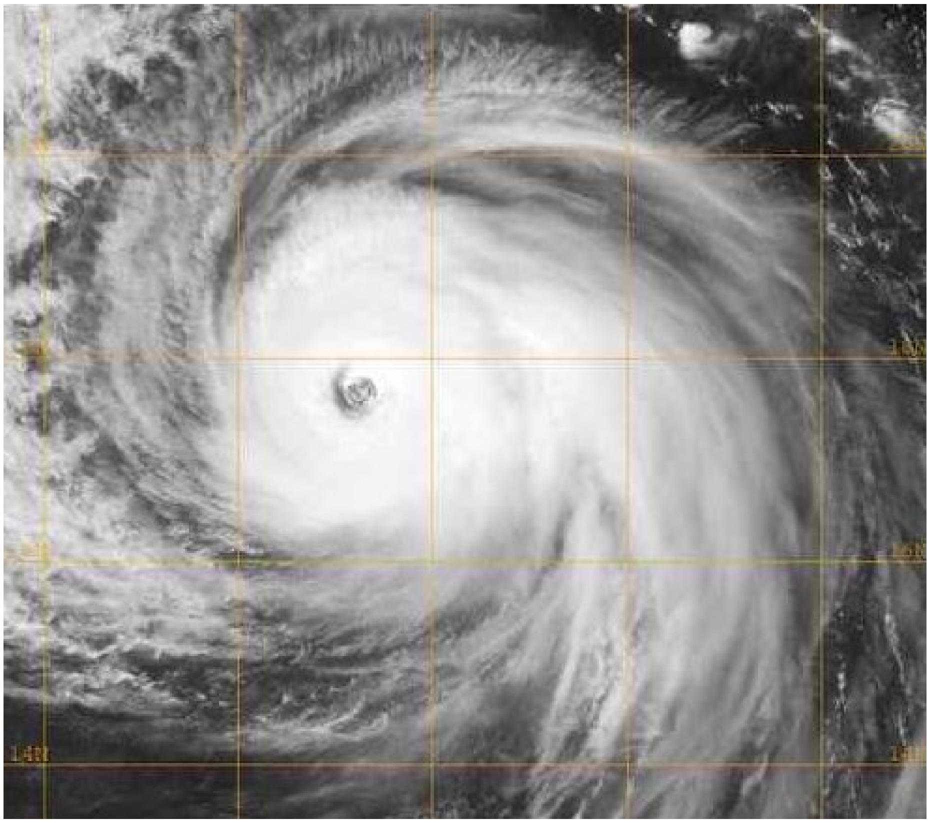


Figure 1-WP28-4. 230413Z October 2004 Goes-9 visible satellite image of TY 28W (Nock-Ten), reveals a very well-defined eye with a peak intensity of 110 knots.

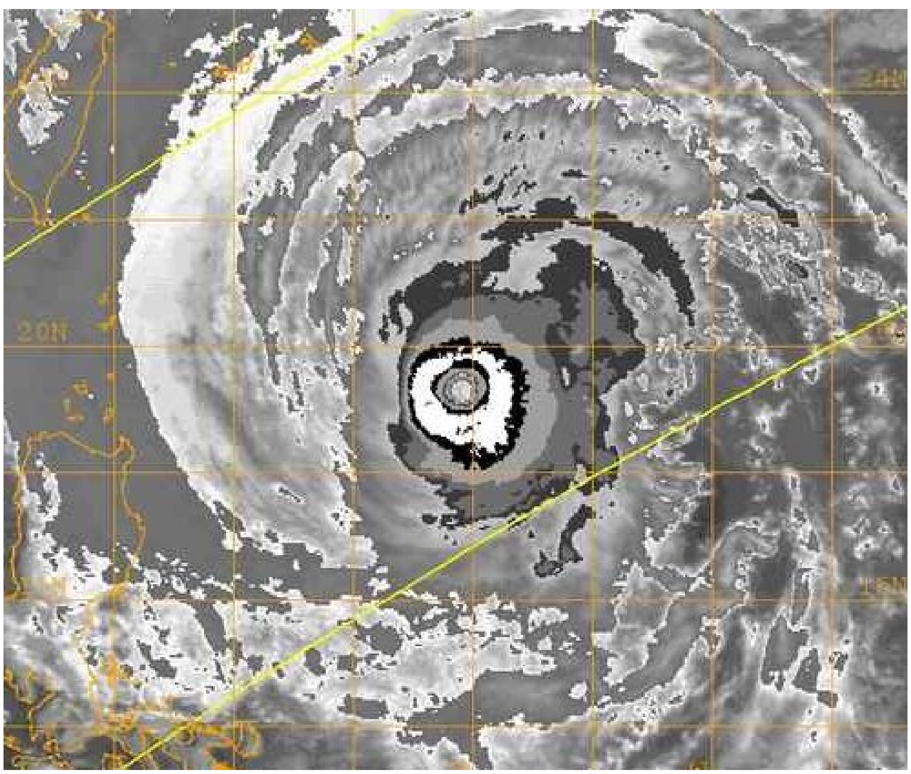


Figure 1-WP28-5. 231725Z October 2004 Goes-9 Enhanced Infrared BD curve image of TY 28W (Nock-Ten), reveals a symmetrical eye with a very intense outer eyewall. At this time, the system was located approximately 400NM southeast of Taiwan with a peak intensity of 105 knots.

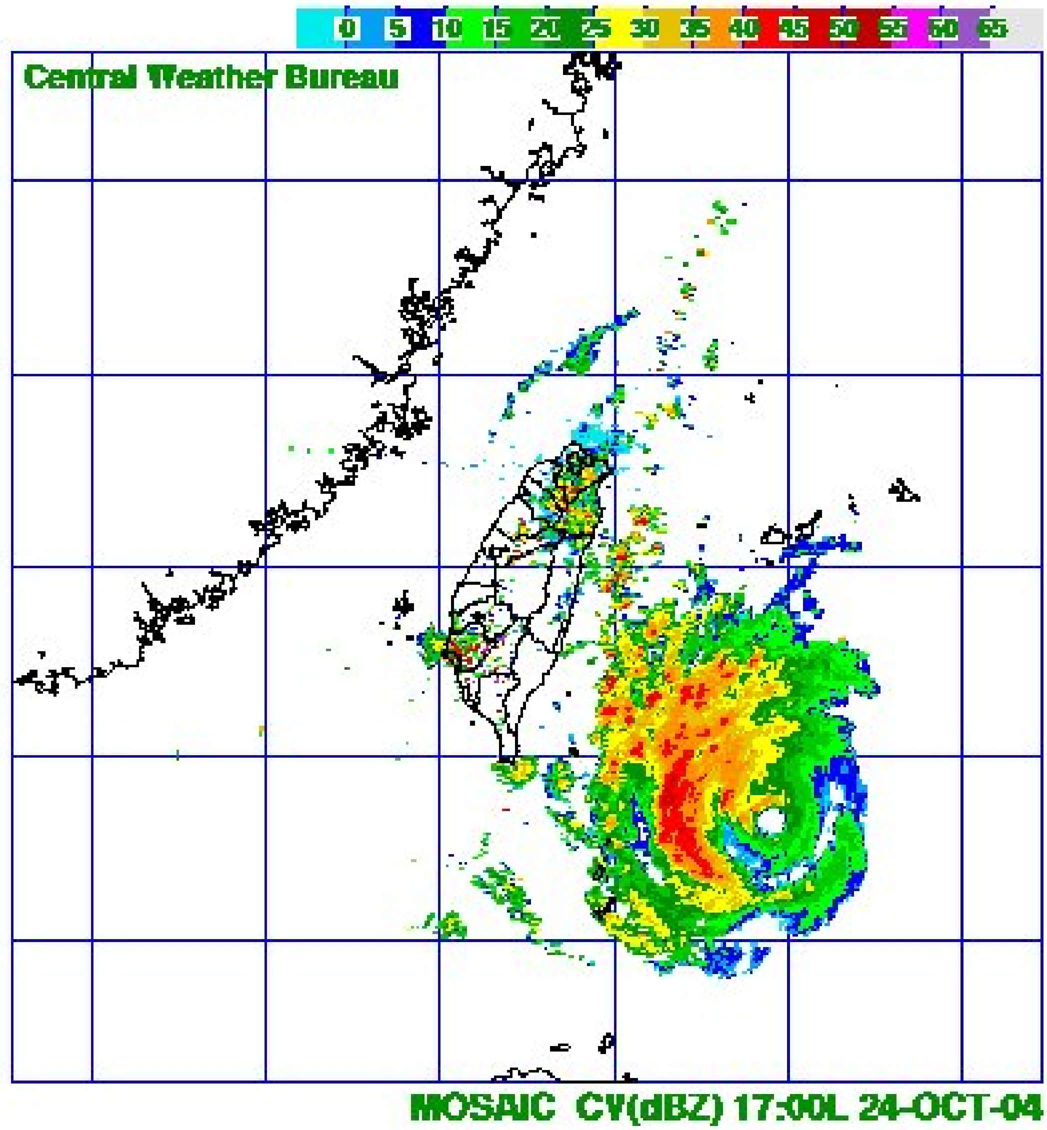
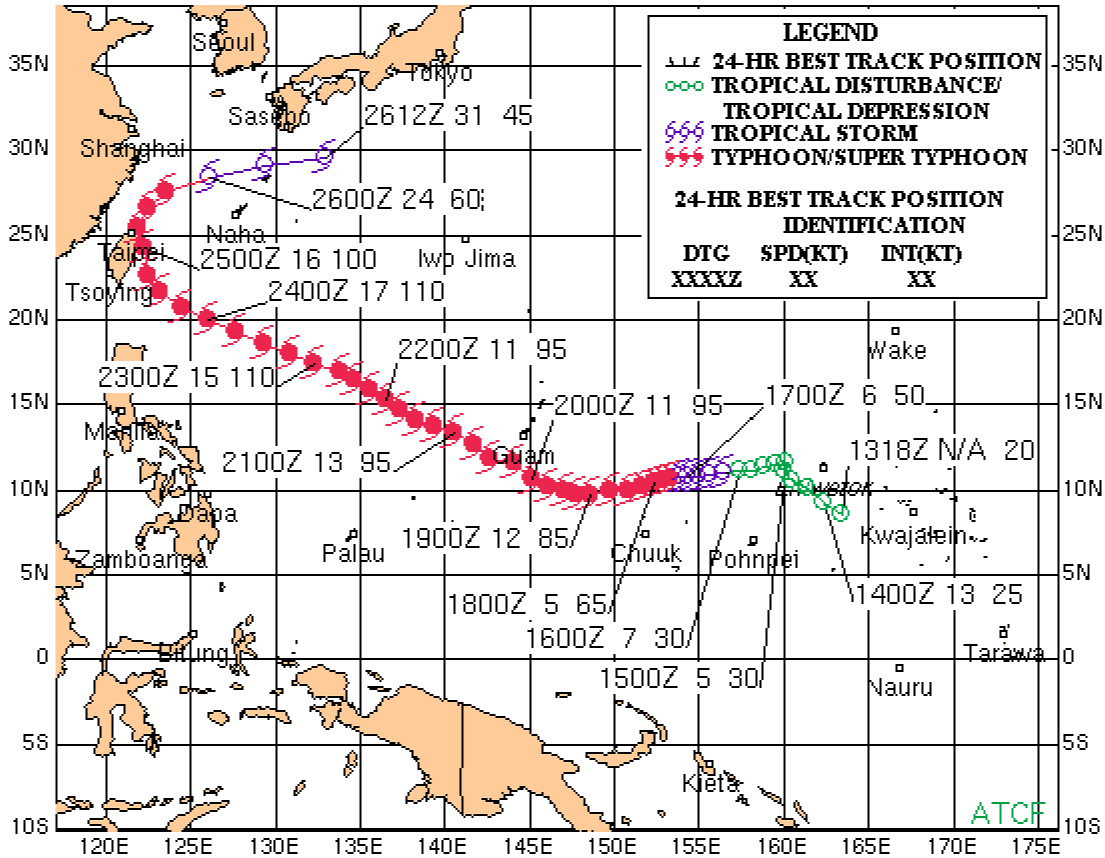
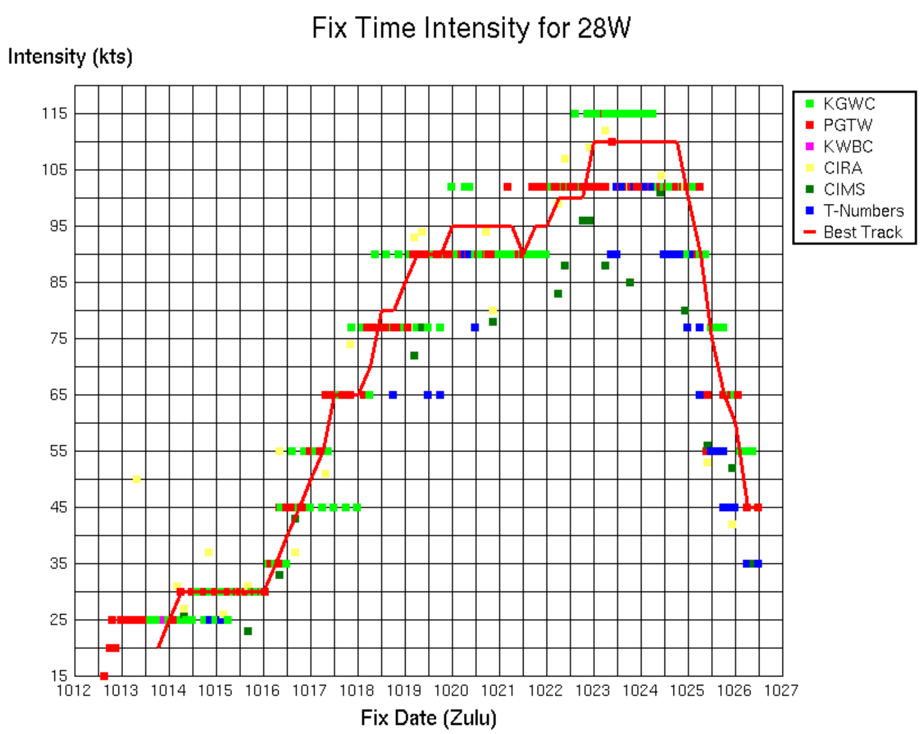


Figure 1-WP28-6. 240900Z October 2004 Composite radar image for TY 28W (Nock-Ten), reveals a pinhole eye located 170NM to the southeast of Taiwan with a peak intensity of 105 knots. Image produced by the Taiwan Central Weather Bureau,

TYPHOON 28W (NOCK-TEN)
14 -26 OCT 2004





Typhoon (TY) 29W (Muifa)

First Poor : 1600Z 13 Nov 04

First Fair : N/A

First TCFA : 2000Z 13 Nov 04

First Warning : 0000Z 14 Nov 04

Last Warning : 0000Z 26 Nov 04, Dissipated over land

Max Intensity : 115 kts, gusts, to 140 kts

Landfall : 100 nm Southwest of Bangkok, Thailand

Total Warnings : 49

Remarks:

1) Typhoon (TY) 29W initially formed approximately 300 nm southeast of the island Yap on 11 Nov. The cyclone initially tracked northwestward for 36 hours and then shifted to a more west-northwestward track around the southern periphery of the subtropical ridge. The cyclone intensified to tropical storm stength by 1200Z on 14 Nov and remained on a west-northwestward track for approximately 24 hours before shifting to a northwest track towards the Philippines. TY 29W approached the Philippines, intensified to typhoon strength and then slowly began to track poleward in a weak steering environment. The cyclone reached maximum intensity of 115 kts just off the east coast of northern Philippines then became quasi-stationary in the weak steering area asssociated with a break in the subtropical ridge. On 18 Nov TY 29W began to track southwestward along the southeastern periphery of the western ridge. Once the cyclone entered the South China Sea it re-intensified back to typhoon strength after weakening to a tropical storm during passage through the Philippine island. TY 29W continued to track southwestward through the South China Sea into the Gulf of Thailand where it dissipated.

2) Assets associated with the week long exercise Talon Vision-05 were pulled out of Clark Air Base and some 70 US Marines were evacuated via a military aircraft to Okinawa. Nearly 3000 people were stranded as the ferry crossings between Bicol and the central islands of the Philippines were closed to vessels under 1000 tons.

Statistics for JTWC on TY 29W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04111318		11.1N	133.5E	20																
04111400	1	11.1N	131.8E	30	134	244	251	218	204	174			0	0	5	10	10	-10		
04111406	2	11.2N	130.1E	30	82	112	47	48	46	30			0	0	5	10	5	-15		
04111412	3	11.5N	128.5E	35	94	88	53	45	25	144	306	395	0	5	10	10	-5	-25	-70	-40
04111418	4	11.6N	127.6E	35	47	74	61	87	87	204	366	395	0	5	10	0	-15	-50	-60	-30
04111500	5	12.2N	127.0E	35	55	85	127	109	125	295	453	448	0	0	0	-15	-15	-60	-55	-25
04111506	6	13.0N	127.1E	35	11	30	64	61	146	351	470	381	0	0	-5	-15	-25	-70	-40	-10
04111512	7	13.5N	126.4E	35	39	65	29	61	161	373	443	361	0	-5	-15	-20	-35	-70	-35	-10
04111518	8	13.7N	125.6E	35	8	21	13	68	156	355	398	328	0	-5	-15	-25	-50	-60	-30	-10
04111600	9	14.5N	125.7E	40	35	73	42	59	154	325	306	236	-5	-15	-20	-35	-65	-60	-25	-10
04111606	10	14.5N	124.9E	45	16	40	30	109	196	297	209	181	0	-10	-15	-45	-80	-45	-15	-10
04111612	11	14.5N	124.2E	55	21	54	110	173	256	350	289	251	0	-5	-15	-60	-75	-30	5	-15
04111618	12	14.4N	123.6E	55	6	63	140	196	267	276	214	220	0	-5	-40	-70	-65	-25	0	-25
04111700	13	14.6N	123.6E	60	8	75	134	196	233	198	149	172	0	-15	-55	-70	-65	-20	0	-20
04111706	14	14.8N	123.6E	65	13	71	125	189	200	136	130	165	0	-25	-60	-60	-55	-10	-5	-20
04111712	15	15.2N	123.8E	75	0	48	101	123	167	123	94	198	0	-30	-45	-45	-45	5	-10	-10
04111718	16	15.5N	123.8E	90	6	25	65	95	109	79	177	255	0	-25	-20	-10	-15	5	-15	-5
04111800	17	15.7N	123.8E	105	5	31	52	100	109	72	146	267	-5	-15	-10	5	0	15	0	-5
04111806	18	15.9N	123.9E	115	13	46	63	71	81	38	178	255	-5	10	15	15	15	0	-15	-5
04111812	19	15.9N	124.2E	115	5	21	50	72	48	17	190	249	0	10	20	20	20	-10	-5	0
04111818	20	15.7N	124.4E	105	5	25	36	76	55	19	152	273	0	5	5	15	15	-15	5	5
04111900	21	15.2N	124.2E	105	18	35	67	61	57	42	125	210	-10	-5	-5	5	0	-15	0	0
04111906	22	14.7N	124.1E	90	6	18	64	54	67	102	135	202	-5	-5	5	5	0	-15	0	5
04111912	23	14.2N	123.7E	85	18	42	50	59	57	114	177	217	0	-5	10	5	-5	0	0	0
04111918	24	13.7N	122.8E	80	5	43	44	63	72	129	182		-10	-5	5	5	-15	-5	-20	
04112000	25	12.8N	121.6E	75	5	8	19	21	43	140	198		-10	5	5	-5	-10	-5	-20	
04112006	26	12.5N	120.3E	65	11	36	34	50	84	164	223		-5	0	0	-15	-15	-15	-20	
04112012	27	12.3N	119.3E	60	5	13	18	40	88	152	185		0	0	-10	-10	-5	-10	-10	
04112018	28	12.2N	118.3E	65	6	21	24	51	84	152	128		-5	-5	-20	-10	5	-5	-10	
04112100	29	11.9N	117.2E	65	0	25	8	42	86	138	101		0	-10	-10	0	5	-5	-10	
04112106	30	11.9N	116.1E	70	5	18	49	82	114	153	197		0	-15	-5	15	10	0	0	
04112112	31	11.8N	115.2E	80	5	30	69	104	125	138	122		0	0	15	25	20	5	20	
04112118	32	11.6N	114.4E	90	8	35	65	86	117	80	48		0	5	30	25	25	5	20	
04112200	33	11.4N	113.6E	85	13	35	72	84	120	72	102		0	10	20	15	10	5	30	
04112206	34	11.1N	113.1E	85	5	41	72	105	122	88			-10	5	5	10	5	10		
04112212	35	10.8N	112.6E	75	5	43	64	107	91	61			-5	0	0	5	15	30		
04112218	36	10.5N	112.1E	65	8	13	45	56	59	101			0	0	5	10	20	30		
04112300	37	10.1N	111.7E	65	18	24	51	73	109	102			0	5	10	20	15	40		
04112306	38	9.9N	111.1E	65	0	30	63	72	83				0	10	15	20	25			
04112312	39	9.6N	110.6E	60	5	48	47	49	84				5	10	20	20	35			

04112318	40	9.3N	110.2E	55	8	30	51	114	119				0	5	15	20	30			
04112400	41	9.1N	109.7E	55	6	30	96	121	156				0	15	15	25	20			
04112406	42	8.8N	108.8E	50	24	81	148	130					5	15	20	30				
04112412	43	8.5N	107.4E	40	101	245	285	293					5	0	10	20				
04112418	44	8.3N	105.7E	40	8	104	129						0	5	10					
04112500	45	8.7N	103.6E	40	5	8	190						0	10	10					
04112506	46	8.7N	101.7E	35	0	81							0	0						
04112512	47	8.8N	100.5E	30	24	190							0	0						
04112518	48	9.9N	99.5E	30	26								0							
04112600	49	11.3N	99.9E	25	18								0							
			AVERAGE		20	56	76	95	116	156	213	269	2	7	15	20	24	22	18	12
			BIAS										-1	-1	-2	-3	-9	-14	-13	-11
			# CASES		49	47	45	43	41	37	31	21	49	47	45	43	41	37	31	21

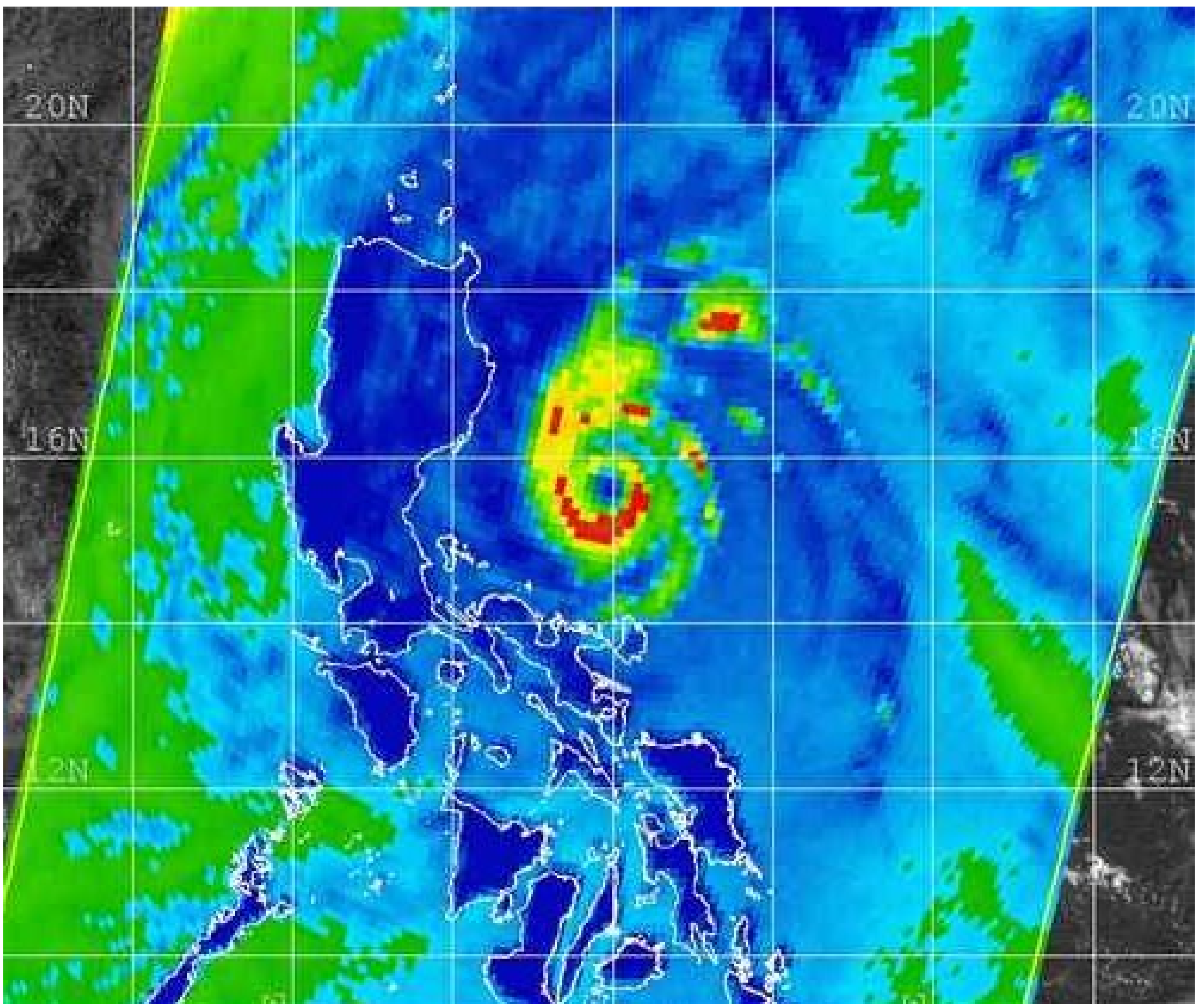


Figure 1-WP29-1. 172302Z November 2004 SSM/I microwave image of TY 29W (Muifa), reveals a well defined eye located approximately 125NM east of the Luzon shoreline with a peak intensity of 90 knots.

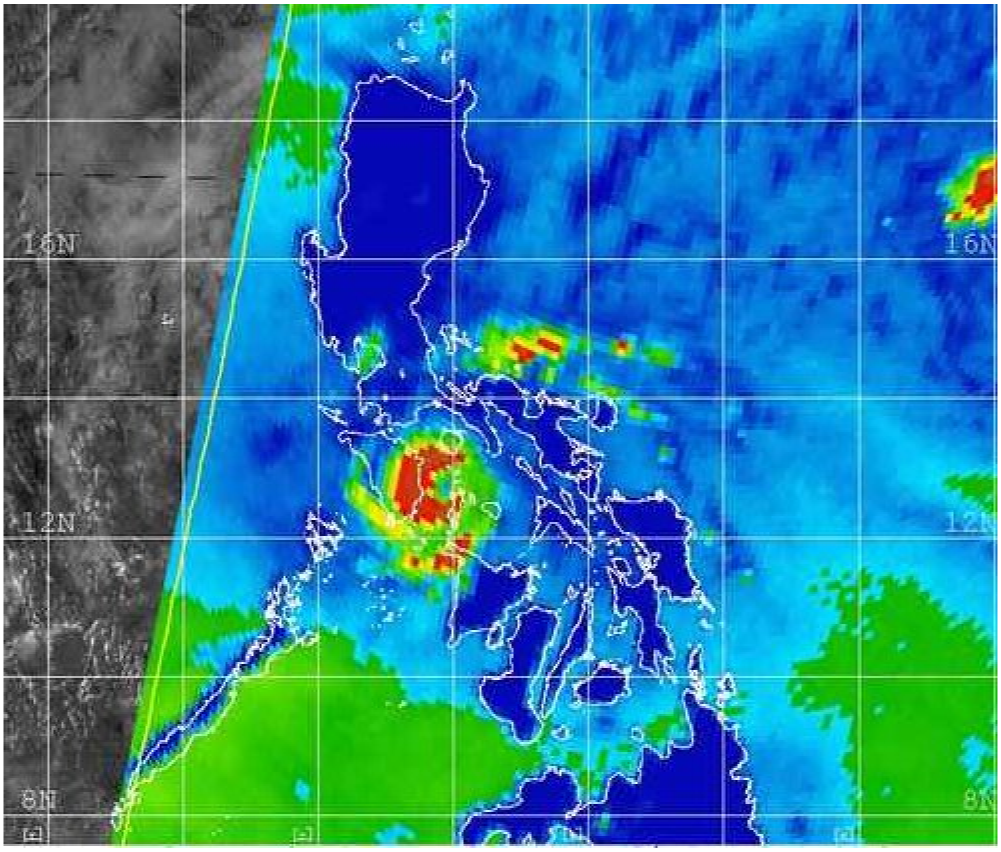
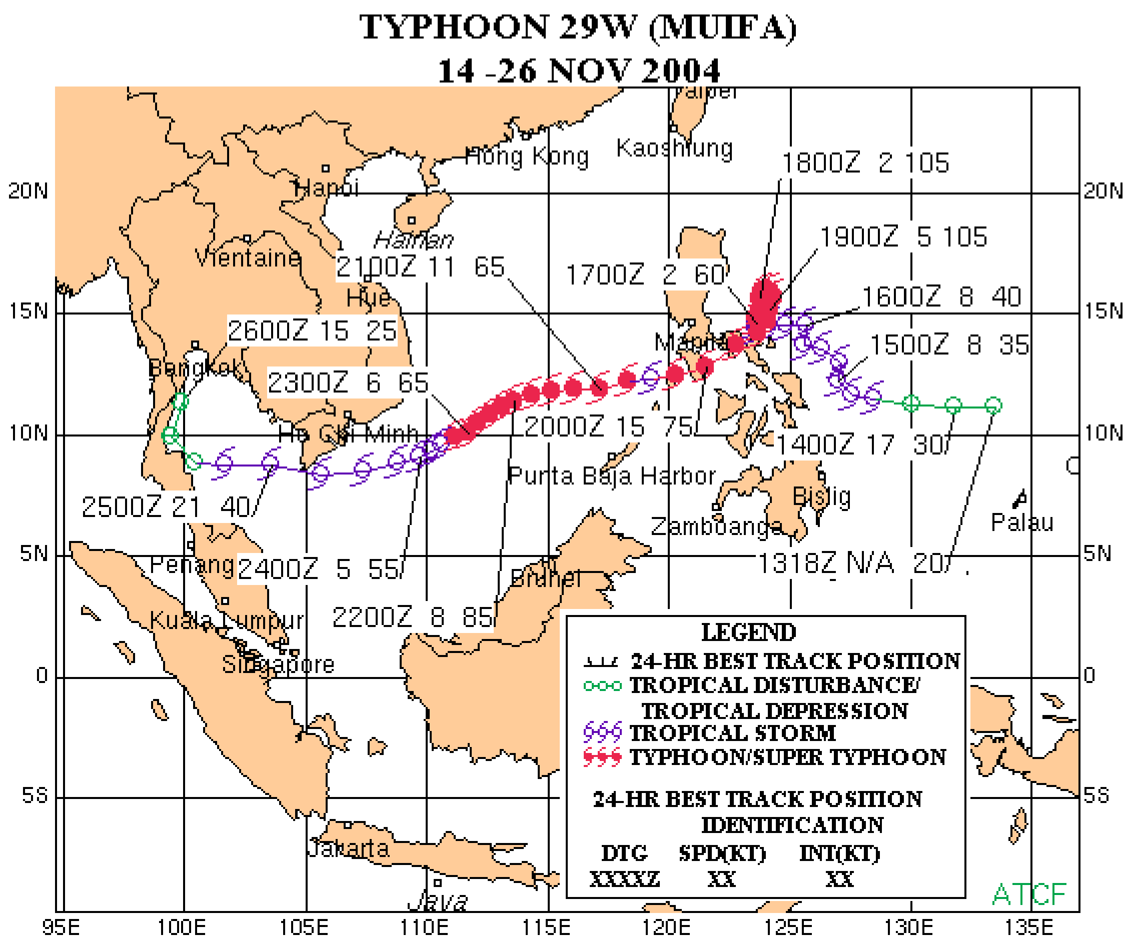


Figure 1-WP29-2. 192217Z November 2004 SSM/I image of TY 29W (Muifa), reveals the system after crossing southern Luzon into the Tablas Strait. During this time, the system maintained a small ragged and cloud filled eye with a peak intensity of 70 knots.



TYPHOON 29W (MUIFA)
14 -26 NOV 2004
1800Z 2 105
1900Z 5 105
1600Z 8 40
1500Z 8 35
1700Z 2 60
2100Z 11 65
2600Z 15 25
2300Z 6 65
2000Z 15 75
1400Z 17 30
2500Z 21 40
2400Z 5 55
2200Z 8 85
1318Z N/A 20
Hong Kong
Kaohsiung
Hanoi
Hainan
Vientaine
Hue
Manila
Bangkok
Ho Chi Minh
Puerta Baja Harbor
Bislig
Palau
Zamboanga
Penang
Brunei
Kuala Lumpur
Singapore
Jakarta
Java
LEGEND
24-HR BEST TRACK POSITION
TROPICAL DISTURBANCE/ TROPICAL DEPRESSION
TROPICAL STORM
TYPHOON/SUPER TYPHOON
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
ATCF
20N
15N
10N
5N
0
5S
95E
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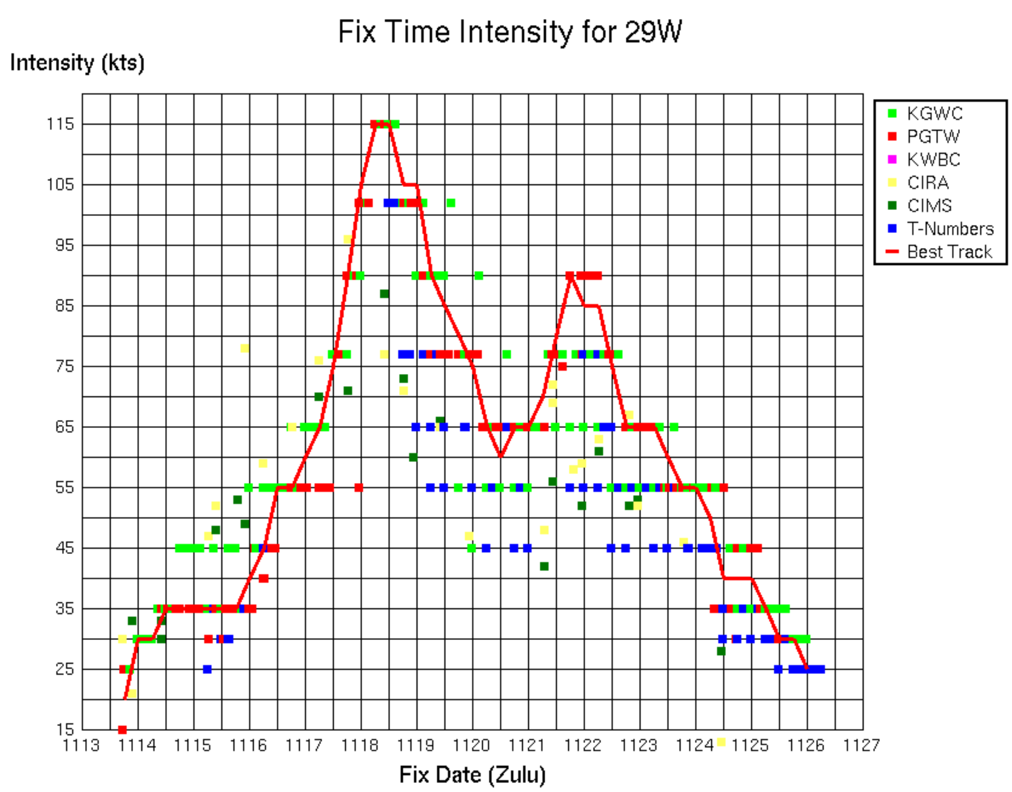


Fix Time Intensity for 29W
Intensity (kts)
115
105
95
85
75
65
55
45
35
25
15
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
T-Numbers
Best Track

Typhoon (TY) 30W (Nanmadol)

First Poor : N/A

First Fair : 272200Z Nov 04

First TCFA : 280300Z Nov 04

First Warning : 281800Z Nov 04

Last Warning : 031800Z Dec 04, Extra-tropical

Max Intensity : 130 kts, gusts to 160 kts

Landfall : Casiguran, Luzon, Philippines

Total Warnings : 21

Remarks:

1) Super Typhoon (STY) 30W formed about 380 nm east-southeast of Chuuk and initially moved westward at 16 kts for 18 hours after the first warning was issued. The cyclone center passed approximately 8 nm north of Yap causing maximum winds of 80 kts on that island. While in the Philippine Sea, the cyclone moved rapidly northwestward along the southwestern periphery of the subtropical ridge. Even though the speed of movement of the system was at times over 19 kts, the radial outflow remained well organized and STY 30W reached super typhoon strength prior to making landfall on the island of Luzon near Casiguran, Philippines. The cyclone then crossed over Luzon within 6 hours, weakening to approximately 100 kts. STY 30W then entered the South China Sea where it began moving poleward and started to further weaken as it entered an environment of increased vertical wind shear caused by mid-latitude westerlies flow. The system shifted to a northeastward track on 03 Dec towards Taiwan due to the effect of a short wave trough that was moving eastward through China. Prior to making landfall on Taiwan STY 30W rapidly transformed to an extra-tropical cyclone as it became embedded into a baroclinc zone.

2) A total of 70 fatalities, 37 missing and 157 injuries were reported in the Philippines. Over 10,000 homes were destroyed and another 55,000 plus damaged. STY 30W was the fourth tropical cyclone in a span of 2 weeks to hit the Philippines.

Statistics for JTWC on TY 30W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04112800		5.4N	153.1E	20																
04112806		5.6N	151.8E	25																
04112812		5.8N	150.5E	25																
04112818	1	6.0N	149.2E	30	5	38	67	83	129	258			0	-20	-30	-30	-30	-60		
04112900	2	6.3N	147.8E	35	0	72	77	124	193	305	337	264	0	-20	-20	-25	-40	-60	-20	25
04112906	3	6.9N	146.0E	55	25	66	120	186	251	310	352		0	-10	-5	-5	-20	-20	20	
04112912	4	7.1N	144.1E	65	23	56	124	215	267	283	310		0	5	10	-5	-20	-10	30	
04112918	5	7.7N	142.7E	75	24	78	122	182	222	275	260		0	5	10	0	-5	20	40	
04113000	6	8.5N	141.0E	75	0	48	112	164	184	208	163		0	5	-5	-10	-10	20	50	
04113006	7	9.3N	139.1E	80	5	35	64	109	105	159			-5	0	-15	-15	0	25		
04113012	8	10.0N	137.1E	85	5	25	63	84	96	156			0	-10	-20	-10	-5	30		
04113018	9	10.8N	135.0E	90	13	26	55	55	100	153			0	-20	-25	0	5	35		
04120100	10	11.6N	132.8E	105	0	8	17	21	64	166			0	-10	-5	10	10	55		
04120106	11	12.3N	130.7E	115	13	34	46	30	92				0	-5	-5	0	25			
04120112	12	13.0N	128.6E	125	8	13	0	51	93				0	-5	0	0	25			
04120118	13	13.7N	126.7E	130	11	18	50	85	130				-10	-10	0	10	20			
04120200	14	14.3N	125.0E	130	0	12	53	103	150				0	5	5	15	20			
04120206	15	14.9N	123.4E	120	0	43	84	117					10	0	20	20				
04120212	16	15.8N	121.9E	115	0	44	80	145					5	0	20	25				
04120218	17	17.0N	120.0E	100	16	65	120						10	20	25					
04120300	18	17.9N	119.0E	95	0	49	104						0	20	30					
04120306	19	19.3N	118.5E	75	36	33							-5	-5						
04120312	20	20.2N	118.3E	65	24	38							0	5						
04120318	21	21.3N	119.1E	55	26								0							
04120400		22.4N	120.2E	45																
			AVERAGE		12	40	75	110	148	227	284	264	2	9	14	11	17	34	32	25
			BIAS										0	-3	-1	-1	-2	4	24	25
			# CASES		21	20	18	16	14	10	5	1	21	20	18	16	14	10	5	1

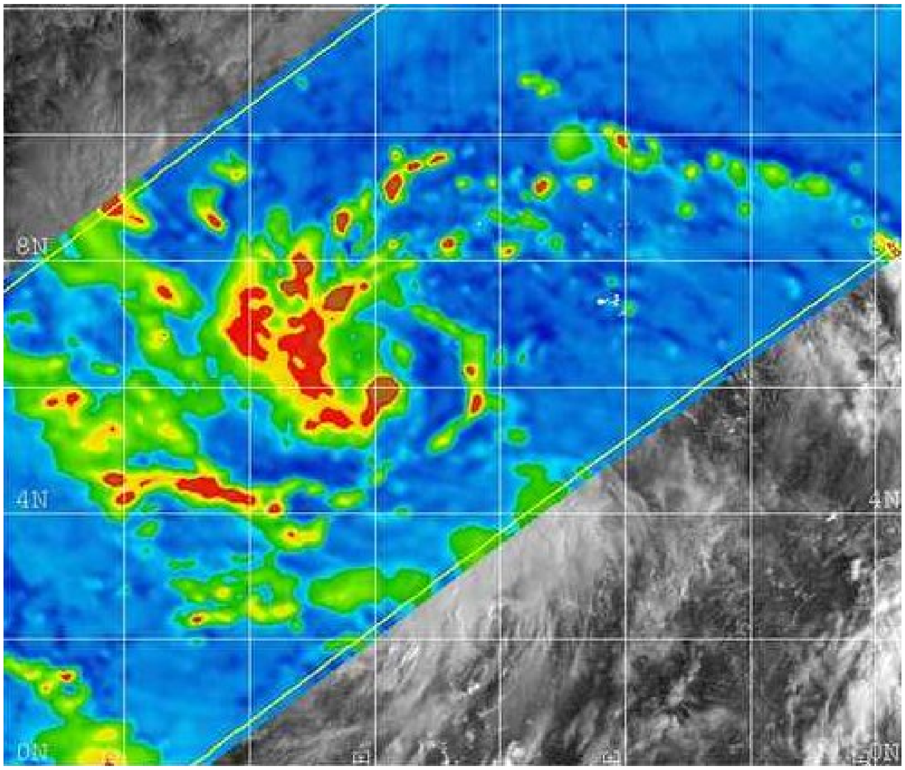


Figure 1-WP30-1. 282123Z November 2004 TRMM image of STY 30W (Nanmadol), reveals the system in the initial stages of development located approximately 220NM west of Chuuk with a peak intensity of 30 knots.

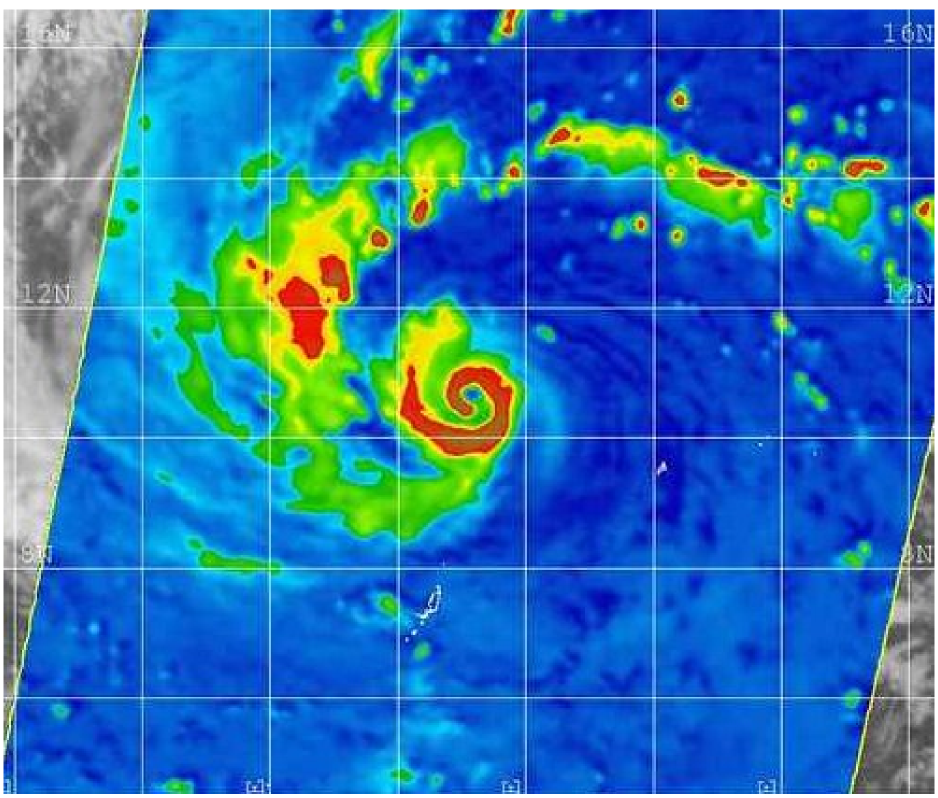


Figure 1-WP30-2. 301635Z November 2004 AMSR-E image of STY 30W (Nanmadol), reveals a very well organized system with a small pinhole eye located approximately 185NM north of Palau with a peak intensity of 90 knots.

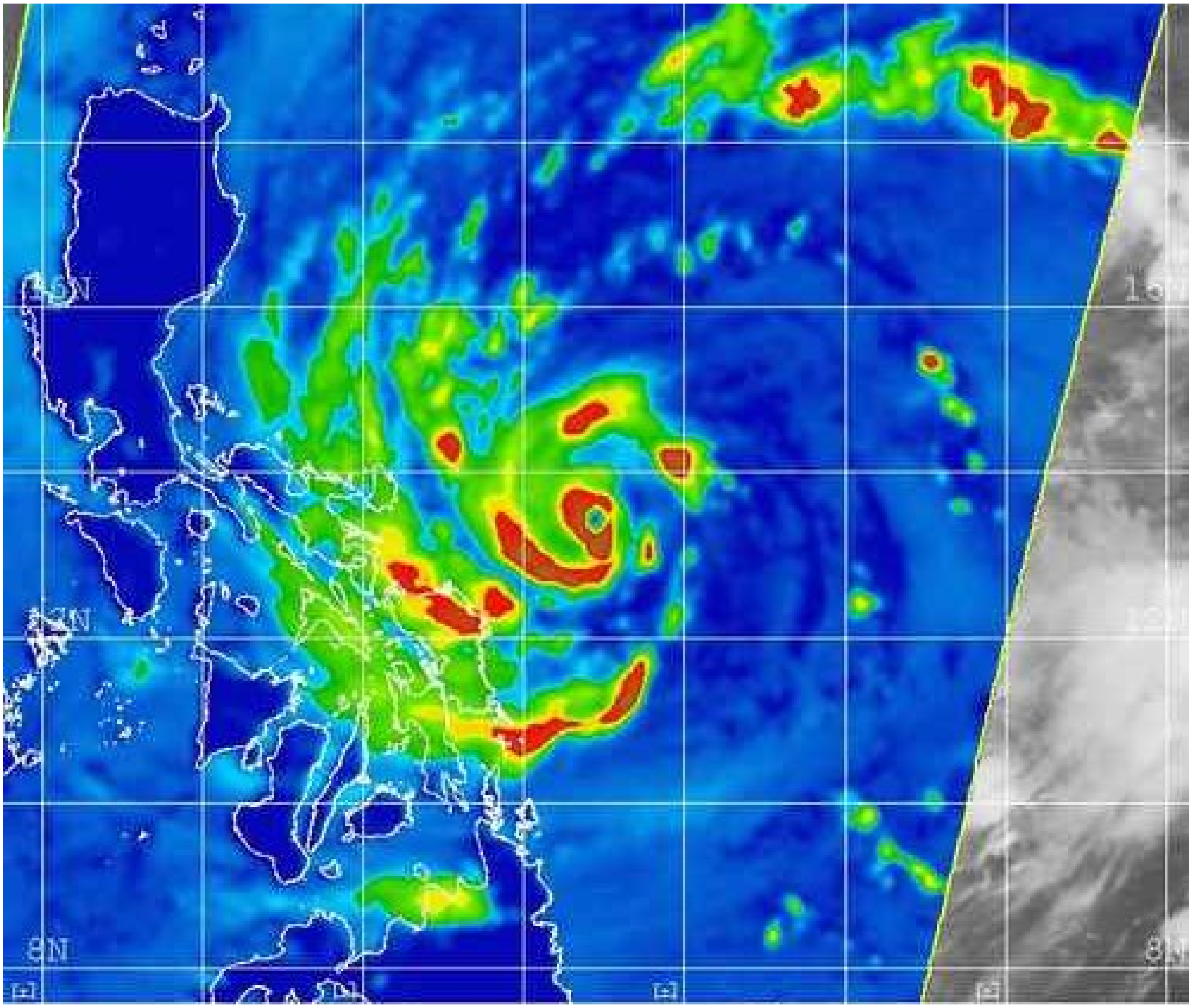
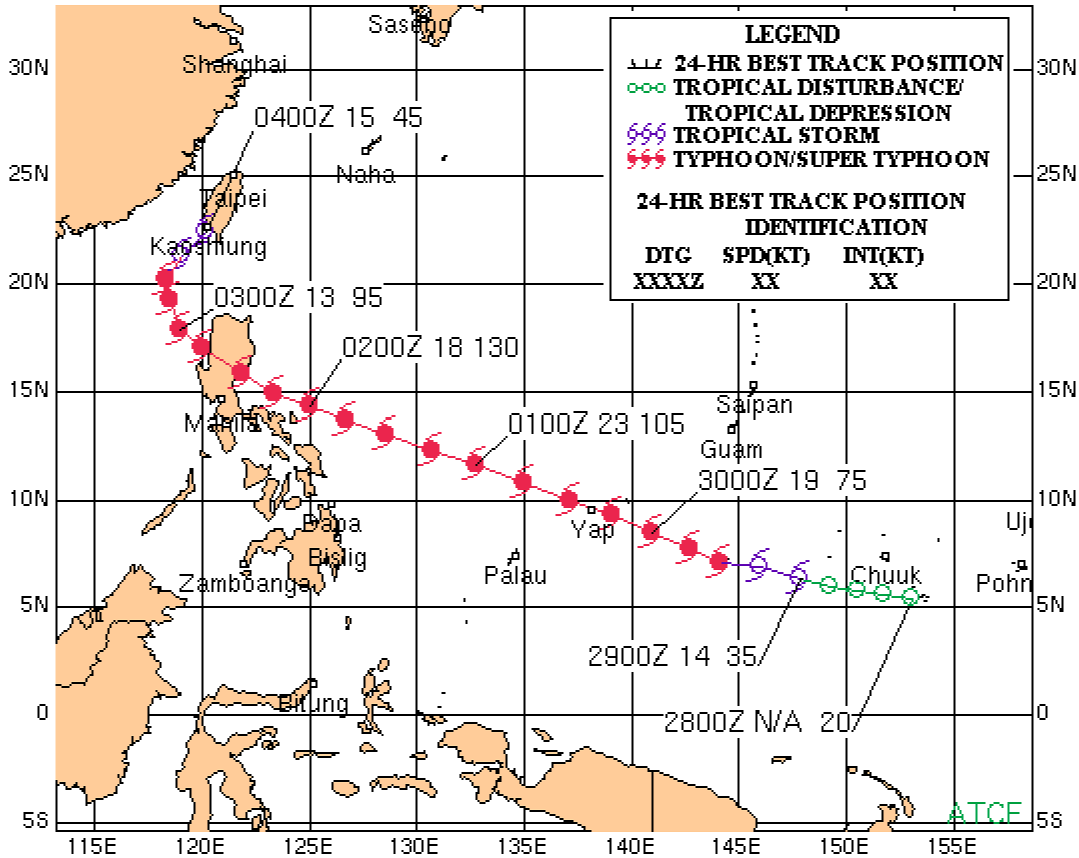
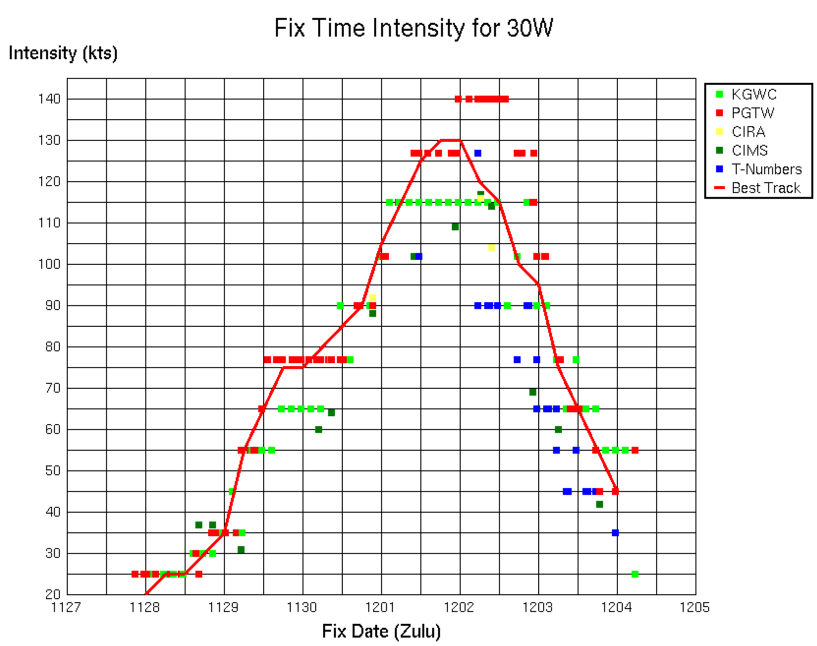


Figure 1-WP30-3. 011717Z December 2004 AMSR-E image of STY 30W (Nanmadol), reveals the systems outer bands beginning to interact with the Philippine coast while maintaining a small pinhole eye. At this time, the system had a peak intensity of 120 knots.

TYPHOON 30W (NANMADOL)
28 NOV 2004 -03 DEC 2004





Tropical Storm (TS) 31W (Talas)

First Poor : 0130Z 09 Dec 04

First Fair : 0600Z 09 Dec 04

First TCFA : 2200Z 09 Dec 04

First Warning : 0000Z 10 Dec 04

Last Warning : 1200Z 19 Dec 04, Extra-tropical

Max Intensity : 50 kts, gusts to 65 kts

Landfall : None

Total Warnings : 39

Remarks:

1) Tropical Storm (TS) 31W formed near the Dateline on 8 Dec and tracked westward along the southern periphery of the low to mid-level ridge centered to the north. The first warning was issued on 10 Dec as the cyclone approached Kwajalein Atoll. TS 31W passed approximately 10 nm south of Kwajalein Atoll near 1200Z on 10 Dec, which reported maximum gusts of 53 kts. The cyclone attained maximum intensity of 50 kts and weakened slightly in a moderate wind shear environment while tracking westward through the Caroline Islands. A passing shortwave trough in the mid-latitude westerly flow in the Philippine Sea after 15 Dec. The shortwave trough subsequently passed north and out of the area leaving TS 31W nearly quasistationary on 17 Dec before an east moving longwave trough caused the cyclone to resume a poleward track. TS 31W briefly reintensified shortly before becoming embedded in the longwave trough and rapidly transitioning to an extra-tropical low on 19 Dec.

2) No damage reports were received for this system.

Statistics for JTWC on TS 31W																				
	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04120900		6.1N	177.2E	20																
04120906		5.9N	175.7E	20																
04120912		5.9N	174.2E	25																
04120918		6.7N	172.8E	25																

04121000	1	7.7N	171.5E	30	5	32	54	105	148	256			0	0	-5	5	10	30		
04121006	2	8.4N	169.7E	30	0	30	19	36	43	136			0	0	0	10	15	35		
04121012	3	8.6N	167.8E	35	24	25	30	54	93	150	320	517	0	0	10	10	25	40	55	65
04121018	4	8.4N	165.9E	35	13	42	63	25	40	96	152	294	0	0	10	10	25	35	55	65
04121100	5	8.6N	163.9E	45	34	60	56	13	19	73	171	247	0	10	20	35	40	55	65	70
04121106	6	9.1N	161.9E	45	11	51	49	72	99	178	261	330	0	5	10	25	35	50	65	70
04121112	7	9.5N	159.7E	45	6	17	54	84	132	189	312	459	0	0	15	20	30	45	60	60
04121118	8	9.9N	157.4E	45	24	64	118	159	182	248	367	397	0	0	15	20	25	50	55	50
04121200	9	10.0N	155.3E	50	11	61	90	139	163	295	405	433	-5	5	10	15	25	45	50	40
04121206	10	9.9N	153.2E	50	6	66	98	127	150	244	351	381	-5	5	10	15	25	45	50	30
04121212	11	9.7N	151.1E	45	13	44	84	108	142	237	314	339	0	0	5	20	25	45	45	30
04121218	12	9.8N	149.1E	45	24	43	56	107	151	222	259	296	0	0	5	15	20	35	30	20
04121300	13	10.1N	147.2E	45	11	42	68	106	162	214	196	197	0	0	10	15	25	35	25	15
04121306	14	10.3N	145.5E	45	5	30	73	97	132	208	184	153	0	0	10	20	20	25	10	15
04121312	15	10.5N	143.8E	45	11	29	56	101	121	167	120	132	-5	0	5	15	20	25	10	20
04121318	16	11.0N	142.3E	45	13	55	83	124	159	185	180	130	-10	0	10	15	25	25	10	10
04121400	17	11.3N	140.8E	40	24	42	81	105	154	155	144	87	0	0	10	20	25	20	10	10
04121406	18	11.6N	139.3E	40	8	72	137	155	201	193	204	163	0	10	15	25	25	5	10	10
04121412	19	11.8N	138.1E	40	44	134	156	163	176	193	232	193	0	10	15	10	10	-10	-5	0
04121418	20	11.7N	137.1E	35	30	61	73	102	90	94	135	220	5	10	15	10	10	-5	-5	0
04121500	21	11.4N	136.2E	35	36	18	42	32	25	100	220		0	10	15	10	5	-5	-5	
04121506	22	11.7N	135.4E	35	8	6	30	36	31	99			0	5	5	0	-15	-10		
04121512	23	11.9N	134.6E	30	5	35	36	53	66	159			0	0	0	-10	-20	-15		
04121518	24	12.1N	133.8E	30	18	34	30	25	43	192			0	0	0	-15	-15	-15		
04121600	25	12.1N	133.0E	30	5	23	36	95	148	231			0	0	-5	-15	-15	-15		
04121606	26	12.1N	132.5E	30	5	30	100	126	175	221			0	0	-15	-10	-5	-5		
04121612	27	12.6N	132.2E	30	17	41	110	177	169	137			0	-5	-15	-10	-5	0		
04121618	28	12.8N	131.6E	30	11	47	94	116	135	83			0	-15	-10	-5	-5	0		
04121700	29	13.2N	131.4E	35	0	55	128	138	166	78			0	-10	0	5	0	10		
04121706	30	13.6N	131.5E	45	0	48	69	122	113				0	10	20	20	20			
04121712	31	14.3N	131.4E	45	18	94	87	54	233				0	5	10	10	20			
04121718	32	13.7N	131.2E	40	45	23	32	42	71				0	5	5	10	10			
04121800	33	14.6N	131.8E	40	18	42	77	83	87				0	5	5	15	15			
04121806	34	15.2N	130.9E	35	0	63	56	45					0	0	0	5				
04121812	35	16.0N	131.2E	35	13	8	104	149					0	0	5	5				
04121818	36	16.9N	131.1E	35	17	31	81						0	5	5					
04121900	37	17.8N	131.3E	35	6	82	121						0	10	10					
04121906	38	18.4N	130.7E	30	8	46							0	5						
04121912	39	19.1N	130.5E	25	18	63							0	5						
04121918		19.6N	130.9E	25																
04122000		19.9N	131.5E	20																
			AVERAGE		15	46	74	94	122	174	238	276	1	4	9	14	18	25	33	32
			BIAS										-1	2	6	10	14	20	31	32
			# CASES		39	39	37	35	33	29	19	18	39	39	37	35	33	29	19	18

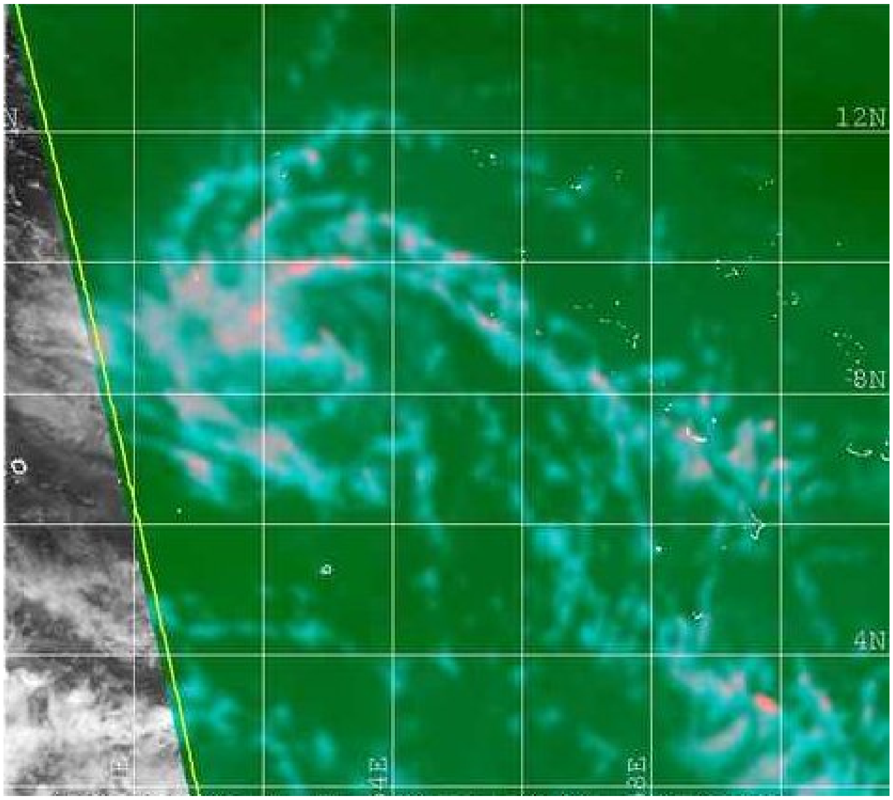


Figure 1-WP31-1. 110221Z December 2004 37GHZ AMSR-E image of TS 31W (TALAS), reveals the system in the early stages of development. At this time, the low-level circulation was located approximately 285NM west of Kwajalein with a peak intensity of 45 knots.

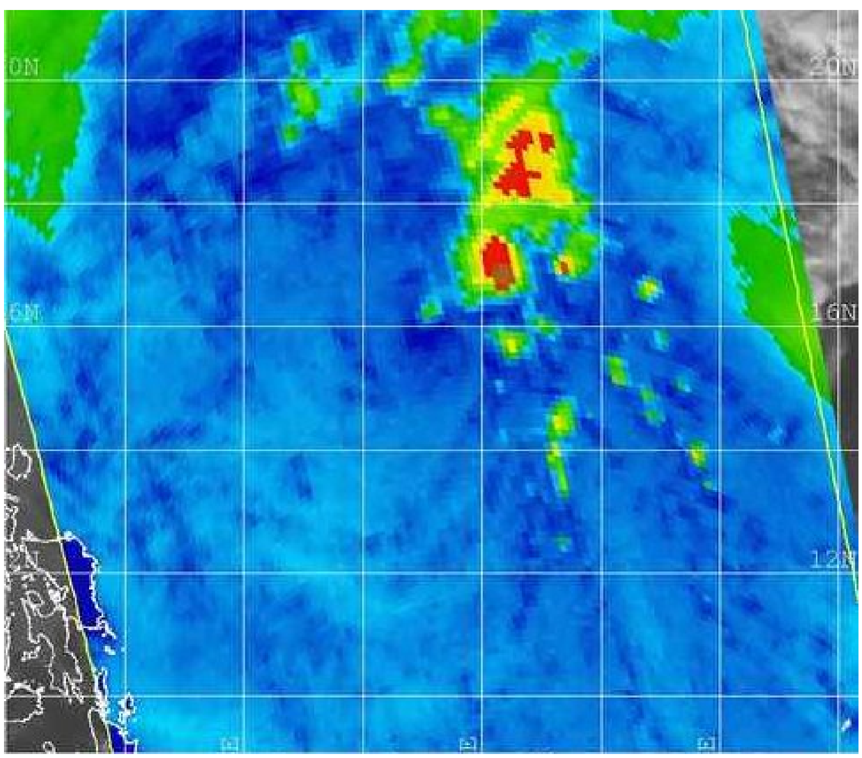
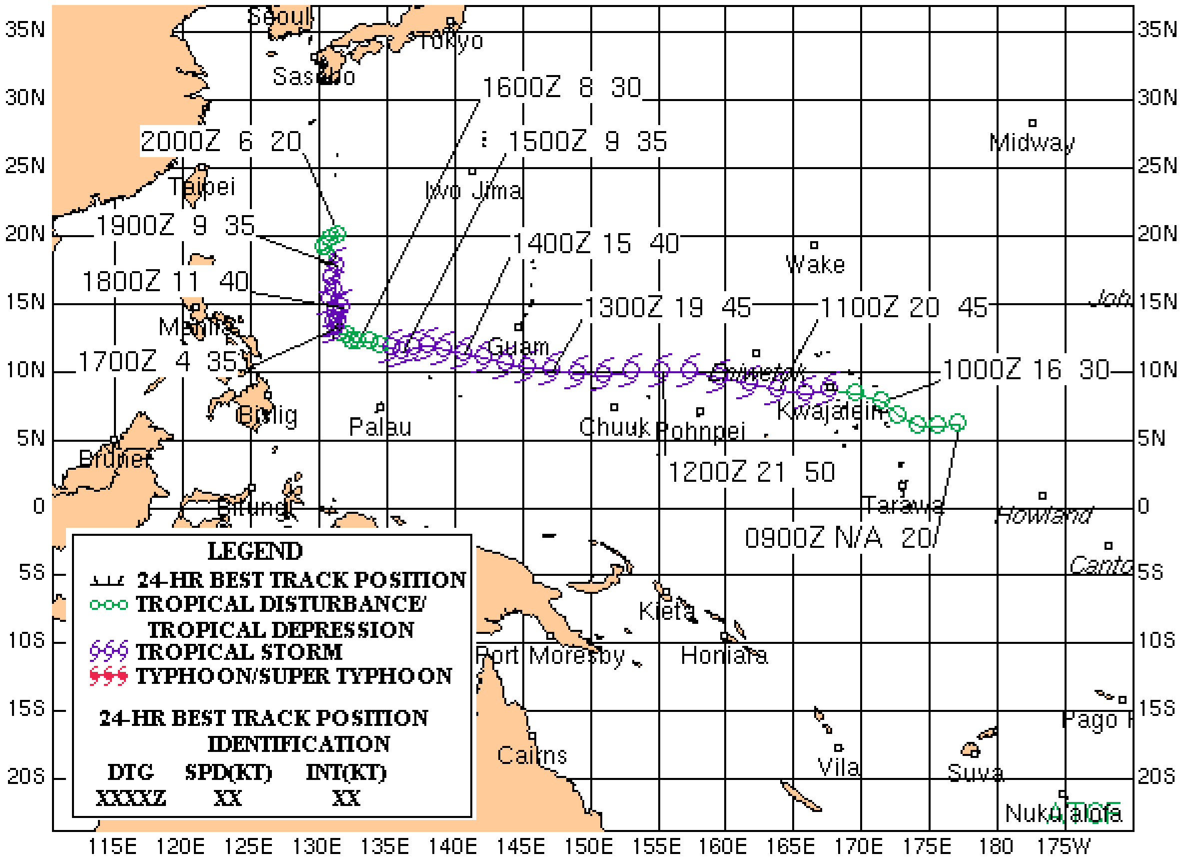
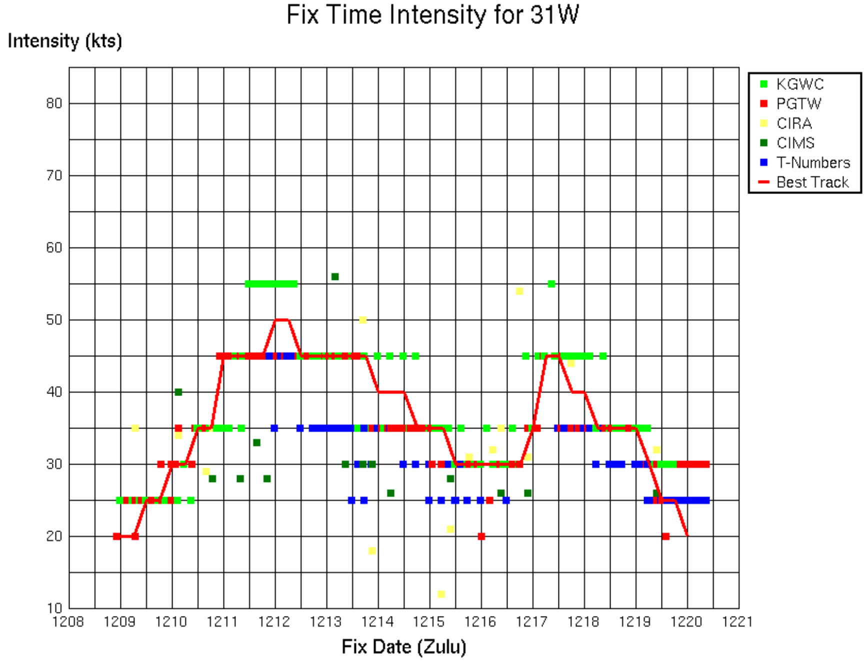


Figure 1-WP31-2. 180935Z December 2004 SSM/I image of TS 31W (TALAS), reveals a fully exposed low-level circulation center located to the southwest of the associated deep convection. At this time, the system was beginning its extratropical transition and had a peak intensity of 35 knots.

TROPICAL STORM 31W (TALAS)
10 -19 DEC 2004





Tropical Storm (TS) 32W (Noru)

First Poor : 1700Z 15 Dec 04

First Fair : 1930Z 16 Dec 04

First TCFA : 0300Z 17 Dec 04

First Warning : 1800Z 17 Dec 04

Last Warning : 0600Z 21 Dec 04, Extra-tropical

Max Intensity : 55 kts, gusts to 70 kts

Landfall : None

Total Warnings : 15

Remarks:

1) Tropical Storm (TS) 32W formed in the monsoon trough southwest of Pohnpei around 15 Dec and was initially slow to consolidate and intensify as it drifted northwest before the first warning was issued on 17 Dec at 1800Z. A passing longwave trough provided more favorable outflow and shifted the track poleward after 18 Dec. TS 32W subsequently passed approximately 55 nm east of Saipan with an estimated intensity of 45 knots. Saipan reported maximum sustained winds of 18 kts during closest point of approach. After moving past Saipan, the cyclone began to accelerate and reached a maximum intensity of 55 kts before it became an extra-tropical cyclone.

2) No damage reports were received for this system.

Statistics for JTWC on TS 32W

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04121618		10.1N	154.3E	15																
04121700		11.1N	154.0E	20																
04121706		12.0N	153.6E	20																
04121712		12.7N	152.9E	25																
04121718	1	13.2N	152.0E	30	11	42	106	163	142	261			-5	-5	0	5	-5	0		
04121800	2	13.5N	151.0E	30	11	62	123	143	136	237			0	0	10	0	-5	5		
04121806	3	13.4N	150.1E	35	21	59	100	109	120	133			0	10	20	10	0	-5		
04121812	4	13.3N	149.2E	35	18	53	59	69	59	61			0	10	10	5	-5	-5		
04121818	5	13.3N	148.4E	35	13	41	84	87	102	153			0	5	-5	-5	0	20		
04121900	6	13.3N	147.7E	35	13	61	109	72	112	76			0	-5	-10	-5	5	20		
04121906	7	14.0N	147.2E	35	13	100	108	133	200				0	-10	-10	-5	-5			

04121912	8	15.1N	146.7E	45	6	44	64	128	191				-5	-10	-5	0	5			
04121918	9	16.5N	146.4E	50	8	24	69	159	158				0	0	5	10	30			
04122000	10	17.6N	146.4E	55	5	28	88	178	170				0	5	10	20	25			
04122006	11	18.7N	146.5E	55	11	51	122	152					0	0	5	20				
04122012	12	20.0N	147.1E	55	13	60	100	103					0	5	10	15				
04122018	13	21.4N	148.1E	55	21	55	80						0	0	15					
04122100	14	23.0N	150.1E	50	5	66	136						0	5	10					
04122106	15	24.5N	152.7E	50	16	88							-5	10						
04122112		25.5N	155.3E	40																
04122118		26.3N	158.0E	30																
04122200		26.8N	160.9E	30																
			AVERAGE		13	56	96	125	139	154			1	5	9	8	9	9		
			BIAS										-1	1	5	6	5	6		
			# CASES		15	15	14	12	10	6			15	15	14	12	10	6		

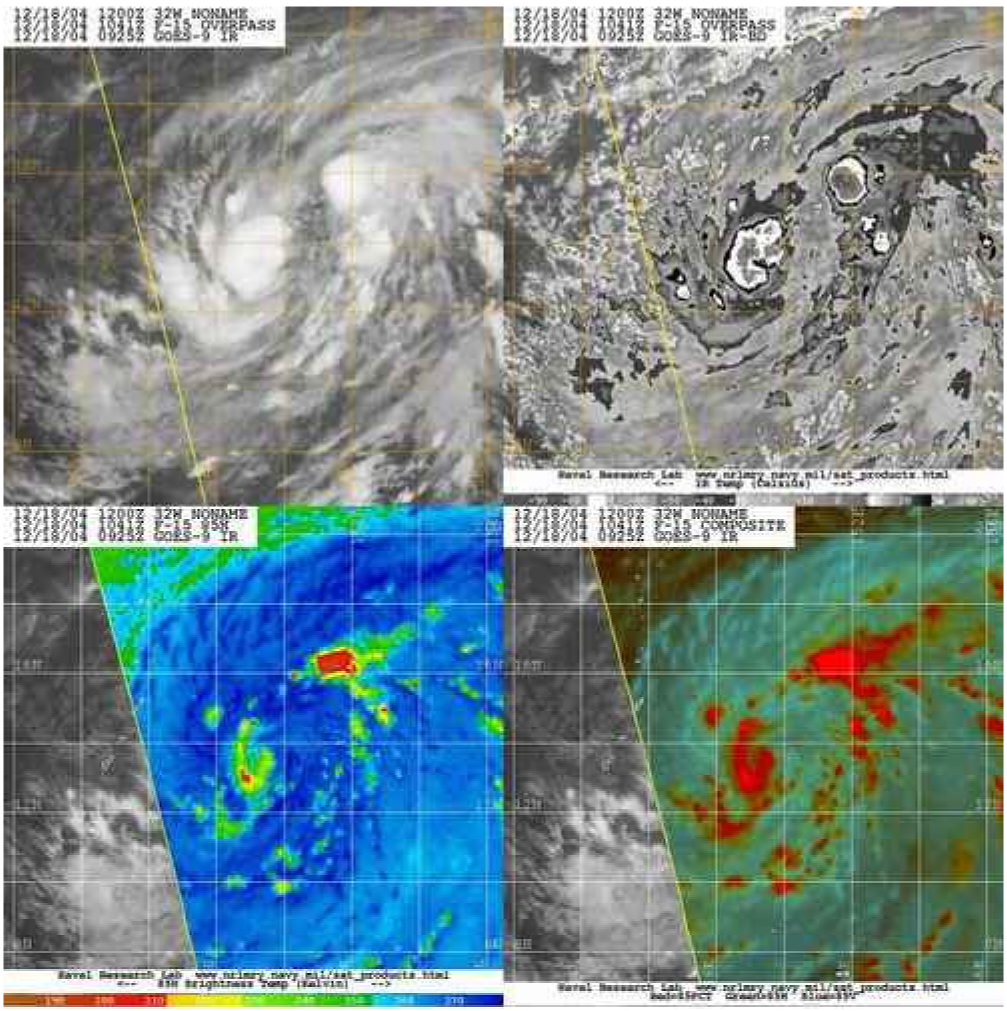


Figure 1-WP32-1. 181041Z December 2004 SSM/I Multi-sensor image of TS 32W (Noru), reveals a partially exposed low-level circulation center located approximately 285NM to the east of Guam with a peak intensity of 35 knots.

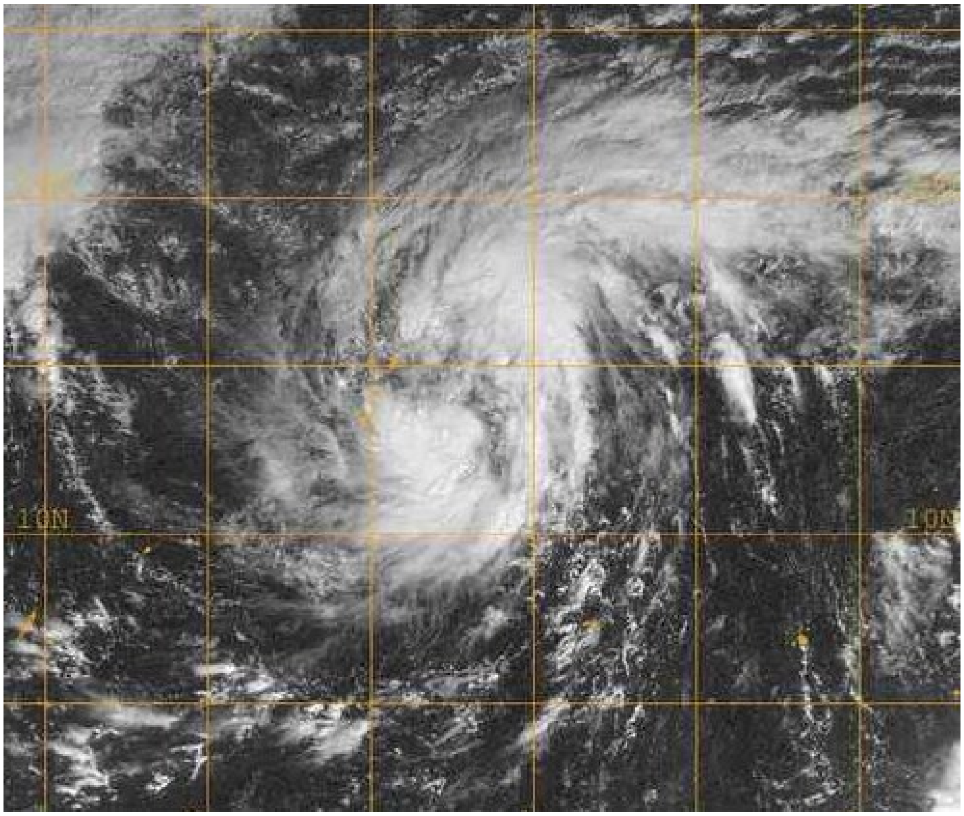


Figure 1-WP32-2. 190001Z December 2004 Goes-9 visible image of TS 32W (Noru), at this time the system was located approximately 180NM east of Guam with a peak intensity of 35 knots.

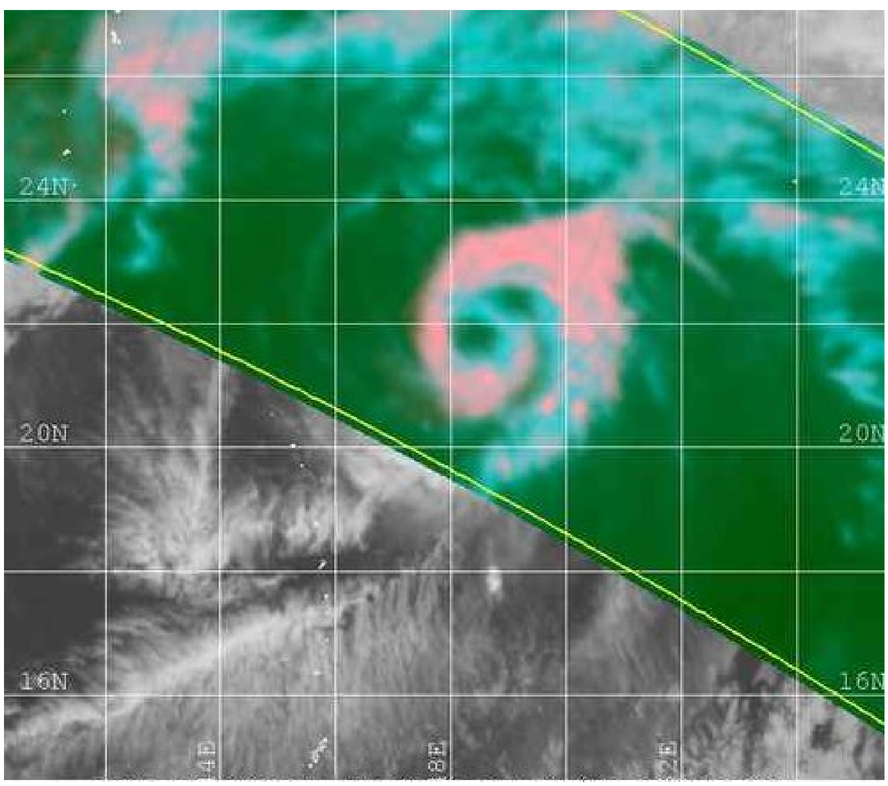
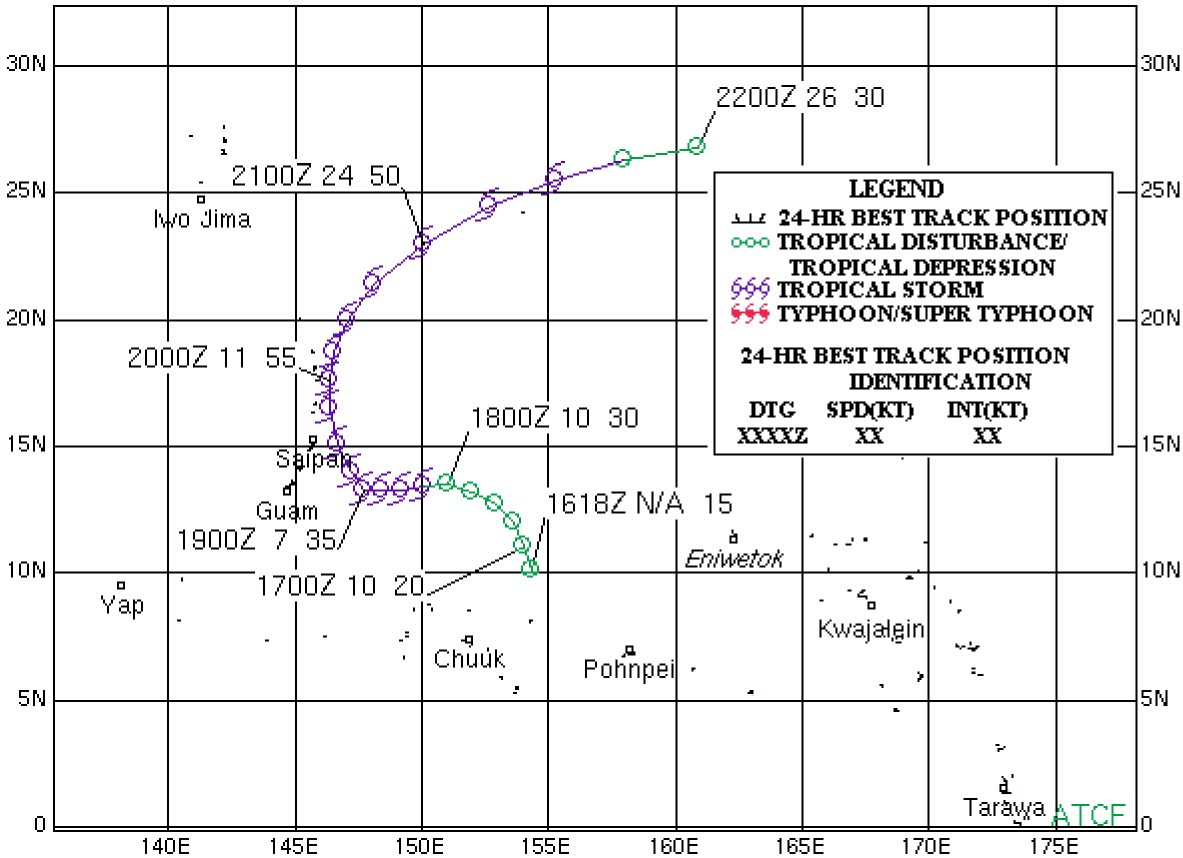
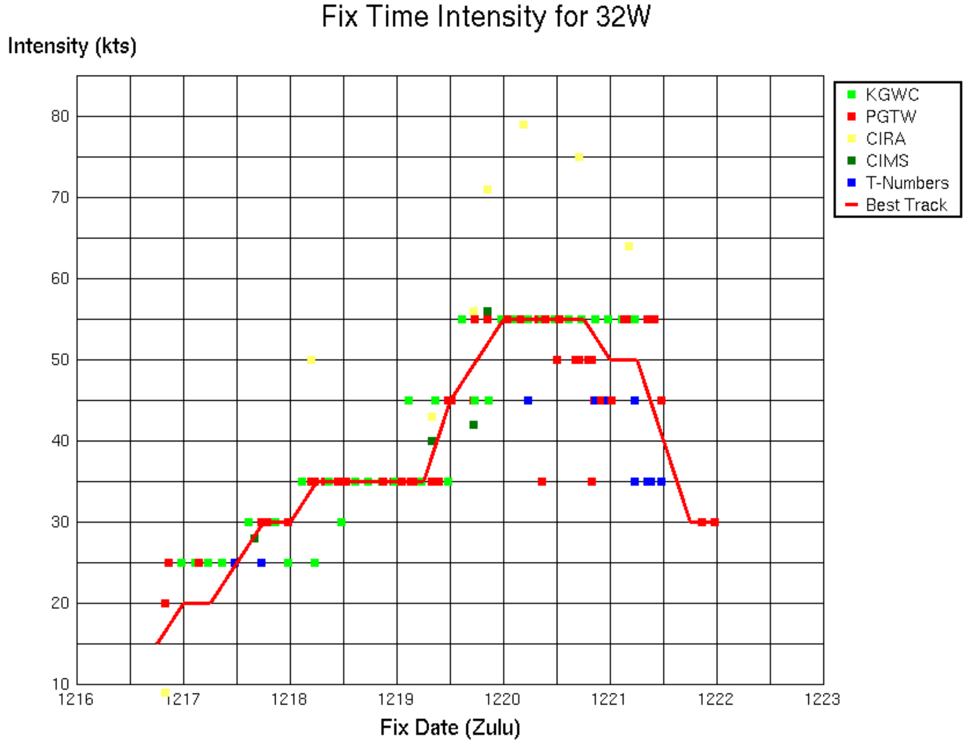


Figure 1-WP32-3. 201858Z December 2004 TRMM image of TS 32W (Noru), reveals a well organized low-level circulation center located to the northeast of the Mariana Islands with a peak intensity of 55 knots.

TROPICAL STORM 32W (NORU)
17 -21 DEC 2004



Fix Time Intensity for 32W



Tropical Cyclone (TC) 01A

First Poor : 0500Z 28 Apr 04

First Fair : 1800Z 01 May 04

First TCFA : 1300Z 04 May 04

First Warning : 0000Z 05 May 04

Last Warning : 0000Z 10 May 04, Dissipated over water

Max Intensity : 45 kts, gusts to 55 kts

Landfall : None

Total Warnings : 21

Remarks:

1) Tropical cyclone (TC) 01A developed from a tropical disturbance that had formed in the Bay of Bengal and tracked westward across Sri Lanka and the south India. The cyclone was first warned on in the Maldive Islands and initially remained quasi-stationary for the first thirty-six hours and then intensified slowly to a maximum intensity of 45 kts as it drifted northward. Vertical shear caused the low level circulation center to become exposed as the cyclone moved northwest along the southwestern periphery of the subtropical ridge after 0600Z on 08 May. The cyclone became more disorganized as increased vertical wind shear resulted in rapid weakening 09 May. The final warning was issued on this cyclone at 0000Z on 10 May, approximately 225 nm west of Bombay, India.
2) No damage reports were received for this cyclone.

Statistics for JTWC on TC 01A

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04050400		11.1N	74.3E	20																
04050406		11.2N	73.9E	25																
04050412		11.4N	73.6E	30																
04050418		11.6N	73.3E	30																
04050500	1	11.6N	72.9E	30	30	82	73	75	80	85			0	0	10	15	15	45		
04050506	2	11.4N	72.7E	35	18	40	0	34	58	79			0	10	10	15	20	40		
04050512	3	11.1N	72.5E	35	17	19	18	25	43	154			0	10	10	15	35	45		
04050518	4	10.8N	73.2E	35	17	55	80	97	18	54			0	5	10	10	30	30		
04050600	5	11.1N	73.3E	35	13	8	19	21	122	196			0	-5	-5	10	20	25		
04050606	6	11.3N	73.3E	40	11	13	13	71	138	129			0	5	5	20	15	35		
04050612	7	11.5N	73.3E	40	26	30	59	145	201	152			0	0	15	20	15	40		

04050618	8	11.9N	73.1E	40	24	42	77	149	178				0	0	15	10	15			
04050700	9	12.2N	72.8E	45	6	60	156	180	192				0	15	20	15	25			
04050706	10	12.5N	72.5E	45	25	123	187	225	225				0	15	10	15	30			
04050712	11	12.7N	72.9E	35	88	185	228	256	196				10	10	5	15	30			
04050718	12	12.4N	73.1E	35	26	108	155	166					10	0	0	15				
04050800	13	12.7N	73.5E	35	63	101	122	168					10	0	10	25				
04050806	14	13.2N	73.5E	45	0	30	52						0	0	15					
04050812	15	13.7N	73.2E	45	8	18	83						0	10	25					
04050818	16	14.1N	72.9E	45	6	32							0	15						
04050900	17	14.5N	72.5E	40	13	104							5	20						
04050906	18	15.2N	71.8E	35	33								0							
04050912	19	16.4N	70.4E	30	21								5							
			AVERAGE		24	62	88	124	132	121			2	7	11	15	23	37		
			BIAS										2	6	10	15	23	37		
			# CASES		19	17	15	13	11	7			19	17	15	13	11	7		

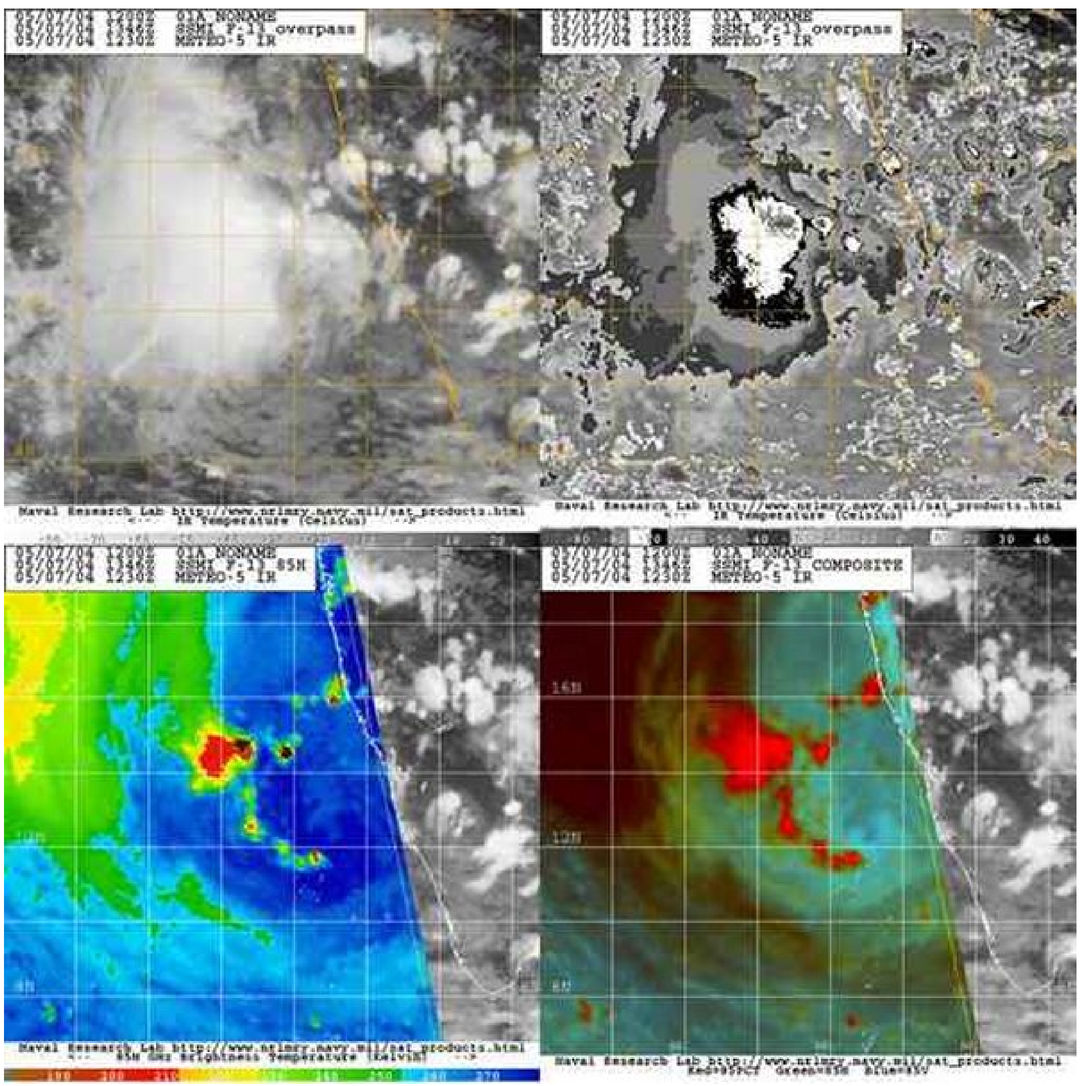
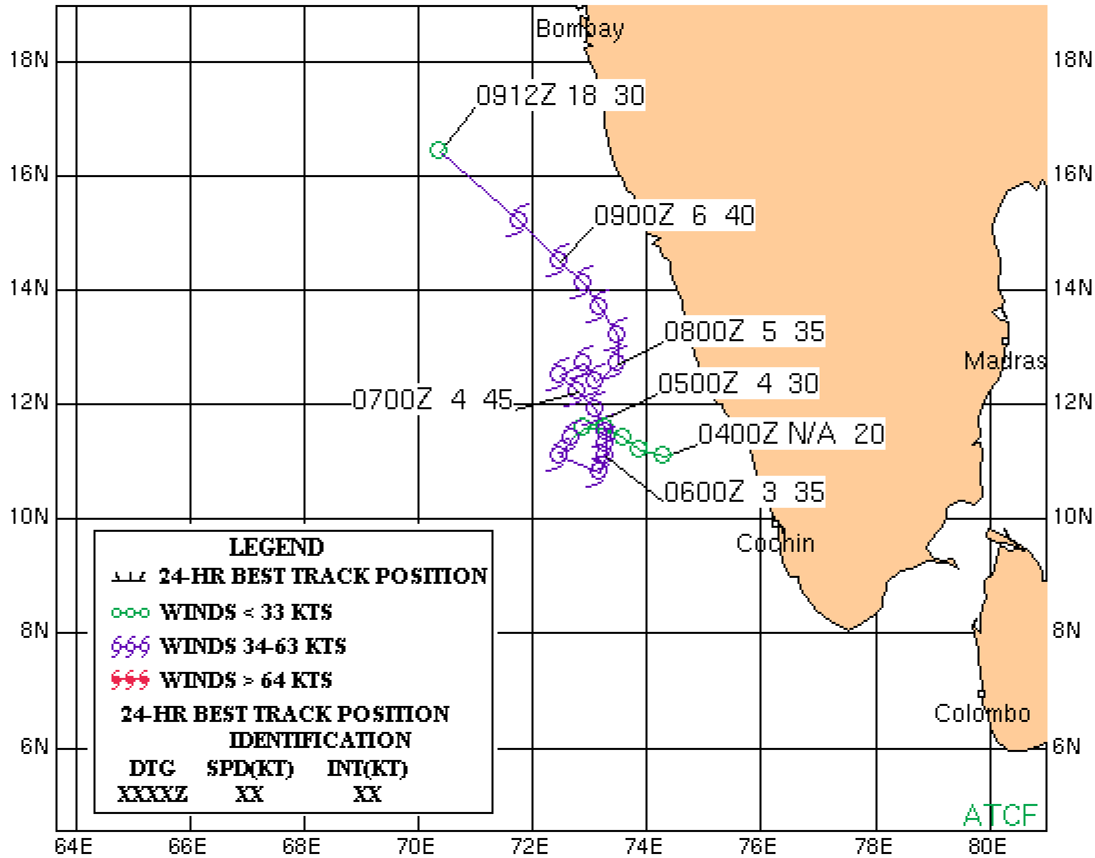
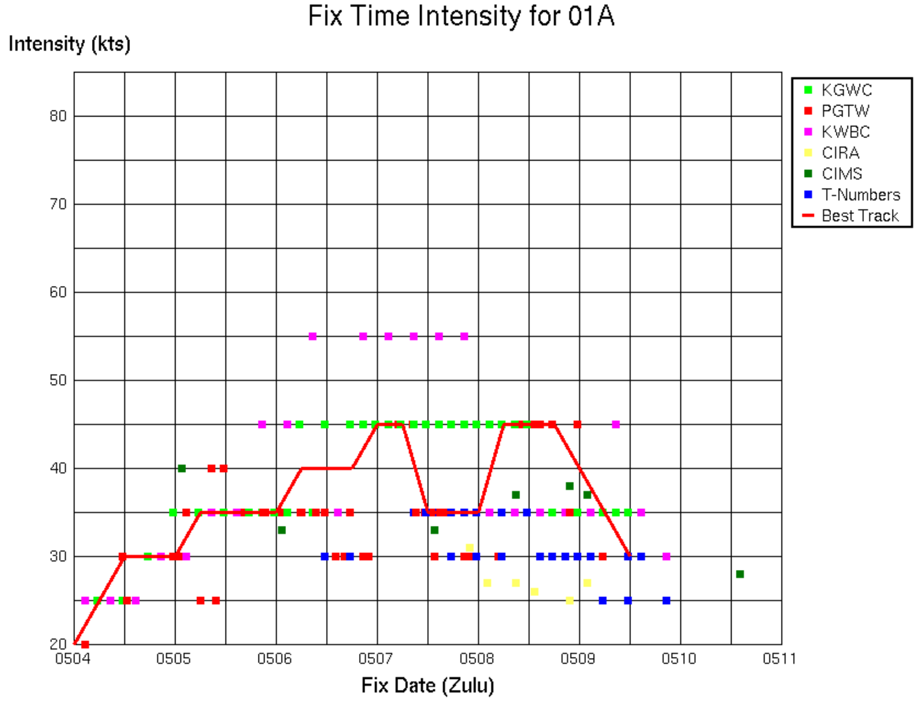


Figure 1-IO01-1. 071346Z May 2004 SSM/I Multi-sensor imagery of TC 01A, reveals a exposed Low-level circulation to the southeast of the associated deep convection with a peak intensity of 45kts.

TROPICAL CYCLONE 01A
05 -10 MAY 2004





Tropical Cyclone (TC) 02B

First Poor : 2300Z 14 May 04

First Fair : 1800Z 15 May 04

First TCFA : 2200Z 16 May 04

First Warning : 1200Z 17 May 04

Last Warning : 1200 19 May 04, Dissipated over land

Max Intensity : 65 kts, gusts to 80 kts

Landfall : Sittwe, Myanmar

Total Warnings : 6

Remarks:

1) Tropical Cyclone (TC) 02B was detected as a tropical disturbance approximately 480 nm south of Calcutta, India on 14 May. The cyclone Tracked north for three days before moving west. The first warning was issued on 17 May during this westward movement. TC 02B tracked slowly in a weak steering environment and meandered in a cyclonic loop for approximatley 30 hours before turning northeastward, towards Myanmar and attaining typhoon intensity just prior to landfall. TC 02B made landfall near Sittwe, Myanmar at approximately 0600Z on 19 May, and a final warning was issued at 1800Z on 19 May.

2) Reports indicated one person missing and 7 boats capsized.

Statistics for JTWC on TC 02B

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
05011100		3.4N	90.2E	15																
05011106		3.5N	90.1E	15																
05011112		3.7N	89.9E	15																
05011118		3.9N	89.7E	20																
05011200		4.2N	89.5E	20																
05011206		4.5N	89.4E	20																
05011212		4.9N	89.4E	20																
05011218		5.2N	88.8E	20																
05011300		5.2N	88.2E	25																
05011306		5.4N	87.5E	25																

05011312		5.6N	87.3E	30																
05011318		5.9N	87.1E	30																
05011400		5.9N	87.5E	30																
05011406		5.3N	87.5E	30																
05011412		4.9N	87.3E	30																
05011418	1	5.1N	86.9E	35	13	8	31	44	57				0	0	0	0	10			
05011500	2	5.1N	86.8E	35	13	40	46	24	27				0	0	0	0	15			
05011506	3	4.9N	86.7E	35	21	43	40	12	54				0	0	0	5	20			
05011512	4	4.6N	86.6E	35	18	25	17	40					0	0	0	10				
05011518	5	4.5N	86.5E	35	8	19	18	78					0	0	5	20				
05011600	6	4.4N	86.4E	35	11	0	38						0	0	10					
05011606	7	4.4N	86.2E	35	13	57	32						0	5	15					
05011612	8	4.6N	85.9E	35	18	42							0	10						
05011618	9	5.0N	85.5E	30	8	68							0	10						
05011700	10	4.7N	85.3E	25	5								0							
05011706		4.3N	85.3E	20																
			AVERAGE		13	34	32	40	46				0	3	4	7	15			
			BIAS										0	3	4	7	15			
			# CASES		10	9	7	5	3				10	9	7	5	3			

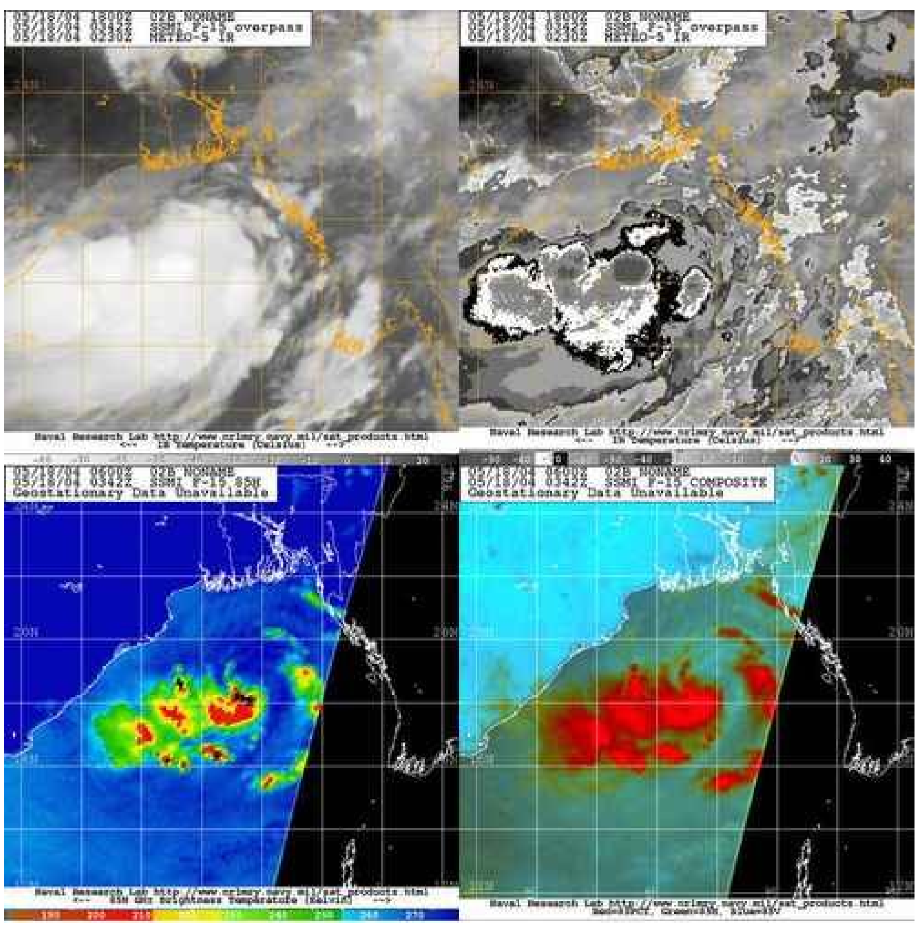
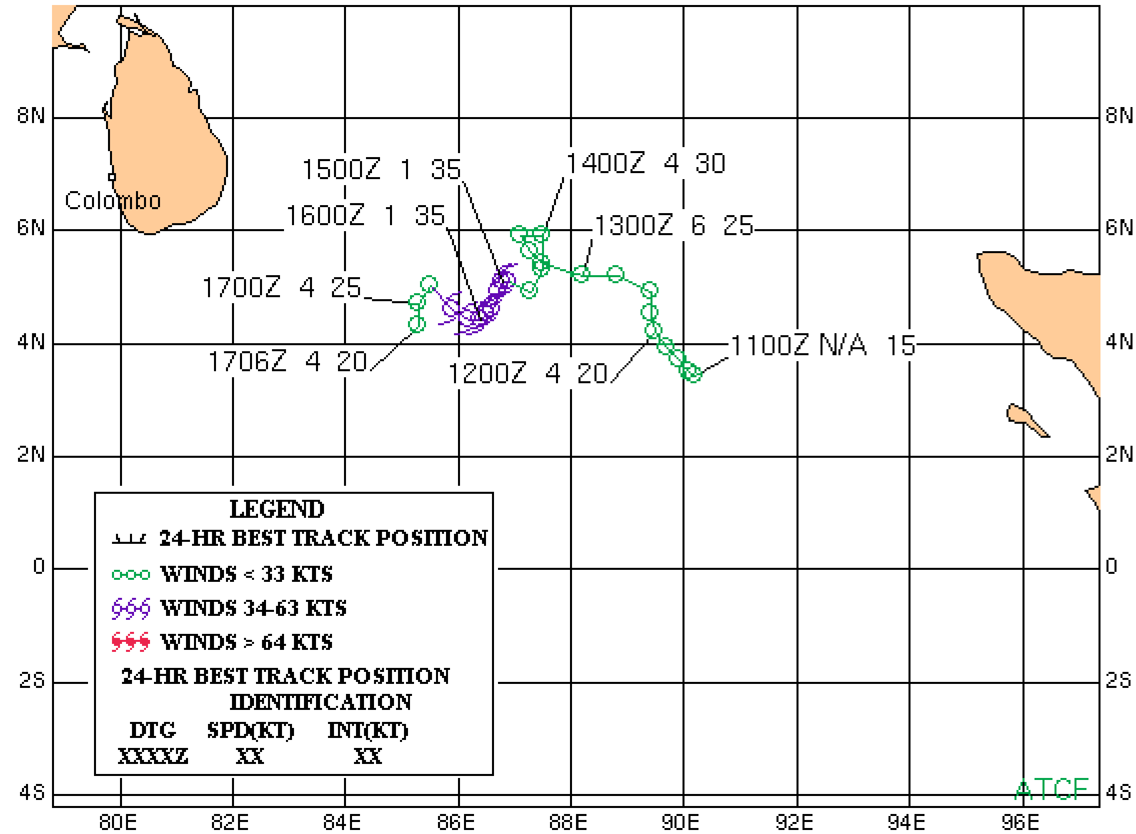
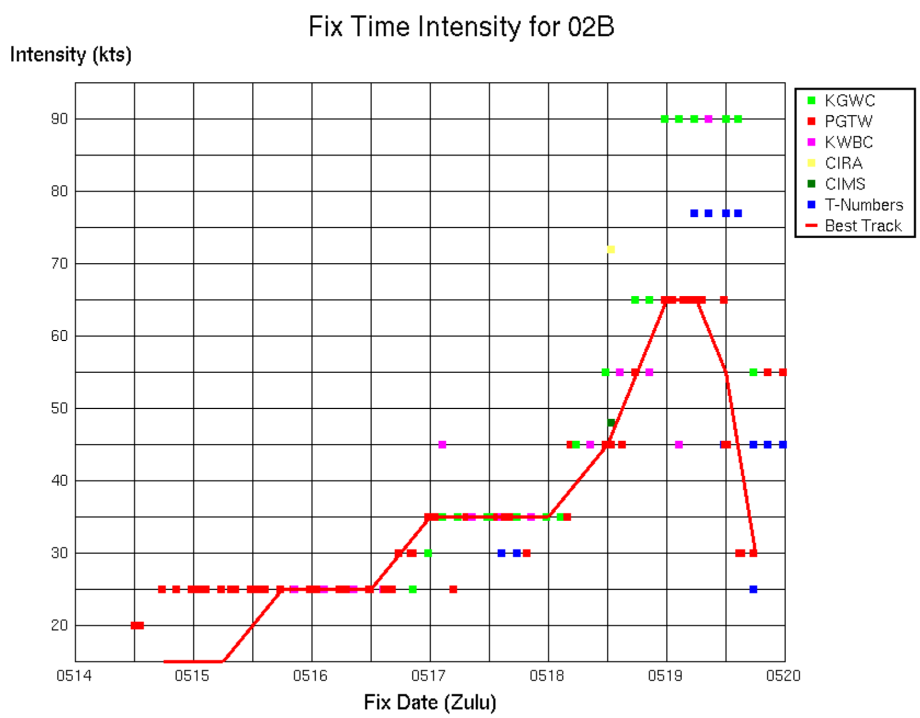


Figure 1-02B-1. 180342Z May 2004 SSM/I Multi-sensor imagery of TC 02B, reveals a partially exposed Low-level circulation center to the northeast of the associated deep convection with a peak intensity of 50kts.

TROPICAL CYCLONE 02B
12 -19 MAY 2004





Tropical Cyclone (TC) 03A

First Poor : N/A

First Fair : 0700 30 Sep 04

First TCFA : 0200Z 01 Oct 04

First Warning : 1200Z 01 Oct 04

Last Warning : 0000Z 03 Oct 04, Dissipated over water

Max Intensity : 35 kts, gusts to 45 kts

Landfall : near Porbandar, India

Total Warnings : 4

Remarks:

1) Tropical cyclone (TC) 03A formed approximately 300 nm south of Karachi, Pakistan and intensified slowly over 18 hours as it tracked northeastward. A maximum intensity of 35 kts was attained on 02 Oct when a poleward outflow channel developed. The cyclone then weakened over the next 18 hours as it approached northwestern India. The final warning was issued at 0000Z on 03 Oct. The cyclone became decoupled and upper-level circulation moving inland over India and the low-level circulation center remaining in the Arabian Sea. The remnants of TC 03A was monitored for days as it made a cyclonic loop overwater south of Karachi, then tracked southward and he next four days, and turned northward towards India. The remnants finally tracked over land near Mangrol, India on 10 Oct.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC 03A

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04093006		16.3N	69.0E	20																
04093012		17.1N	68.2E	20																
04093018		17.8N	67.3E	25																
04100100		18.5N	67.0E	30																
04100106		19.2N	66.6E	30																
04100112	1	19.9N	66.4E	30	12	56	72	88	30				0	0	-5	0	-5			
04100200	2	21.0N	66.9E	35	5	13	58	129	302				5	5	5	-5	-10			
04100212	3	22.1N	67.6E	35	12	42	107	232	353				0	5	-5	-10	-15			
04100300	4	22.9N	68.5E	25	73	142							-5	-15						
04100306		23.3N	68.3E	30																
04100312		23.4N	67.9E	30																
04100318		23.1N	67.5E	30																
04100400		22.5N	67.4E	25																
04100406		21.9N	67.3E	25																
04100412		21.3N	67.2E	25																
04100418		20.8N	67.2E	25																
04100500		20.4N	67.7E	25																
04100506		19.9N	67.8E	25																
04100512		19.4N	67.8E	25																
04100518		19.1N	67.9E	20																
04100600		18.8N	68.0E	20																
04100606		18.6N	68.0E	20																
04100612		18.4N	68.1E	20																
04100618		18.2N	68.2E	25																
04100700		18.0N	68.3E	25																
04100706		17.9N	68.5E	25																
04100712		18.1N	68.8E	25																
04100718		18.3N	68.6E	25																
04100800		18.6N	68.6E	25																
04100806		18.9N	68.6E	25																
04100812		19.1N	68.8E	25																
04100818		19.4N	68.9E	25																
04100900		19.6N	69.1E	25																
04100906		19.9N	69.3E	25																
04100912		20.4N	69.6E	25																
04100918		20.9N	70.2E	25																
04101000		21.0N	70.7E	25																
			AVERAGE		26	63	79	150	228				3	6	5	5	10			
			BIAS										0	-1	-2	-5	-10			
			# CASES		4	4	3	3	3				4	4	3	3	3			

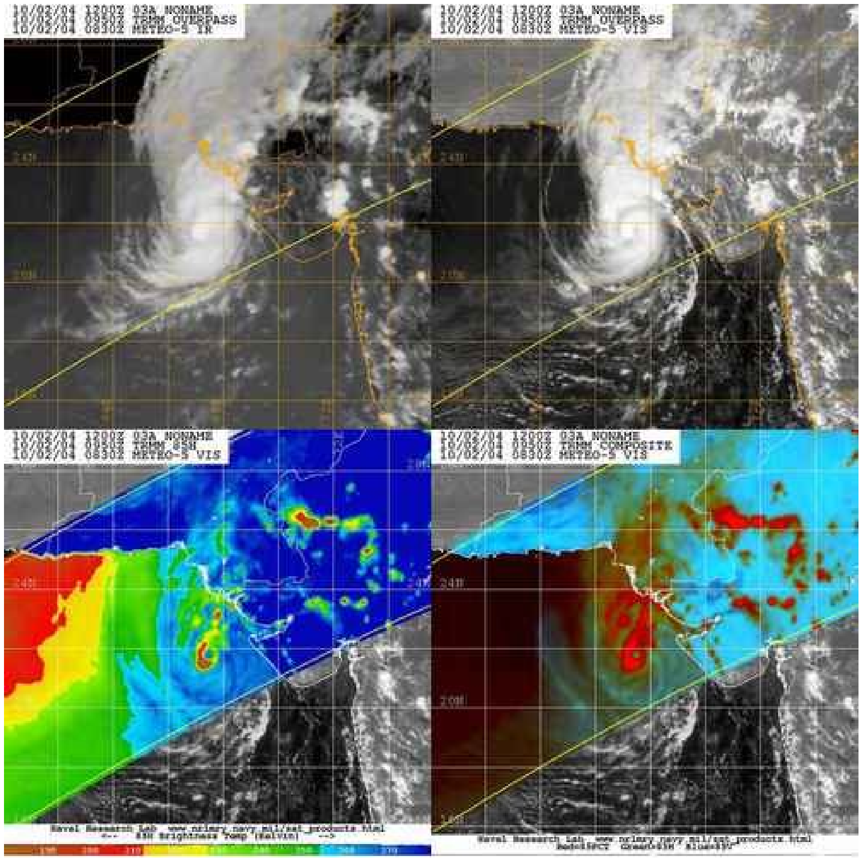


Figure 1-IO03-1. 020950Z October 2004 TRMM multisensor imagery of TC 03A, visible and infrared imagery reveal a very well organized low-level circulation center while the microwave images suggest the system has a small pinhole eye. At this time, the system was located approximately 120NM south of Karachi, Pakistan with a peak intensity of 35 knots.

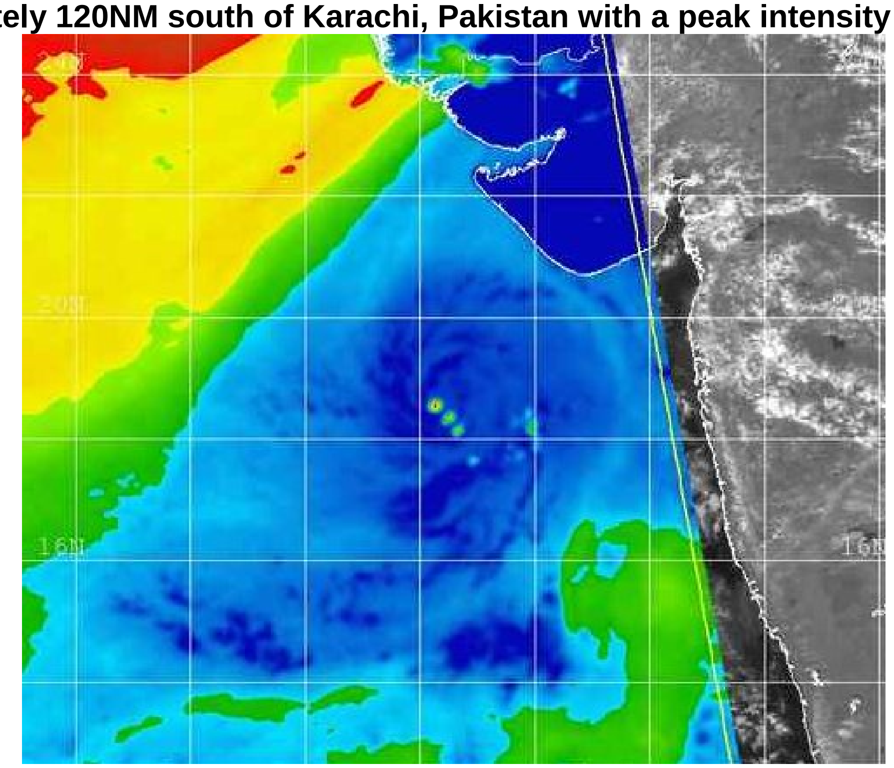
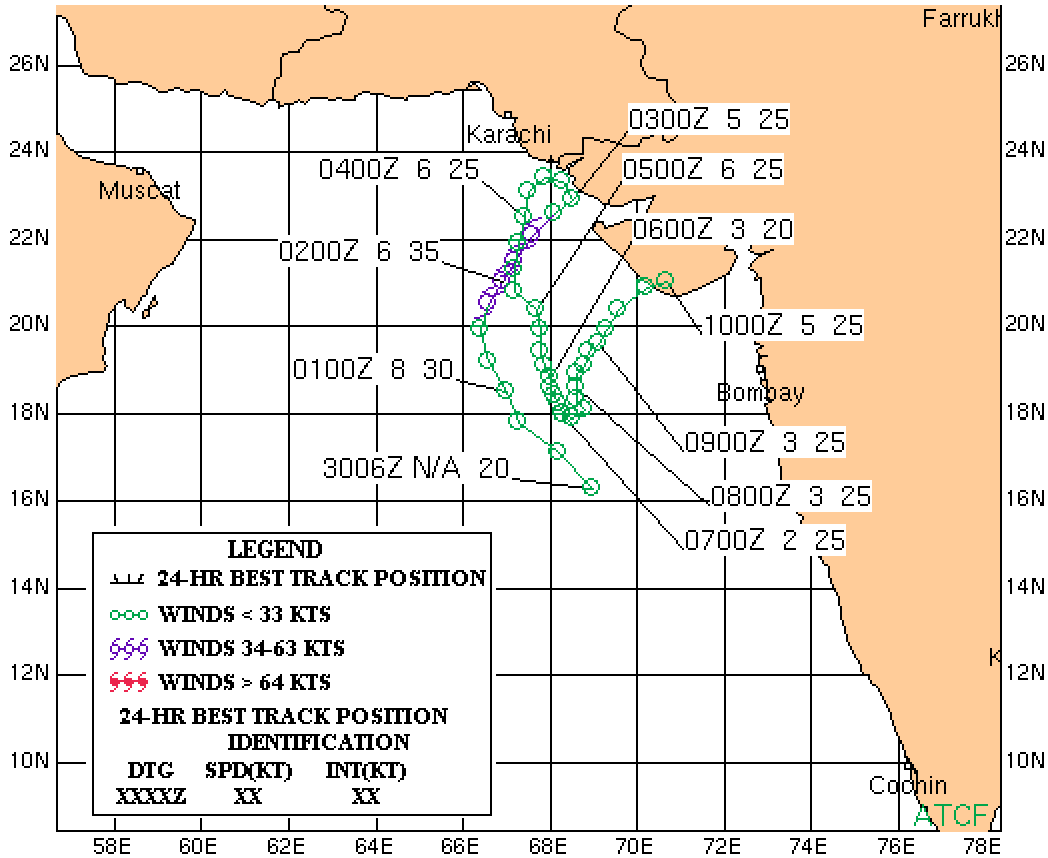
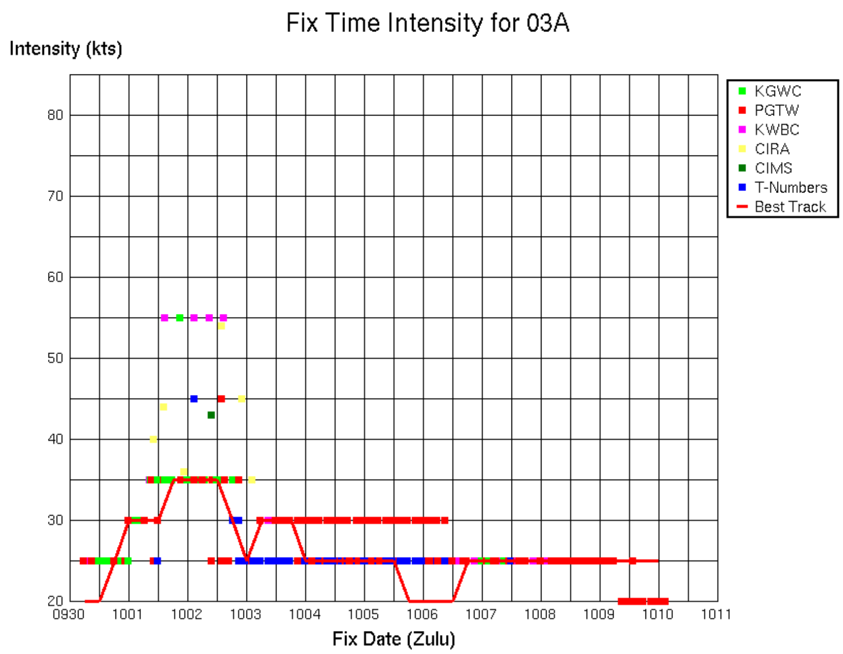


Figure 1-IO-2. 080900Z October 2004 AMSR-E microwave image of TC 03A, reveals the systems low-level circulation center was fully exposed with no associated convection. At this time, the system was located west of India in the Arabian Sea with a peak intensity of 25 knots.

TROPICAL CYCLONE 03A
01 -03 OCT 2004





Tropical Cyclone (TC) 04A

First Poor : N/A

First Fair : 1800Z 03 Nov 04

First TCFA : 0700Z 04 Nov 04

First Warning : 1200Z 04 Nov 04

Last Warning : 1800Z 07 Nov 04, Dissipated over water

Max Intensity : 40 kts, gusts to 50 kts

Landfall : None

Total Warnings : 13

Remarks:

1) Tropical cyclone (TC) 04A was initially detected as a tropical disturbance west of the Maldive Islands on 01 Nov. The cyclone initially moved poleward for several days around the western periphery of the subtropical ridge as it consolidated. Subsequently, it began tracking westward under the influence of the ridge which became established north of the cyclone. The cyclone then intensified to tropical storm intensity reaching maximum intensity of 40 kts before vertical wind shear and slightly drier air began to affect the system.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC 04A

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04110112		9.4N	67.8E	20																
04110118		10.0N	67.1E	20																
04110200		10.4N	66.3E	20																
04110206		11.3N	66.4E	25																
04110212		12.1N	66.6E	25																
04110218		12.7N	67.0E	25																
04110300		13.3N	67.2E	25																
04110306		13.8N	66.9E	25																
04110312		14.3N	66.7E	25																
04110318		14.8N	66.6E	25																
04110400		14.8N	66.3E	30																
04110406		14.7N	66.0E	35																
04110412	1	14.5N	65.8E	35	21	24	18	18	74				0	0	-5	5	5			

04110500	2	14.0N	65.4E	35	18	19	13	59	110				0	-5	0	0	0			
04110506	3	13.9N	64.8E	40	5	8	25	59	58				0	0	10	10	10			
04110512	4	14.2N	64.2E	40	13	19	59	100	76				-5	0	5	0	10			
04110518	5	14.3N	63.4E	40	55	92	133	151	182				-5	5	10	5	10			
04110600	6	14.5N	62.5E	35	40	81	122	131	156				5	10	10	15	15			
04110606	7	14.7N	61.6E	35	29	58	81	127	147				5	5	5	10	10			
04110612	8	14.9N	60.6E	35	5	17	90	105	106				0	0	10	10	10			
04110618	9	15.0N	59.5E	35	18	62	109	97					-5	0	10	5				
04110700	10	15.0N	58.4E	35	13	78	103	102					0	10	10	5				
04110706	11	14.2N	57.6E	35	13	30	36						0	10	10					
04110712	12	13.4N	56.8E	25	5	34	76						0	0	0					
04110718	13	12.8N	55.9E	25	13	55							0	0						
04110800		12.4N	54.9E	25																
04110806		12.2N	53.8E	25																
04110812		11.9N	52.7E	25																
			AVERAGE		20	44	72	95	114				2	3	7	7	9			
			BIAS										0	3	6	7	9			
			# CASES		13	13	12	10	8				13	13	12	10	8			

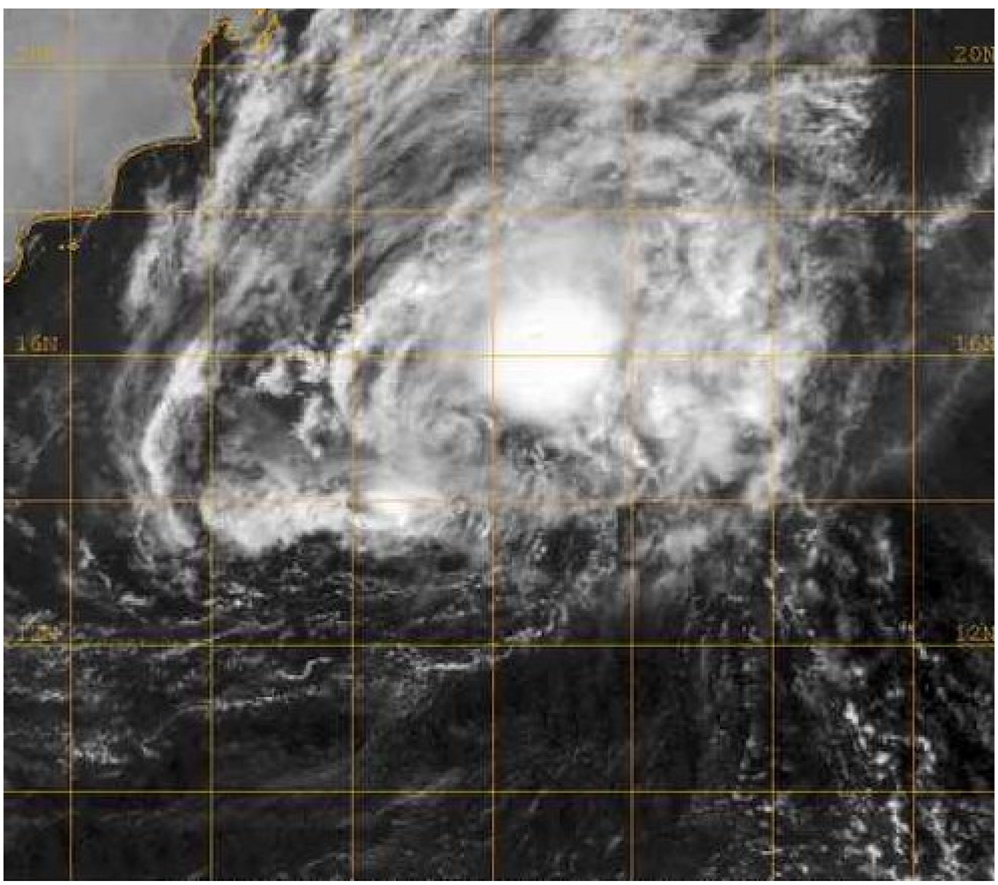


Figure 1-IO04-1. 060700Z November 2004 Meteo-5 visible image of TC 04A, reveals a fully exposed low-level circulation center located southwest of the associated deep convection. Peak intensity at this time was 40 knots.

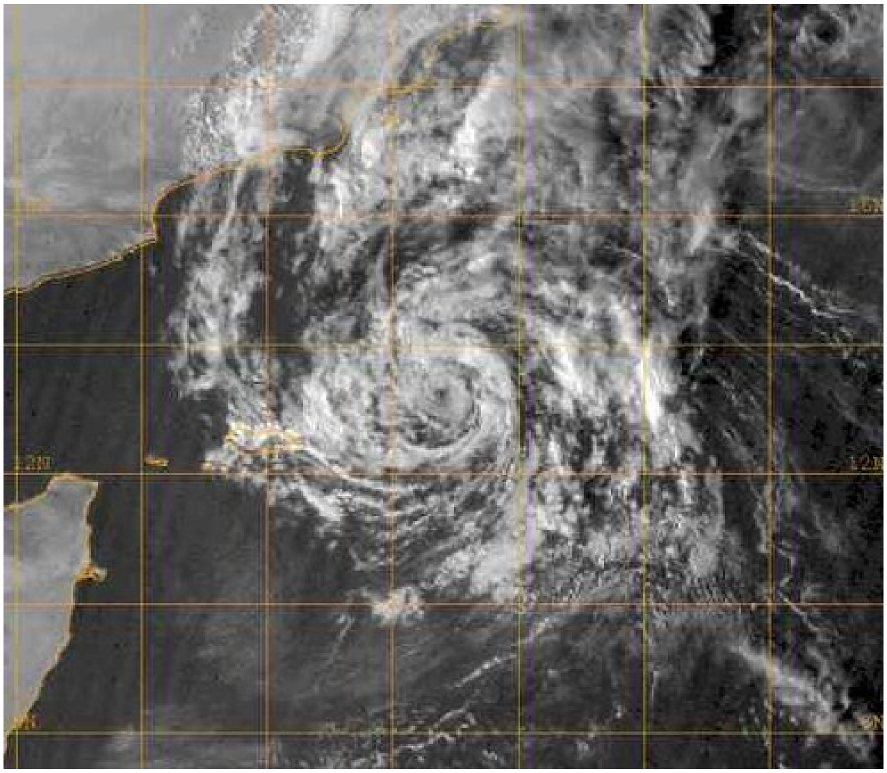


Figure 1-IO04-2. 071230Z November 2004 Meteo-5 visible satellite image of TC 04A, reveals a fully exposed low-level circulation center located 345NM northeast of Cape Guardafui, Somalia with a peak intensity of 25 knots.

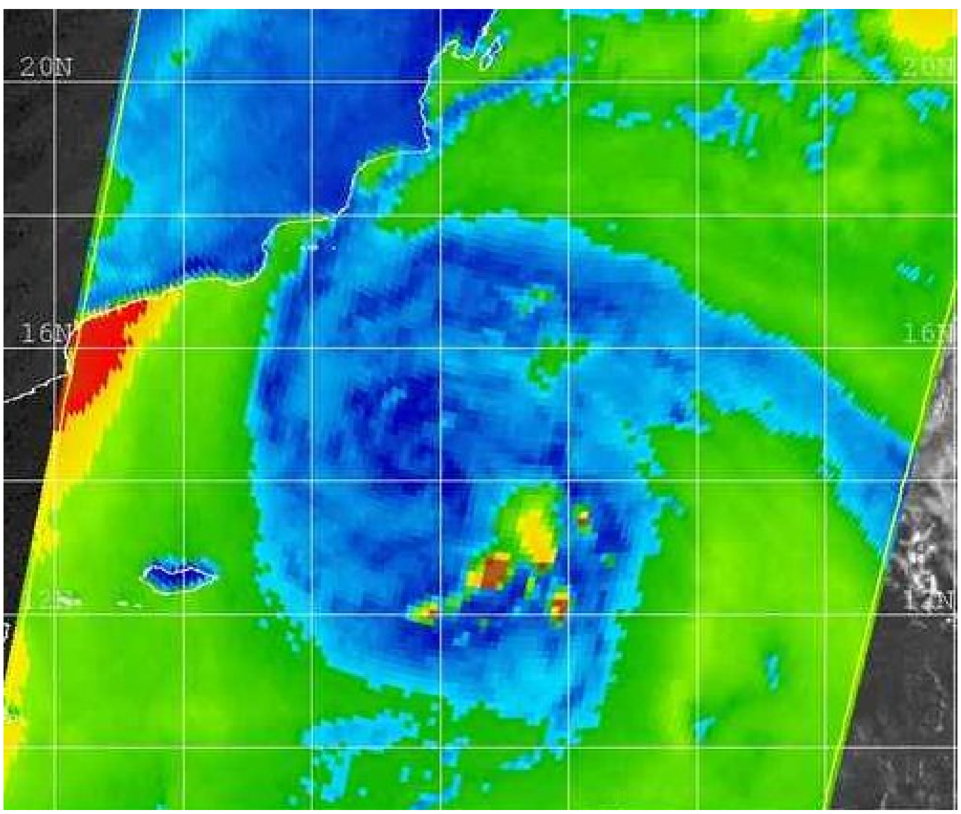
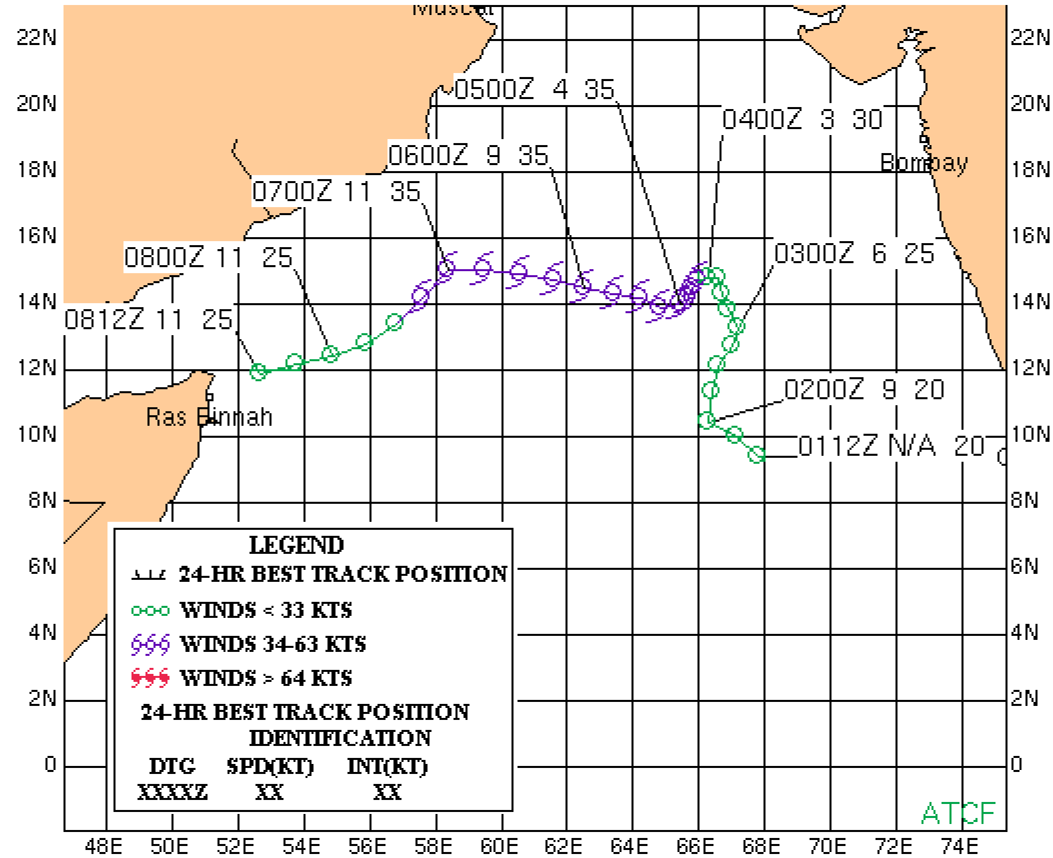
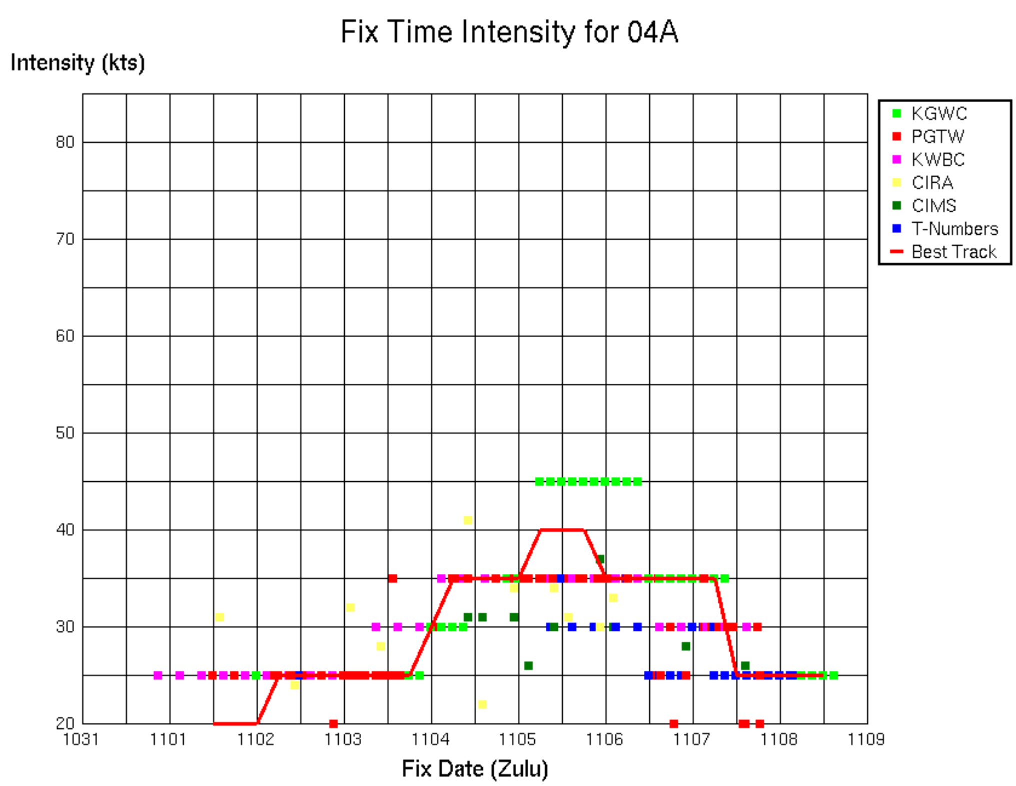


Figure 1-IO04-3. 070324Z November 2004 SSM/I microwave image of TC 04A, reveals a well-defined, fully exposed low-level circulation center with a peak intensity of 35 knots.

TROPICAL CYCLONE 04A
04 -07 NOV 2004





Tropical Cyclone (TC) 05A

First Poor : N/A

First Fair : 1800Z 26 Nov 04

First TCFA : 0300Z 28 Nov 04

First Warning : 0600Z 28 Nov 04

Last Warning : 1800Z 03 Nov 04, Dissipated over water

Max Intensity : 65 kts, gusts to 80 kts

Landfall : None

Total Warnings : 14

Remarks:

1) Tropical cyclone (TC) 05A formed approximately 550 nm west-southwest of Colombo, Sri Lanka and initially intensified slowly due to the effects of vertical windshear. The cyclone subsequently attained a maximum intensity of 65 kts on 29 Nov, and maintained this intensity for 30 hours. During this time, a small eye was noted on TRMM imagery, but was never seen in multispectral imagery. TC 05A then started to weaken on 30 Nov as it entered an environment of dry, continental air and increased vertical wind shear. The remnants of TC 05A tracked over land roughly 18 hours after the final warning was issued near Ceel Huur, Somalia.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC 05A

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04112700		1.6N	72.4E	20																
04112706		1.5N	71.5E	20																
04112712		1.2N	70.7E	20																
04112718		0.9N	69.9E	30																
04112800		0.7N	69.0E	35																
04112806	1	0.8N	68.3E	40	6	35	67	130	170				-5	-5	-10	5	0			
04112812	2	1.1N	67.5E	45	16	31	63	115	115				-5	-10	-5	5	10			
04112900	3	2.0N	65.9E	60	6	32	78	76	147				-5	-5	5	5	15			
04112912	4	3.5N	64.3E	65	5	38	24	25	8				0	5	0	5	10			
04112918	5	4.3N	63.6E	55	13	48	42	32	61				10	0	5	10	15			
04113006	6	5.7N	61.8E	65	0	17	65	87	86				0	0	15	20	15			

04113018	7	6.5N	59.9E	65	5	78	126	128	160				-10	-5	0	-5	-5			
04120106	8	7.5N	58.9E	55	13	43	72	127	171				0	10	5	5	-5			
04120118	9	7.8N	57.4E	45	16	44	112	143	177	352			0	-5	-5	-5	0	0		
04120200	10	7.9N	56.5E	45	5	38	76	110	116	355			-5	-5	-5	-5	-5	-5		
04120212	11	8.2N	55.0E	40	13	36	93	97	66				0	-5	0	0	0			
04120300	12	8.3N	53.9E	40	37	83	94	42	137				0	5	5	5	0			
04120306	13	8.3N	53.4E	40	42	36	35	148	228				0	10	5	10	5			
04120318	14	7.9N	52.1E	30	5	68							0	-5						
04120400		7.5N	51.3E	30																
04120406		6.9N	50.3E	30																
04120412		6.1N	49.2E	25																
04120418		4.6N	47.9E	25																
04120500		3.4N	46.4E	25																
04120506		1.9N	46.5E	20																
			AVERAGE		14	45	73	97	126	354			3	5	5	7	7	3		
			BIAS										-1	-1	1	4	4	-3		
			# CASES		14	14	13	13	13	2			14	14	13	13	13	2		

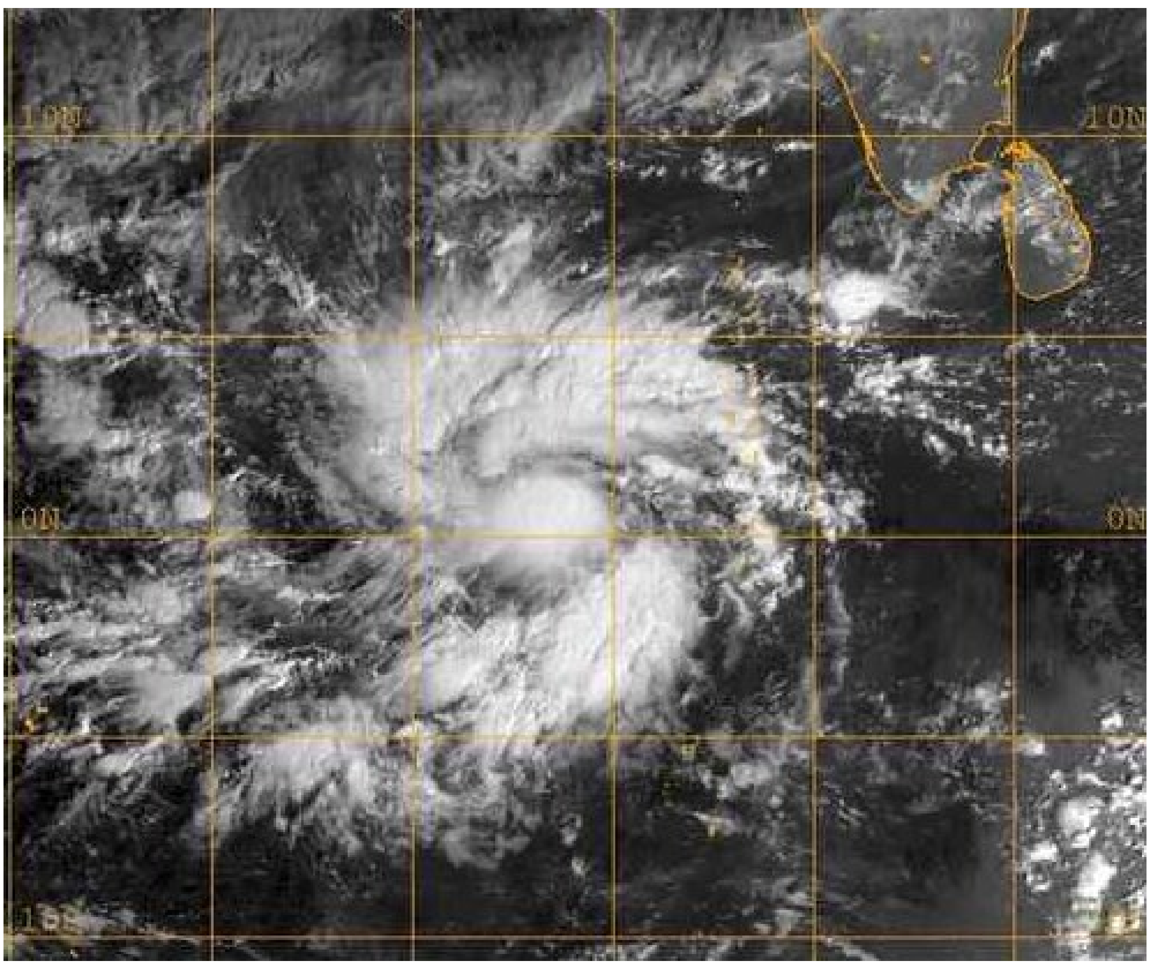


Figure 1-IO05-1. 280400Z November 2004 MET-5 visible image of TC 05A (AGNI), reveals a broad low-level circulation center located in the southern Arabian sea just north of the equator with a peak intensity of 25 knots.

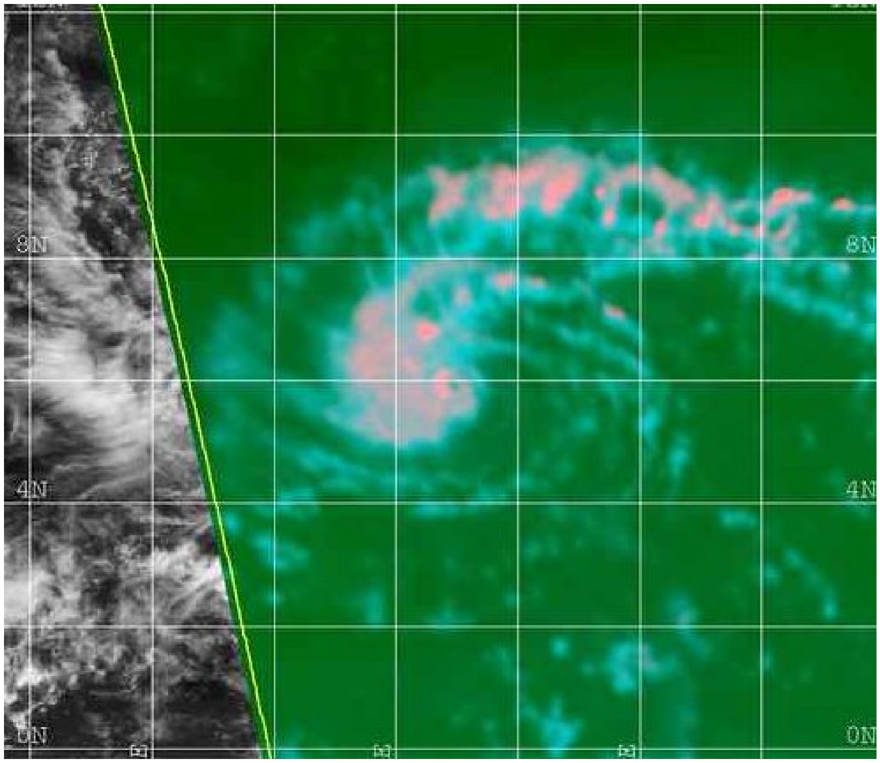


Figure 1-IO05-2. 300915Z November 2004 37GHZ AMSR-E image of TC 05A (AGNI), reveals a well organized system with a small pinhole eye. At this time, the system had a peak intensity of 65 knots.

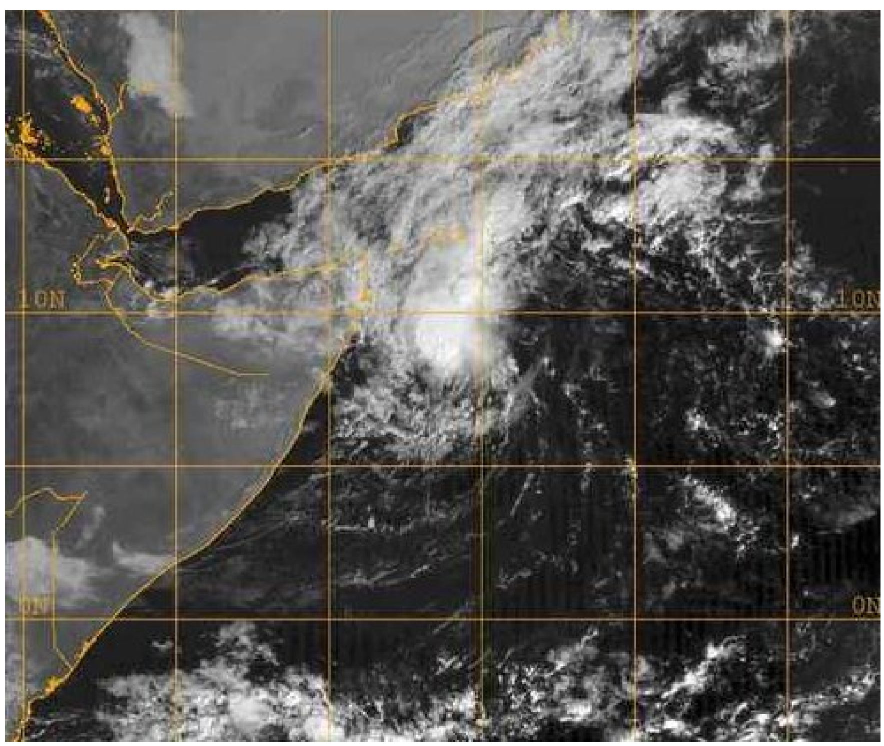
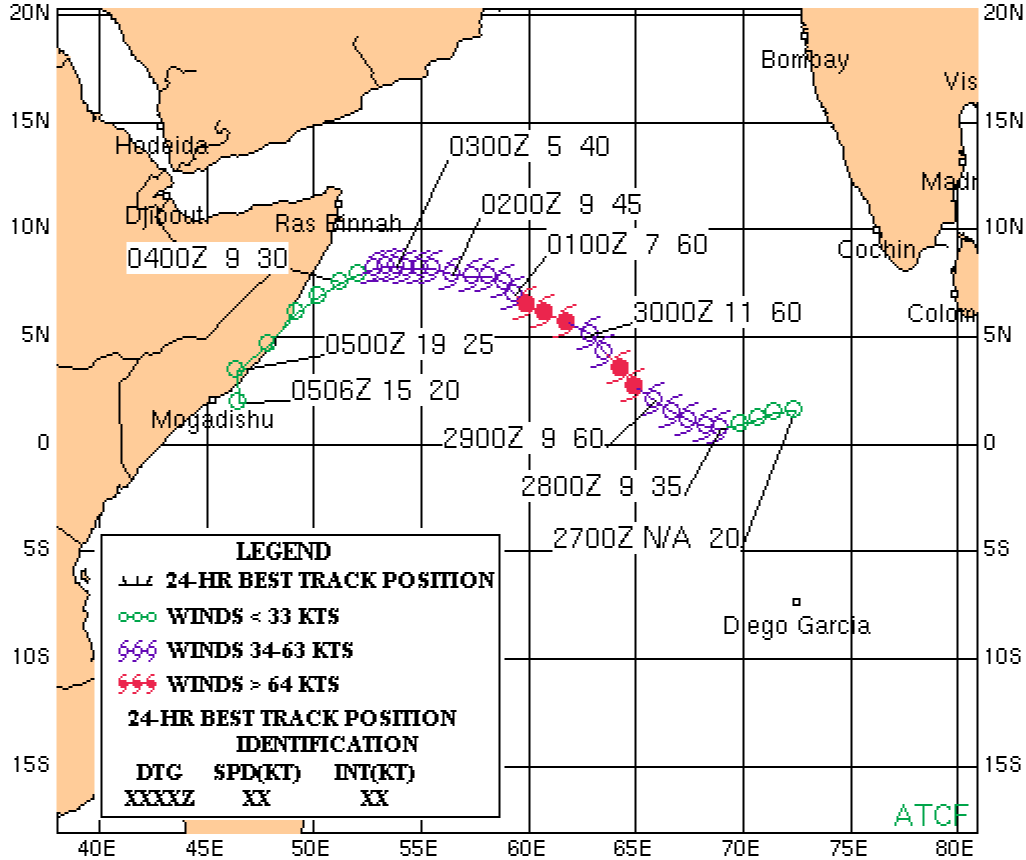
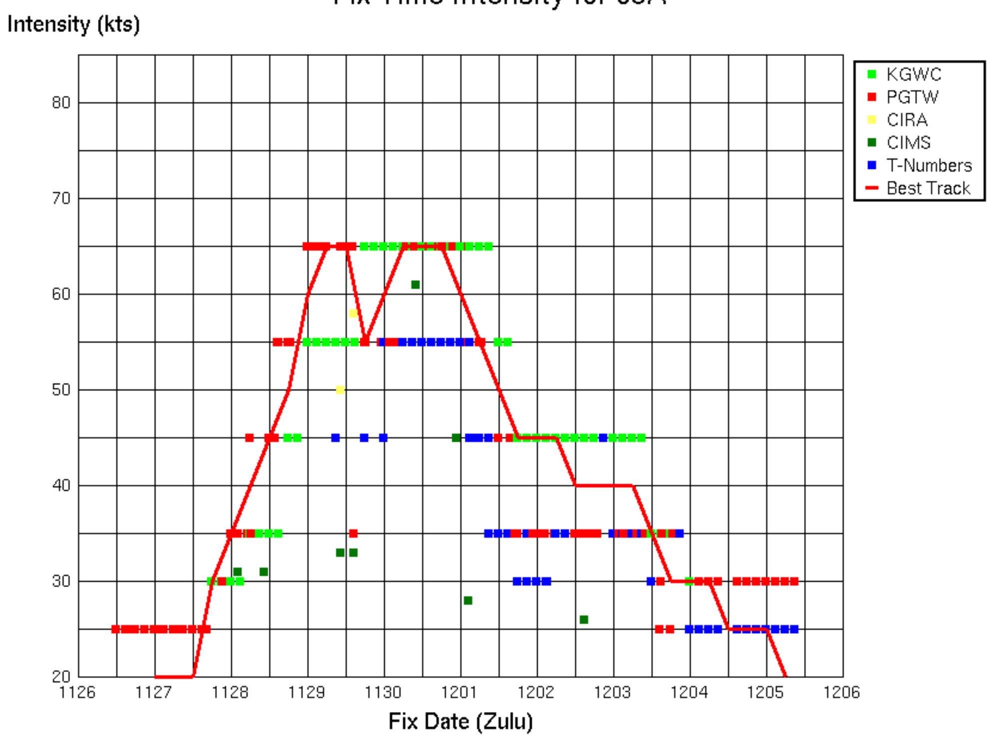


Figure 1-IO05-3. 030530Z December 2004 MET-5 visible image of TC 05A (AGNI), reveals the systems low-level circulation is becoming decoupled from the associated convection. At this time, the system was located approximately 180NM east of Somalia with a peak intensity of 40 knots.

TROPICAL CYCLONE 05A (AGNI)
28 NOV 2004 -03 DEC 2004



Fix Time Intensity for 05A



2. SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

2.1 GENERAL

In accordance with CINCPACINST 3140.1 (series), Southern Hemisphere tropical cyclones are numbered sequentially from 01 July through 30 June to reflect the Southern Hemisphere tropical season.

For warning message delineation, the Southern Hemisphere Area of Responsibility (AOR) is divided into two basins: the South Indian (west of 135° East longitude) and the South Pacific Ocean (east of 135° East longitude). The suffixes "S" (South Indian Ocean) and "P" (South Pacific Ocean) are appended to the tropical cyclone number to differentiate warnings for these basins. For this report, the Southern Hemisphere AOR is broken down into three sub-basins, reflecting primary cyclogenesis areas: South Indian (west of 105° East longitude), Australia (105° East longitude to 165° East longitude), and South Pacific (east of 165° East longitude).

2.2 SUMMARY

Table 2-1 lists the significant tropical cyclones during the 2004 season and can be compared to the climatological mean presented in Table 2-2. Table 2-3 compares this year's tropical cyclone activity in the Southern Hemisphere sub-basins to previous years and climatology. Composites of the tropical cyclone best tracks for the Southern Hemisphere appear following Table 2-3.

Table 2-1 SOUTHERN HEMISPHERE TROPICAL CYCLONES FOR 2004 (01 JULY 2003 - 30 JUNE 2004)

TC	NAME	WARNING PERIOD	NUMBER ISSUED	EST MAX SFC WINDS KTS (M/SEC)	MSLP (MB)**
01S	Abaimba	29 SEPT-04OCT	11	45 (90)	991
02S	Beni	09 NOV-20 NOV	26	100 (200)	943

03S	Cela	05 DEC-21DEC	32	65 (130)	976
04S	Jana	07 DEC-12 DEC	11	80 (160)	963
05P	Debbie	18 DEC-21 DEC	6	65 (130)	976
06S	Darius	29 DEC- 04 JAN	14	65 (130)	976
07P	Heta	31 DEC- 08 JAN	26	140 (280)	898
08S	Ken	01 JAN-06 JAN	18	35 (70)	997
09S	Elita	26 JAN-04 FEB	15	65 (130)	976
10S	Frank	27 JAN-06 FEB	21	125 (250)	916
11S	Linda	29 JAN-01 FEB	9	45 (90)	991
12P	Fritz	12 FEB-12 FEB	2	35 (70)	997
13P	Ivy	22 FEB-29 FEB	14	105 (210)	938
14S	Monty	27 FEB-02 MAR	15	110 (220)	933
15P	Evan	01 MAR-02 MAR	4	30 (60)	1000
16S	Gafilo	02 MAR-11 MAR	20	140 (280)	898
17S	Nicky-Helma	08 MAR-13 MAR	11	65 (130)	976
18S	Fay	16 MAR-27 MAR	24	120 (240)	922
19P	Grace	21 MAR-22 MAR	3	35 (70)	997
20S	Oscar	23 MAR-28 MAR	10	115 (230)	927
21S	-	23 MAR-24 MAR	3	30 (60)	1000
22P	-	07 APR-09 APR	5	35 (70)	997
23S	Juba	05 MAY-14 May	10	65 (130)	976
		Total	310		

**MSLP Converted from estimated maximum surface winds using Atkinson/Holliday wind pressure relationship. Number of warnings issued includes Amended warnings.

Table 2-2

DISTRIBUTION OF SOUTH PACIFIC AND SOUTH INDIAN OCEAN TROPICAL CYCLONES

FOR 1958 - 2004

YEAR	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTALS
1958-1977 AVE*	-	-	-	0.4	1.5	3.6	6.1	5.8	4.7	2.1	0.5	-	**24.7**
1981	0	0	0	1	3	2	6	5	3	3	1	0	**24**
1982	1	0	0	1	1	3	9	4	2	3	1	0	**25**
1983	1	0	0	1	1	3	5	6	3	5	0	0	**25**
1984	1	0	0	1	2	5	5	10	4	2	0	0	**30**
1985	0	0	0	0	1	7	9	9	6	3	0	0	**35**
1986	0	0	1	0	1	1	9	9	6	4	2	0	**33**
1987	0	1	0	0	1	3	6	8	3	4	1	1	**28**
1988	0	0	0	0	2	3	5	5	3	1	2	0	**21**

1989	0	0	0	0	2	1	5	8	6	4	2	0	**28**
1990	2	0	1	1	2	2	4	4	10	2	1	0	**29**
1991	0	0	1	1	1	3	2	5	5	2	1	1	**22**
1992	0	0	1	1	2	5	4	11	3	2	1	0	**30**
1993	0	0	1	1	0	5	7	7	2	2	2	0	**27**
1994	0	0	0	0	2	4	8	4	9	3	0	0	**30**
1995	0	0	0	0	2	2	5	4	5	4	0	0	**22**
1996	0	0	0	0	1	3	7	6	6	4	1	0	**28**
1997	1	1	1	2	2	6	9	8	3	1	3	1	**38**
1998	1	0	0	3	2	3	7	9	6	6	0	0	**37**
1999	1	0	1	1	1	6	6	8	7	2	0	0	**33**
2000	0	0	0	0	0	3	6	5	7	6	0	0	**27**
2001	0	1	0	0	1	1	4	6	2	5	0	1	**21**
2002	0	0	0	2	4	1	4	5	4	2	3	0	**25**
2003	0	0	1	0	2	5	5	7	5	2	1	1	**29**
2004	0	0	0	1	1	3	6	3	7	1	1	0	**23**
(1981-2004)													
MEAN	0.3	0.1	0.3	0.7	1.5	3.3	6.0	6.5	4.9	3.0	0.9	0.2	27.8
CASES	8	3	8	17	39	84	149	162	122	75	24	5	**695**
* (GRAY, 1978)													
The criteria used in TABLE 2-2 are as follows:													
1) If a tropical cyclone was first warned on during the last two days of a particular month and continued into the next month for longer than two days, then that system was attributed to the second month.													
2) If a tropical cyclone was warned on prior to the last two days of a month, it was attributed to the first month, regardless of how long the system lasted.													
3) If a tropical cyclone began on the last day of the month and ended on the first day of the next month, that system was attributed to the first month. However, if a tropical cyclone began on the last day of the month and continued into the next month for only two days, then it was attributed to the second month.													

Table 2-3

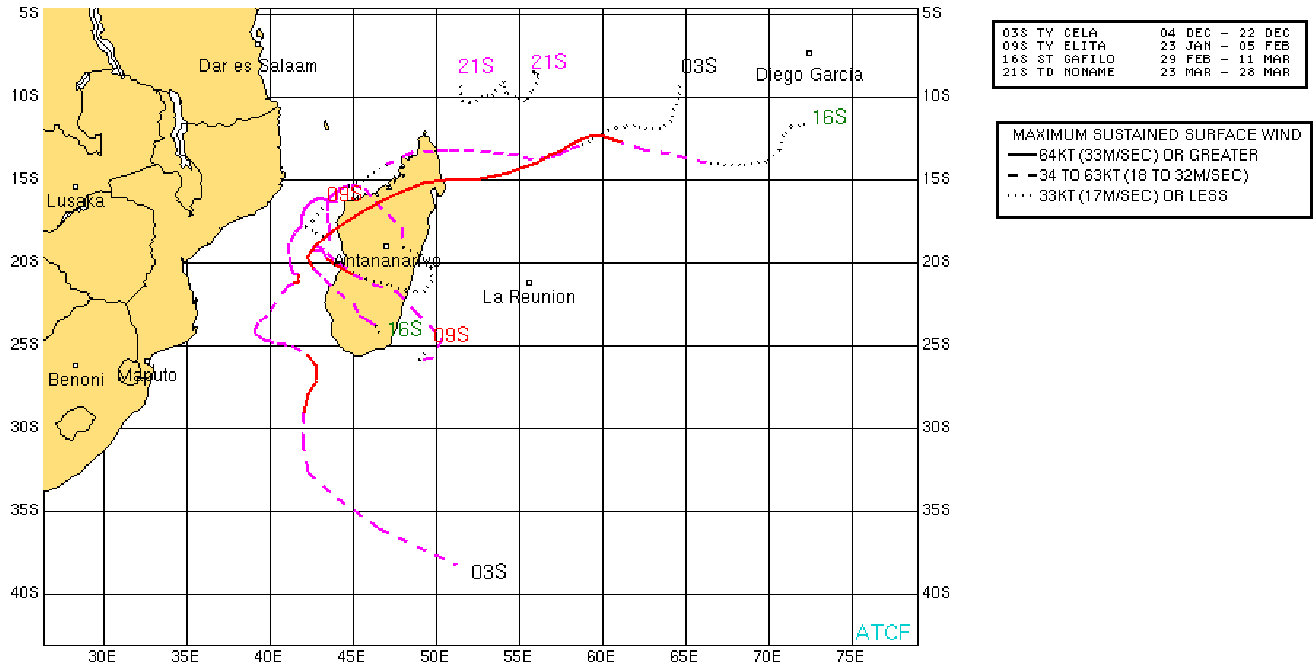
ANNUAL VARIATION OF SOUTHERN HEMISPHERE TROPICAL CYCLONES BY OCEAN BASIN

1958-2004

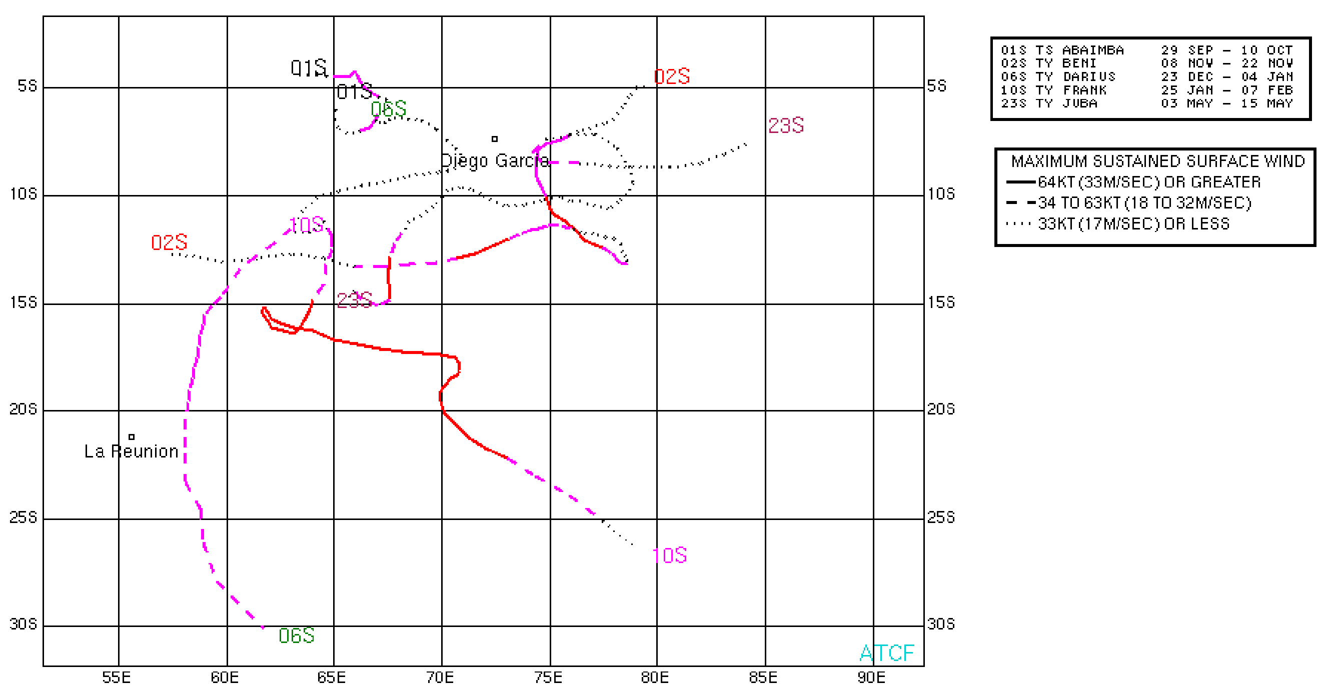
YEAR	SOUTH INDIAN	AUSTRALIAN	SOUTH PACIFIC	
	(WEST OF 105°E)	(105°E - 165°E)	(EAST OF 165°E)	TOTAL
1958-1977 AVERAGE*	8.4	10.3	5.9	24.6
1981	13	8	3	24
1982	12	11	2	25
1983	7	6	12	25

1984	14	14	2	30
1985	14	15	6	35
1986	14	16	3	33
1987	9	8	11	28
1988	14	2	5	21
1989	12	9	7	28
1990	18	8	3	29
1991	11	10	1	22
1992	11	6	13	30
1993	10	16	1	27
1994	16	10	4	30
1995	11	7	4	22
1996	13	11	4	28
1997	17	5	16	38
1998	12	10	15	37
1999	13	16	4	33
2000	10	12	5	27
2001	10	8	3	21
2002	14	7	4	25
2003	14	6	9	29
2004	13	7	3	23
(1981-2004)				
TOTAL	310	238	146	695
AVERAGE	12.4	9.5	5.8	27.8
* (Gray,1978)				

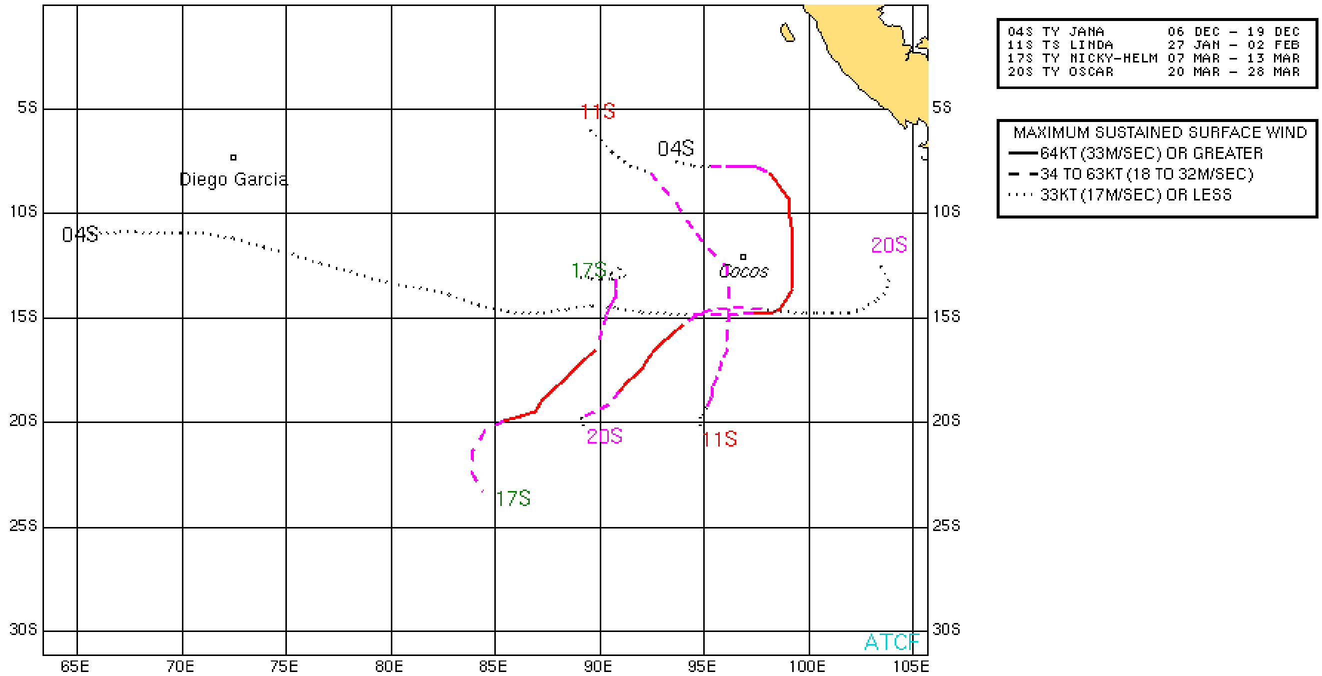
SOUTHWEST INDIAN OCEAN TROPICAL CYCLONES 04 DEC 03 - 28 MAR 04



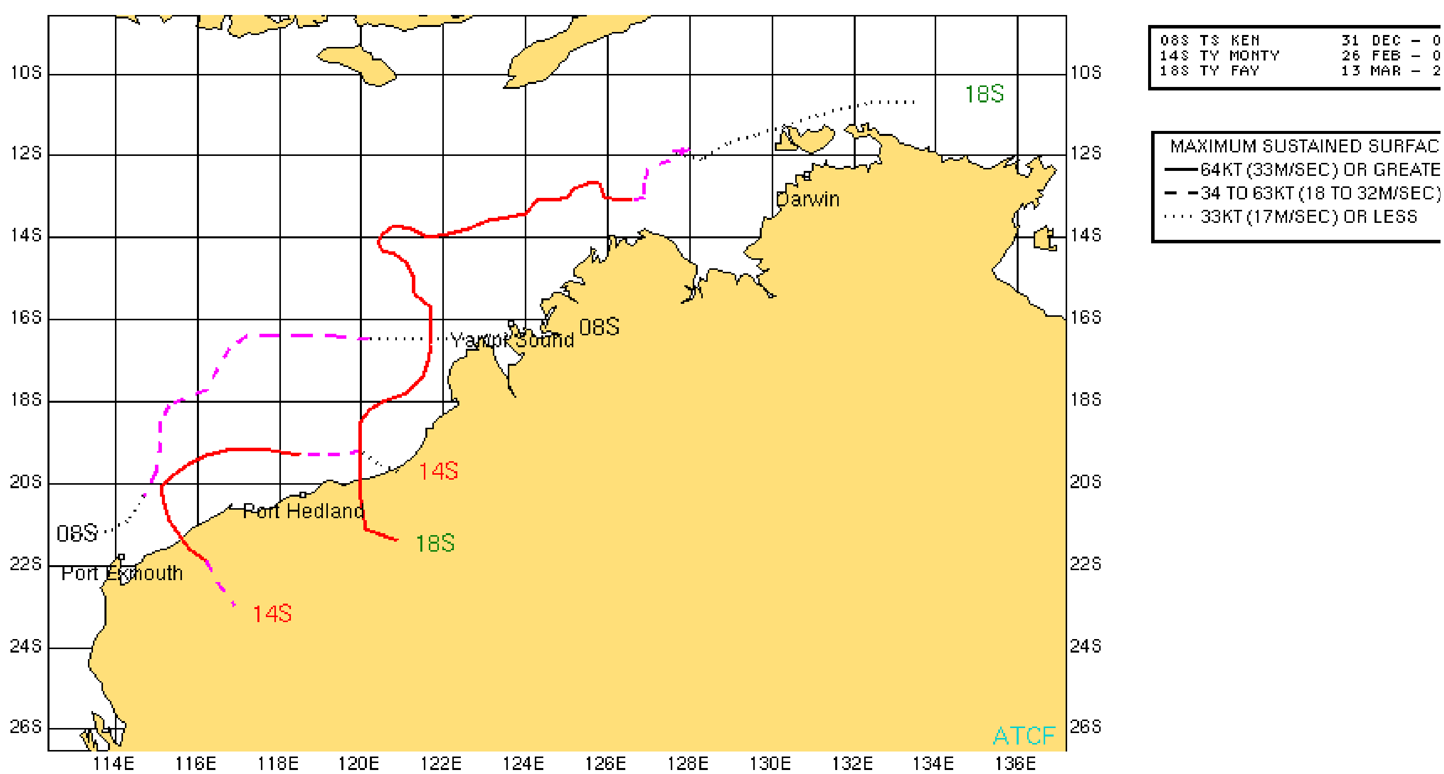
SOUTH INDIAN OCEAN TROPICAL CYCLONE TRACKS 29 SEP 03 - 15 MAY 04



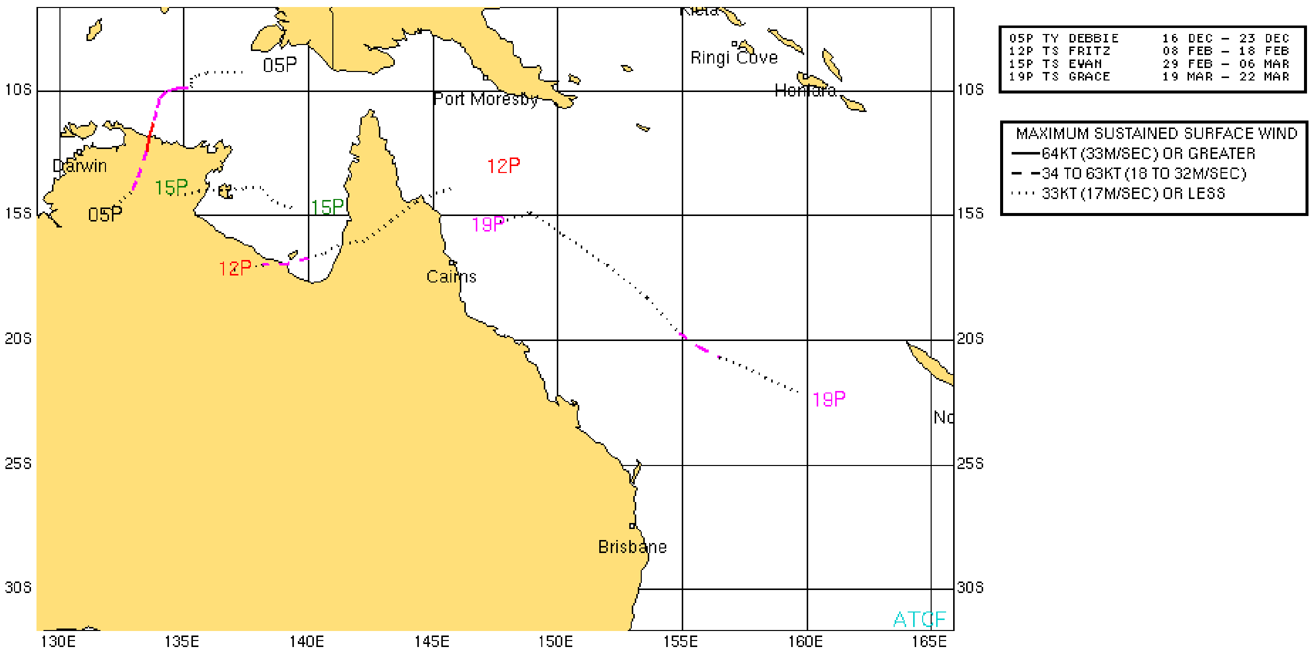
SOUTHEAST INDIAN OCEAN TROPICAL CYCLONE STORM TRACKS 06 DEC 03 - 28 MAR 04



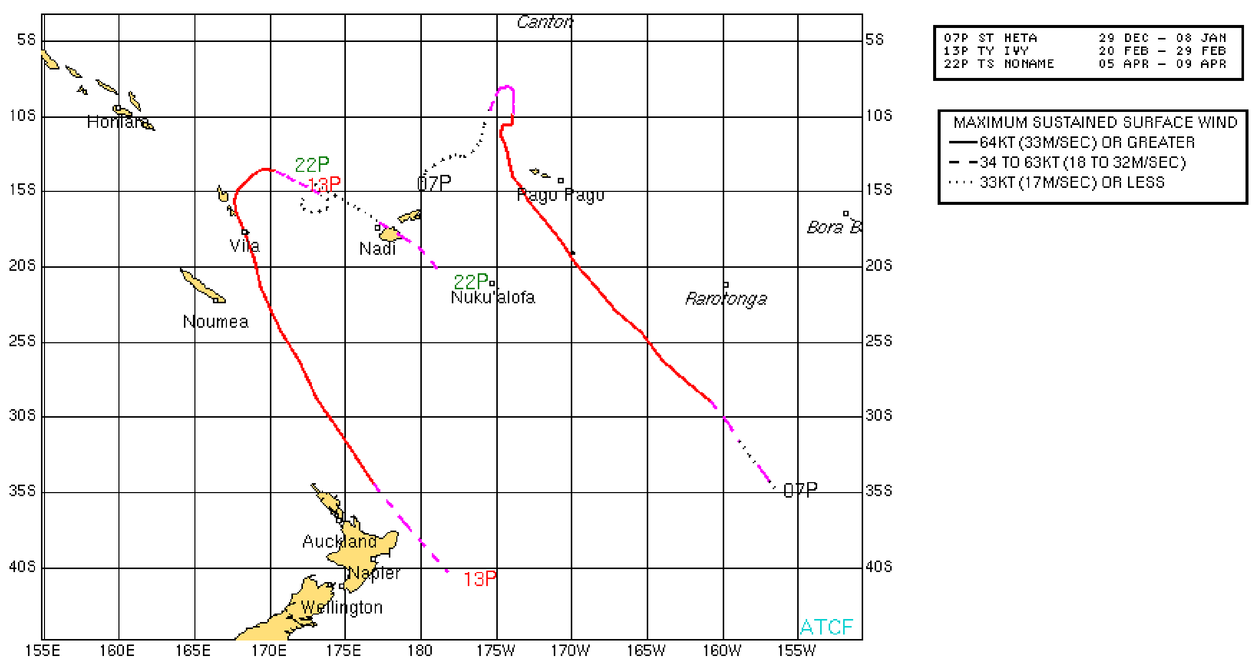
NORTHWEST AUSTRALIA REGION TROPICAL CYCLONE TRACKS 31 DEC 03 - 27 MAR 04



NORTHEAST AUSTRALIA REGION TROPICAL CYCLONE TRACKS 16 DEC 03 - 22 MAR 04



SOUTH PACIFIC OCEAN TROPICAL CYCLONE TRACKS 29 DEC 03 - 09 APR 04



Tropical Cyclone (TC) 01S (Abaimba)

First Poor : N/A

First Fair : 290400Z Sep 03

First TCFA : 290930Z Sep 03

First Warning : 291800Z Sep 03

Last Warning : 041800Z Oct 03, Dissipated over water

Max Intensity : 50 kts, gusts to 65 kts

Landfall : None

Total Warnings : 11

Remarks:

1) Tropical cyclone (TC) 01S formed approximately 600 nm west-northwest of Diego Garcia along the northern periphery of a mid-level steering ridge to the south of the system. After the initial warning, TC 01S tracked eastward toward Diego Garcia for 18 hours, and then began a gradual poleward cyclonic turn. TC 01S intensified at a less than climatological rate, achieving a maximum intensity of 50 kts at 0600Z on 01 Sep and maintaining that intensity for 18 hours before weakening. A short reintensification period occurred as the system crested the ridge axis, followed by a slow weakening trend as the cyclone encountered higher vertical wind shear poleward of the ridge axis. TC 01S dissipated south of the ridge axis as a significant tropical cyclone over water approximately 475 nm west of Diego Garcia.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC01S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
03092906		4.4S	63.4E	30																
03092912		4.4S	63.8E	30																
03092918	1	4.4S	64.2E	30	5	44	89	127	162				0	-5	-5	-10	-10			
03093006	2	4.5S	65.0E	35	5	51	96	133	197				0	5	-5	0	20			
03093018	3	4.4S	65.7E	35	16	31	27	102	227				0	-5	0	20	25			
03100106	4	4.4S	66.1E	45	11	46	99	175	245				5	10	30	40	40			
03100118	5	5.0S	66.4E	45	24	104	206	271	364				5	20	25	25	30			
03100206	6	5.4S	67.0E	30	13	17	57	43	32				0	0	-5	0	15			

03100212	7	5.5S	67.4E	30	21	90	138	126	115				0	5	0	10	25			
03100218	8	5.8S	67.5E	30	13	90	125	132	98				0	-5	0	10	15			
03100306	9	6.2S	67.0E	35	0	24	43	13	99				0	5	20	25	30			
03100318	10	6.8S	66.6E	35	0	12	60	153					-5	10	15	20				
03100406	11	7.1S	65.6E	25	18	90	179						0	5	10					
03100418	12	6.4S	65.0E	25	37	115							0	-5						
03100500		6.1S	65.1E	25																
03100506		5.8S	65.1E	25																
			AVERAGE		14	59	102	127	171				1	7	10	16	23			
			BIAS										0	3	8	14	21			
			# CASES		12	12	11	10	9				12	12	11	10	9			

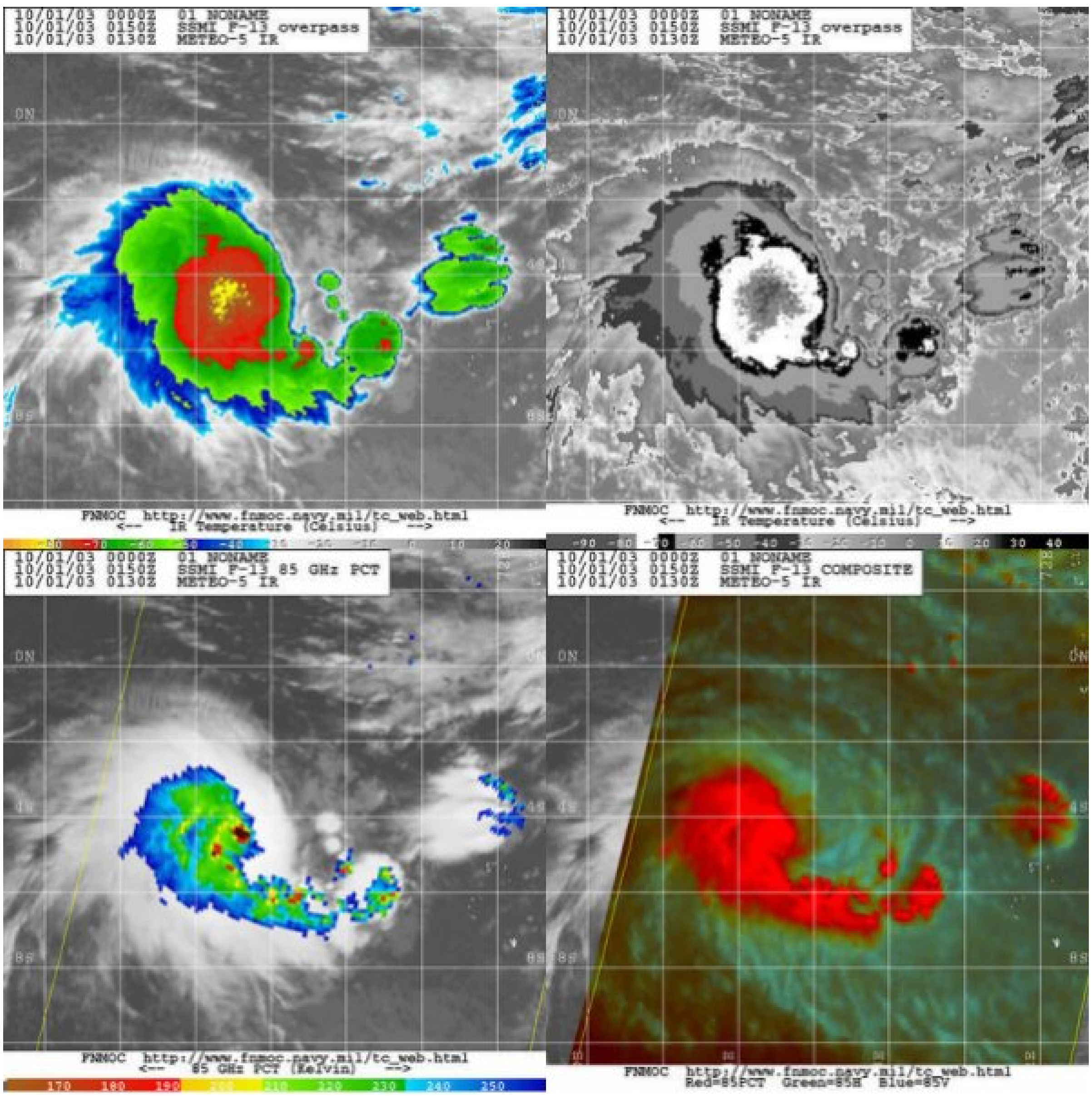
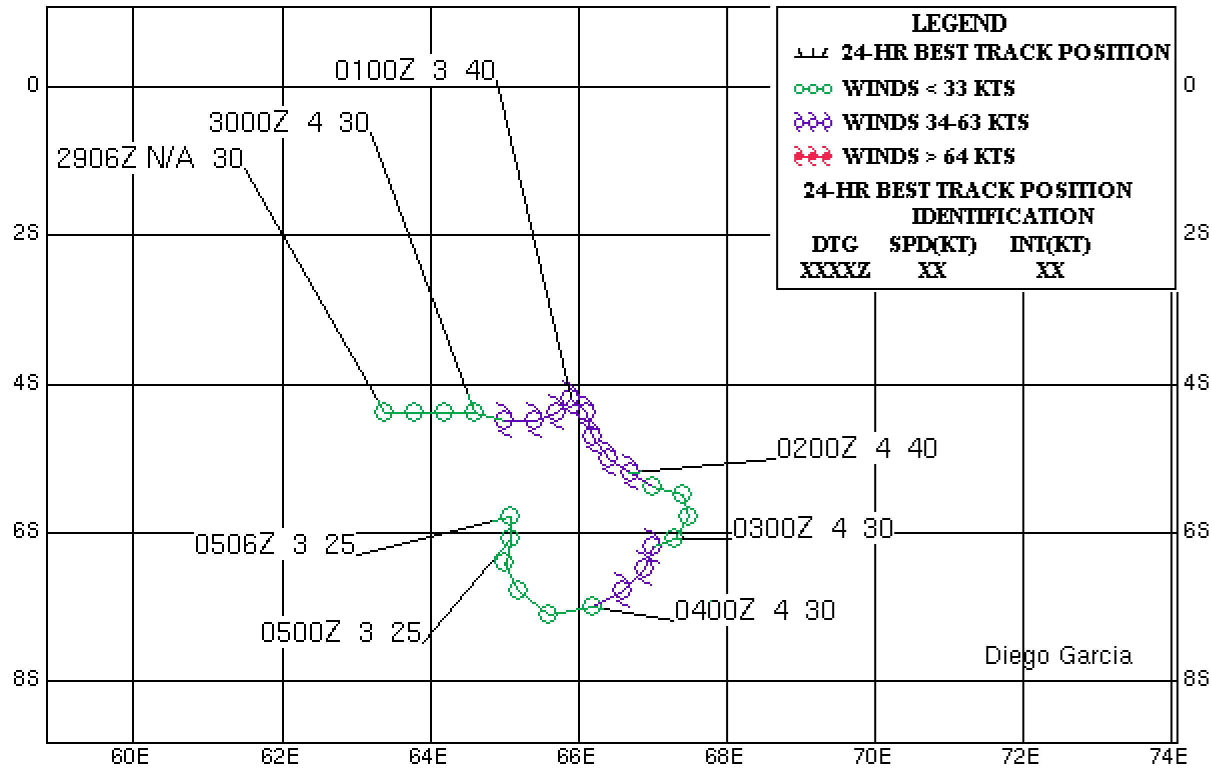
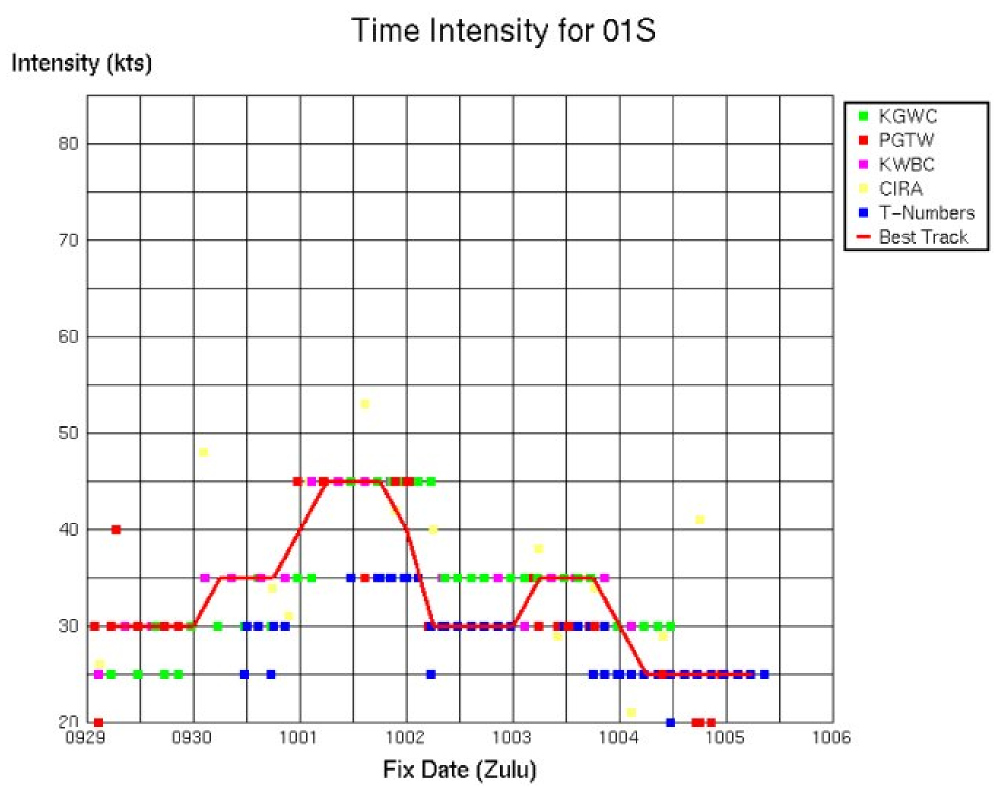


Figure 2-01S-1. 010150Z October 2003 multi-sensor satellite images of TC 01S (Abaimba), the partially exposed low level circulation center is located 450 nm east of the deep convection, northeast of Diego Garcia, with a maximum intensity of 30 knots.

TROPICAL CYCLONE 01S (ABAIMBA)
29 SEP 03 - 04 OCT 03





Tropical Cyclone (TC) 02S (Beni)

First Poor : 1800Z 07 Nov 03

First Fair : 1330Z 08 Nov 03

First TCFA : 2200Z 08 Nov 03

First Warning : 0600Z 09 Nov 03

Last Warning : 1800Z 20 Nov 03, Dissipated over water

Max Intensity : 100 kts, gusts to 125 kts

Landfall : None

Total Warnings : 26

Remarks:

1) TC 02S formed approximately 400 nm east-northeast of Diego Garcia. Initially detected as a tropical disturbance on 07 Nov, it reached warning criteria in less than 48 hours. The cyclone moved southwest, toward Diego Garcia until 11 Nov when it began heading poleward along the western periphery of the steering ridge passing 110 nm to the west of Diego Garcia. TC 02S intensified to a peak intensity of 100 kts on 13 Nov when it also began a clockwise looping track. While in this looping motion, the cyclone weakened to a Tropical Depression. On 16 Nov, TC 02S began to move westward and slowly reintensified to a maximum of 75 kts on 19 Nov. Subsequently the cyclone weakened whil continuing on it's westward track and dissipated 440 nm north of Mauritius.

2) No damage reports were received for this system.

Statistics for JTWC on TC02S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
03110812		4.9S	79.4E	25																
03110818		5.0S	79.0E	25																
03110900		5.4S	78.7E	30																
03110906	1	5.9S	78.4E	30	17	42	84	110	147				0	5	5	5	0			
03110918	2	6.6S	77.5E	30	12	36	36	40	47				0	5	0	-5	-5			
03111000	3	6.8S	76.9E	30	17	12	17	19	60				0	0	0	0	0			
03111006	4	7.0S	76.3E	30	18	54	66	78	122	152			0	0	-5	-5	-5	-40		
03111012	5	7.2S	75.9E	35	32	54	89	132	194	237			0	-5	-5	-5	-10	-50		
03111018	6	7.4S	75.5E	35	17	25	75	163	251	390			0	-5	-5	-5	-15	-45		
03111100	7	7.5S	75.1E	40	17	45	117	195	269	411			5	5	5	0	-25	-10		
03111106	8	7.6S	74.8E	45	13	51	127	214	292	461			0	0	0	-10	-25	10		
03111112	9	7.9S	74.5E	45	13	51	102	162	226	404			0	0	-5	-30	-35	15		
03111118	10	8.2S	74.4E	50	18	60	111	153	230	387			-5	-5	-15	-30	-35	10		
03111200	11	8.7S	74.4E	50	8	42	82	133	211	417			-5	-10	-35	-40	-15	5		
03111206	12	9.2S	74.4E	55	6	32	69	154	276				0	-10	-25	-40	0			
03111218	13	10.1S	74.8E	70	13	30	88	177	265				0	-15	-20	30	45			
03111306	14	10.9S	75.2E	90	5	53	112	166	226				15	15	65	75	75			
03111318	15	11.6S	76.2E	100	8	41	60	100	182				0	-15	-10	0	10			
03111406	16	12.4S	77.4E	55	5	13	62	134	206				-5	0	5	5	0			
03111418	17	13.0S	78.2E	45	21	80	112	155	223				0	10	5	0	0			
03111506	18	13.2S	78.5E	35	13	54	99	162	212				0	5	0	0	-5			
03111518	19	13.0S	78.6E	30	56	126							0	-5						
03111718	20	11.5S	76.0E	35	13	6	38	63	80				-5	-20	-15	-25	-35			
03111806	21	11.4S	74.9E	55	33	88	130	165	187				0	10	5	5	30			
03111818	22	11.6S	74.1E	55	13	46	97	134	159				0	-10	-10	5	25			
03111906	23	12.0S	73.1E	65	16	43	65	53	46				0	0	20	45	45			
03111918	24	12.5S	72.0E	70	5	21	31	53	64				-5	15	30	30	25			
03112006	25	12.9S	70.7E	55	39	115	171	235	293				10	25	25	20	20			
03112018	26	13.2S	68.5E	35	29	59	97						0	0	-5					
03112100		13.3S	67.3E	35																
03112106		13.3S	65.9E	30																
03112112		12.9S	64.5E	30																
03112118		12.7S	63.0E	30																
03112200		12.9S	61.4E	30																
03112206		13.1S	59.8E	30																
03112212		12.8S	58.5E	30																
03112218		12.7S	57.2E	25																
			AVERAGE		18	49	86	131	186	357			2	8	13	17	20	23		
			BIAS										0	0	0	1	3	-13		
			# CASES		26	26	25	24	24	8			26	26	25	24	24	8		

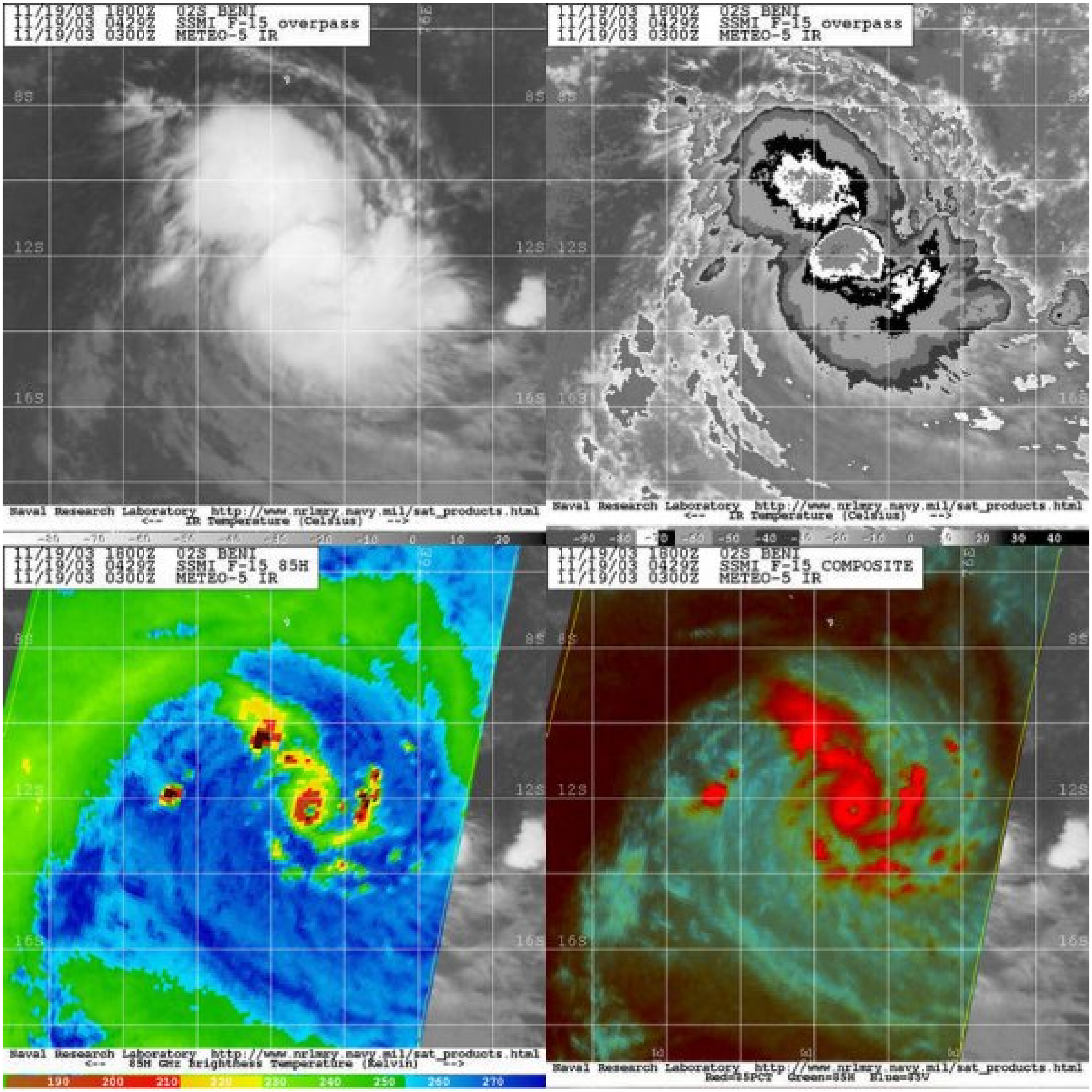
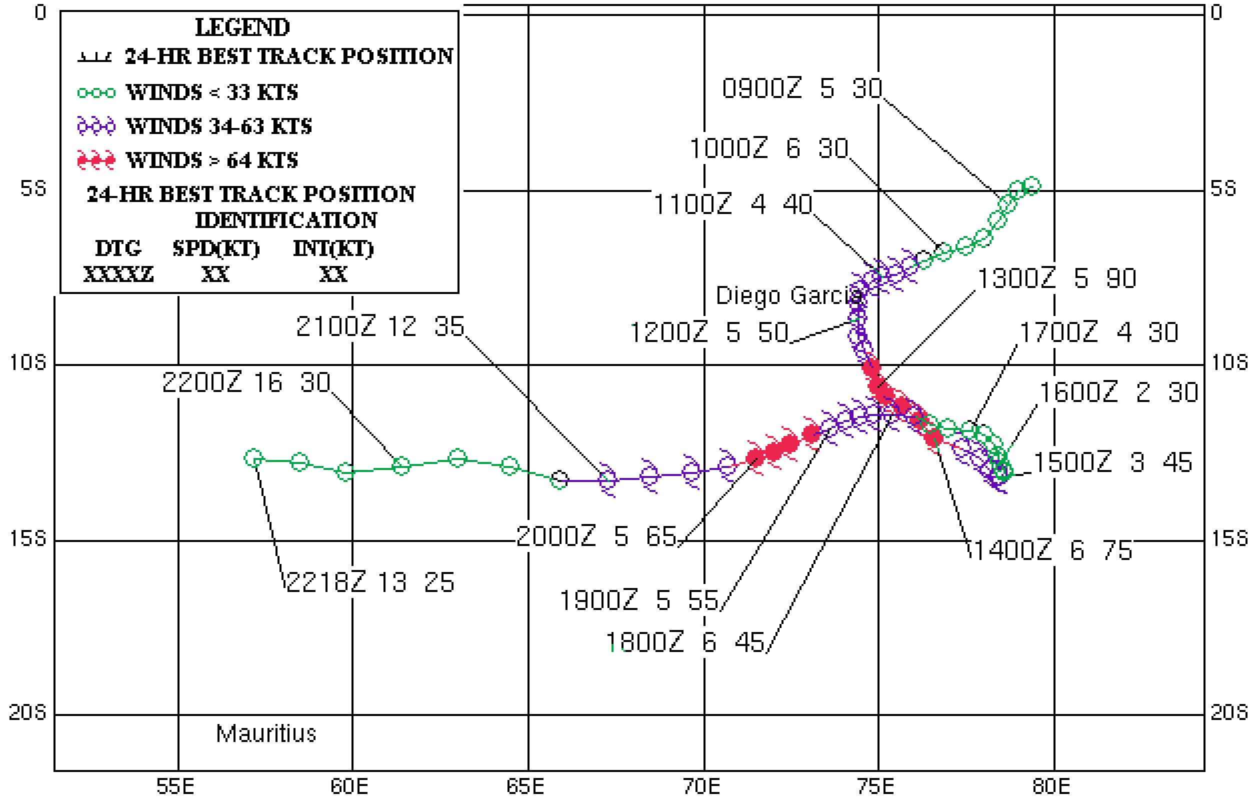
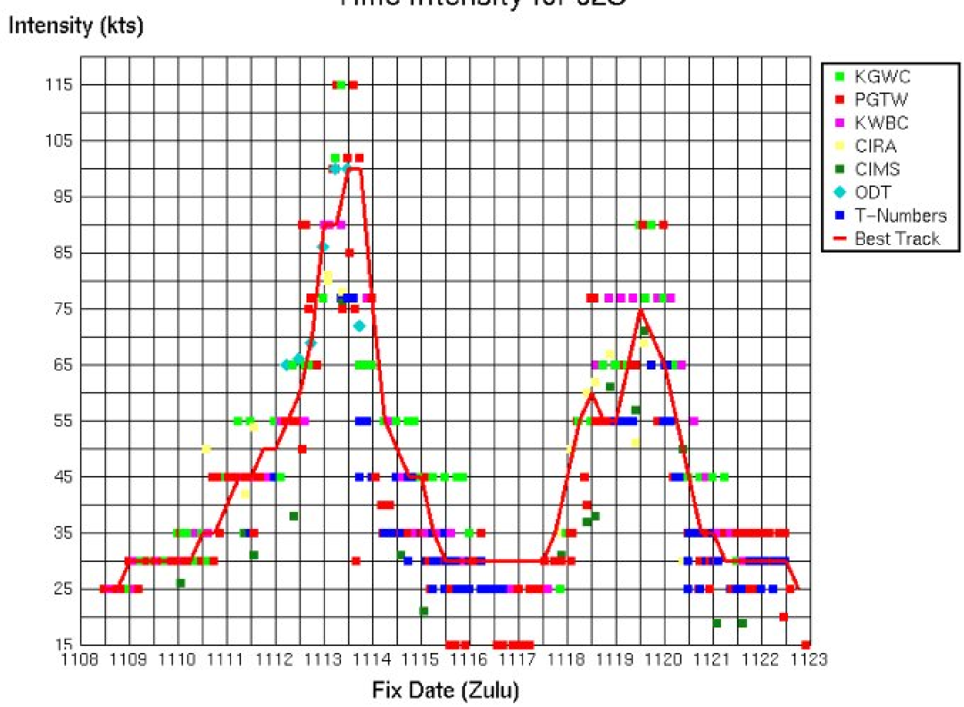


Figure 2-02S-1. 190429Z November 2003 multi-sensor satellite images of TC 02S (Beni), the small embedded eye is located east of the deep convection, 250 nm southwest of Diego Garcia, with a maximum intensity of 65 knots.

TROPICAL CYCLONE 02S (BENI)
09 NOV 03 - 20 NOV 03





Tropical Cyclone (TC) 03S (Cela)

First Poor : 0200Z 04 Dec 03

First Fair : 1800z 04 Dec 03

First TCFA : 2300Z 04 Dec 03

First Warning : 1800Z 05 Dec 03

Last Warning(s) : 0600Z 10 Dec 03 and 0600Z 21 Dec 03, Extra-tropical

Max Intensity : 65 kts, gust to 80 kts

Landfall : Approximately 90 nm SSE of the northern tip of Madagascar

Total Warnings : 32

Remarks:

1) Tropical Cyclone (TC) 03S formed approximately 480 nm west-southwest of Diego Garcia. The first warning was issued as the cyclone tracked westward, reaching a maximum intensity of 45 kts before making landfall on the northern tip of Madagascar. TC 03S then entered the Mozambique Channel and weakened to 25 kts and a final warning was issued on 10 Dec at 0600Z. Subsequently, TC 03S began to reintensify in a more favorable environment of the Mozambique Channel. TC 03S then zigzagged along the western coast of Madagascar under the influence of a series of mid-latitude troughs. The cyclone experienced two periods of maximum intensity reaching 65 kts twice while zigzagging in a general poleward path. On 20 Dec, TC 03S encountered vertical shear and unfavorable sea surface temperatures as it tracked south of 30 degrees and weakened rapidly. The final warning was issued on 21 Dec at 0600Z as TC 03S transitioned rapidly into an extratropical low and accelerated southeastwards to speeds in excess of 50 kts.

2) No damage reports were received for this system.

Statistics for JTWC on TC03S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
03120400		9.3S	64.6E	15																
03120406		10.0S	64.5E	15																
03120412		10.7S	64.3E	15																
03120418		11.4S	64.1E	15																

03120500		11.9S	63.5E	20																
03120506		11.9S	62.6E	25																
03120512		11.6S	61.9E	25																
03120518	1	11.7S	61.3E	30	8	54	113	135	158				0	5	10	10	15			
03120606	2	11.9S	60.3E	30	0	25	27	40	18				0	5	5	10	0			
03120618	3	12.6S	59.2E	30	8	19	35	26	29				0	0	5	0	5			
03120706	4	13.1S	57.9E	35	0	19	8	19	27				0	0	-5	-5	0			
03120718	5	13.6S	56.7E	35	8	35	47	59	41				5	0	5	10	15			
03120806	6	13.5S	54.9E	45	0	6	19	32	119				0	5	10	20	10			
03120818	7	13.3S	53.2E	45	13	17	21	39	113				0	5	10	10	10			
03120906	8	13.2S	51.4E	45	8	13	95	176	134				0	5	5	5	-5			
03120918	9	13.2S	49.8E	35	13	98	171	119	57				0	0	5	-10	-15			
03121006	10	14.0S	47.0E	30	13	89							0	0						
03121018	11	15.3S	44.7E	25	18	31	73	102	144				0	0	-5	-5	5			
03121106	12	15.5S	44.2E	35	39	86	112	126	141				0	-5	-5	0	-5			
03121118	13	15.7S	44.0E	40	5	21	26	18	53				0	5	15	20	25			
03121206	14	16.0S	44.0E	40	8	19	26	60	66				0	5	10	10	15			
03121218	15	16.3S	43.8E	35	8	46	96	111	126				0	0	5	5	0			
03121306	16	16.1S	43.2E	35	33	79	99	115	147				0	0	0	0	-5			
03121318	17	16.3S	42.4E	35	17	50	91	142	134				0	0	0	-5	-15			
03121406	18	17.1S	41.9E	35	11	8	41	45	48				0	0	-5	-15	-40			
03121418	19	18.1S	41.5E	35	13	25	31	21	11				0	-5	-15	-40	-45			
03121506	20	19.6S	41.1E	35	11	34	54	53	62				0	-15	-35	-40	-35			
03121518	21	20.4S	41.3E	45	18	30	52	46	120				0	-15	-20	-20	-20			
03121606	22	20.7S	41.6E	65	6	18	21	103	111				0	-10	-5	-10	-10			
03121618	23	21.1S	41.6E	65	12	42	81	110	124				0	10	5	0	-5			
03121706	24	21.4S	41.0E	55	8	47	50	71	54				0	-15	-20	-10	-10			
03121718	25	23.1S	39.8E	55	5	22	17	52	93				0	-5	-5	-15	-20			
03121806	26	23.9S	39.1E	55	8	44	120	153	80				0	-5	-10	-20	-25			
03121818	27	24.6S	39.6E	55	5	55	126	106	140				0	-5	-10	-15	0			
03121906	28	25.0S	41.3E	60	0	42	58	110	133				-5	-10	-15	-5	-5			
03121918	29	26.2S	42.8E	65	0	32	84	112	237				0	-5	5	5	0			
03122006	30	27.9S	42.3E	65	5	43	70	126					0	5	0	0				
03122018	31	30.8S	41.9E	50	13	32	139						0	5	0					
03122106	32	34.2S	44.0E	45	11	41							0	-5						
03122112		36.0S	46.6E	45																
03122118		38.2S	51.2E	45																
			AVERAGE		10	38	67	84	97				0	5	8	11	13			
			BIAS										0	-1	-2	-4	-6			
			# CASES		32	32	30	29	28				32	32	30	29	28			

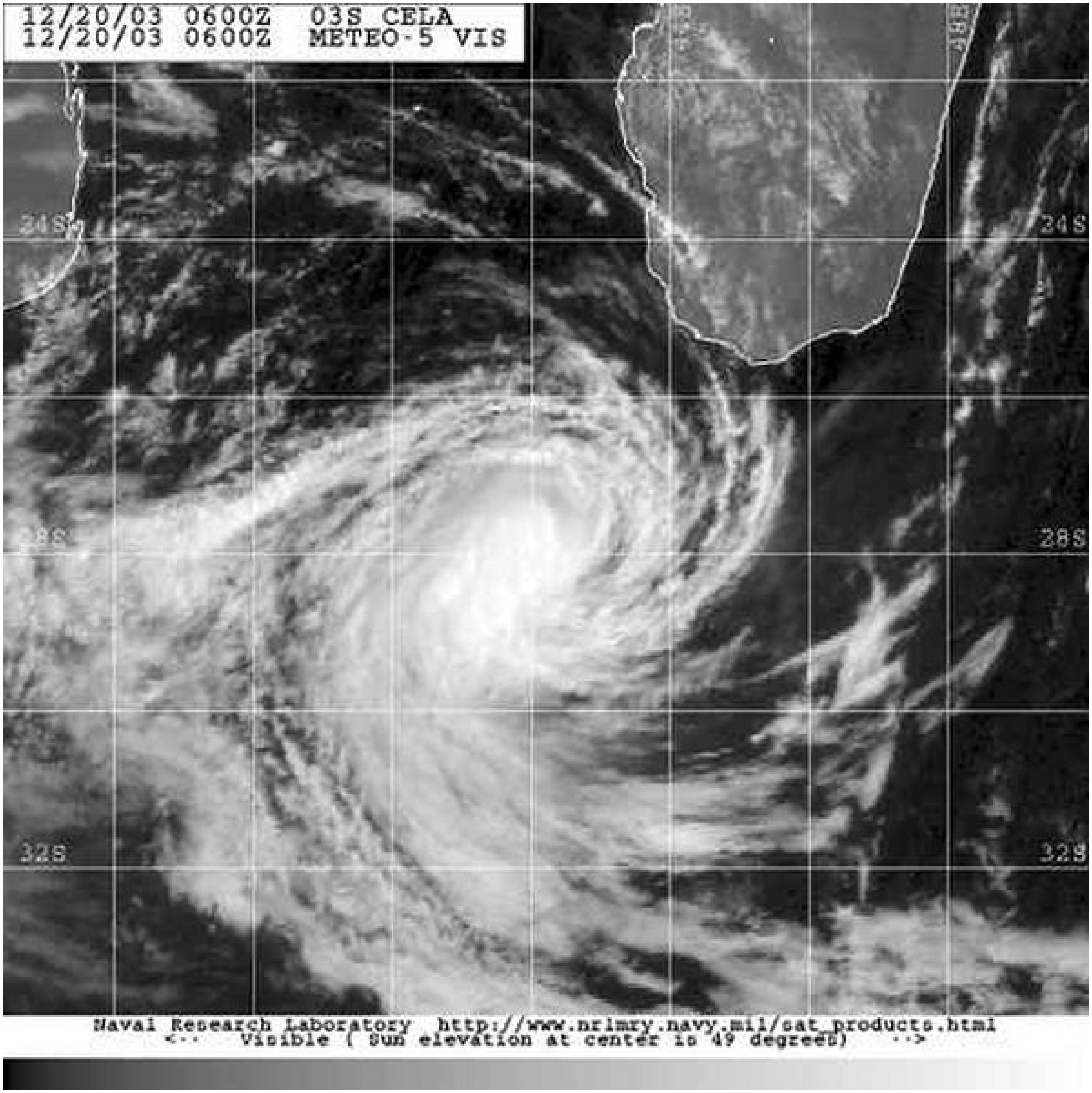
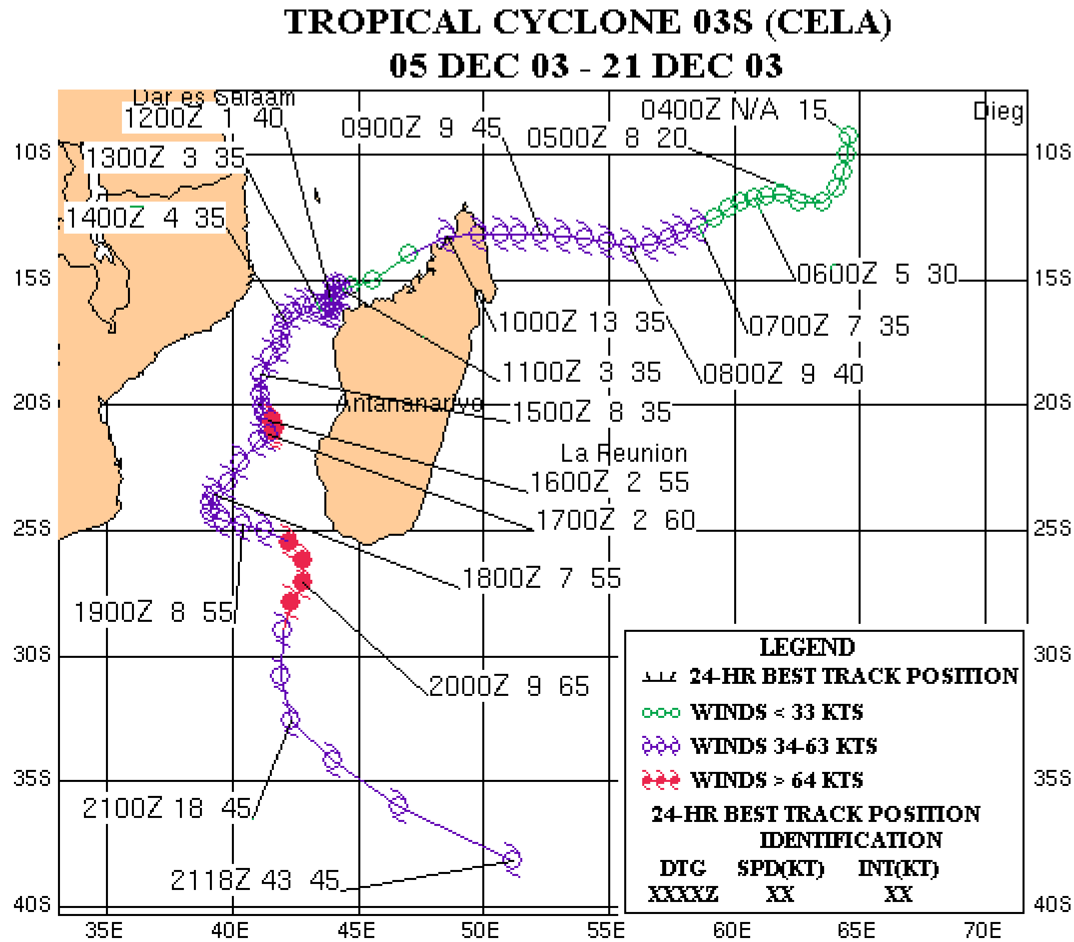
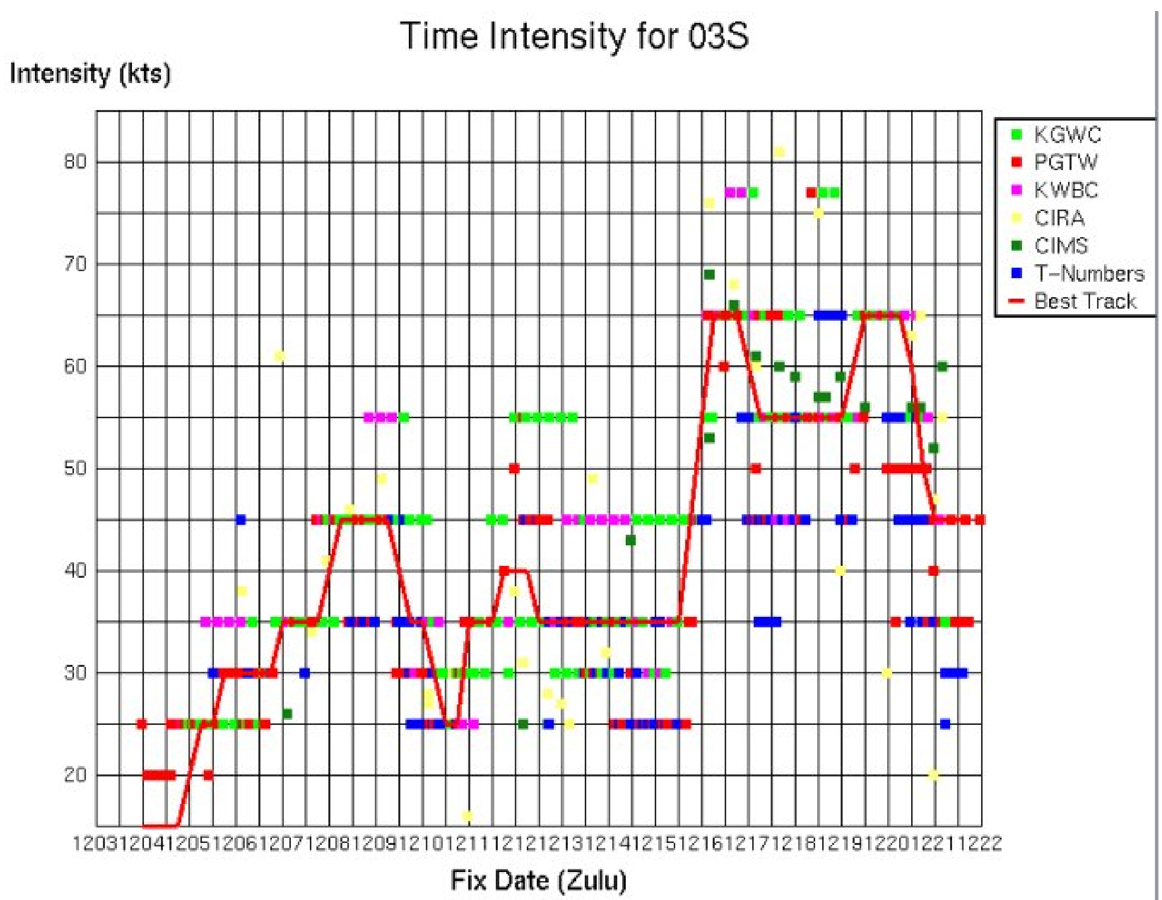


Figure 2-03S-1. 200600Z December 2003 MET-5 visible image of TC 03S (Cela), revealing tightly curved bands wrapping into the system, located southwest of Madagascar, with a maximum intensity of 65 knots.



TROPICAL CYCLONE 03S (CELA)
05 DEC 03 - 21 DEC 03
Dar es Salaam
Antananarivo
La Reunion
Dieg
0400Z N/A 15
0500Z 8 20
0600Z 5 30
0700Z 7 35
0800Z 9 40
0900Z 9 45
1000Z 13 35
1100Z 3 35
1200Z 1 40
1300Z 3 35
1400Z 4 35
1500Z 8 35
1600Z 2 55
1700Z 2 60
1800Z 7 55
1900Z 8 55
2000Z 9 65
2100Z 18 45
2118Z 43 45
LEGEND
24-HR BEST TRACK POSITION
WINDS < 33 KTS
WINDS 34-63 KTS
WINDS > 64 KTS
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
10S
15S
20S
25S
30S
35S
40S
35E
40E
45E
50E
55E
60E
65E
70E



Time Intensity for 03S
Intensity (kts)
80
70
60
50
40
30
20
KGWC
PGTW
KWBC
CIRA
CIMS
T-Numbers
Best Track
12031204120512061207120812091210121112121213121412151216121712181219122012211222
Fix Date (Zulu)

Tropical Cyclone (TC) 04S (Jana)

First Poor : 0200Z 04 Dec 03

First Fair : 2100Z 06 Dec 03

First TCFA : 2330Z 06 Dec 03

First Warning : 0000Z 07 Dec 03

Last Warning : 0000Z 12 Dec 03, Dissipated over water

Max Intensity : 80 kts, gusts to 100 kts

Landfall : None

Total Warnings : 11

Remarks:

1) TC 04S formed approximately 340 nm northwest of the Cocos islands and initially tracked eastward for 48 hours before moving south then west. The cyclone attained maximum intensity during its south movement phase (between 9 and 10 December) and began to weaken.

2) No damage reports were received for this system.

Statistics for JTWC on TC04S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
03120612		7.5S	93.6E	15																
03120618		7.7S	94.5E	25																
03120700	1	7.8S	95.3E	35	16	30	48	106	139				0	-5	-5	-5	0			
03120712	2	7.8S	96.5E	50	5	19	61	96	139				0	5	15	15	15			
03120800	3	7.8S	97.5E	60	38	83	108	116	131				5	10	10	15	25			
03120812	4	8.7S	98.6E	65	18	46	75	107	89				0	0	5	10	25			
03120900	5	10.2S	99.1E	75	5	24	42	38	35				0	5	10	25	50			
03120912	6	12.0S	99.2E	80	5	13	53	110	154				0	10	20	30	35			
03121000	7	13.6S	99.2E	80	18	37	89	146	187				0	5	20	20	15			
03121012	8	14.6S	98.6E	70	24	48	72	97	142				5	15	20	15	10			
03121100	9	14.8S	97.4E	50	18	26	27	53	89				5	10	10	10	10			
03121112	10	14.9S	95.8E	35	5	6	17	43					0	0	5	0				
03121200	11	14.9S	94.1E	30	11	31							0	0						
03121206		14.8S	93.1E	25																
03121212		14.7S	91.9E	25																
03121218		14.5S	90.7E	25																
03121300		14.4S	89.6E	25																
03121306		14.6S	88.4E	25																
03121312		14.8S	87.0E	25																
03121318		14.7S	85.6E	25																
03121400		14.4S	84.2E	25																
03121406		13.9S	82.8E	25																
03121412		13.6S	81.4E	25																
03121418		13.3S	79.8E	25																
03121500		12.8S	78.1E	25																
03121506		12.4S	76.6E	25																
03121512		12.0S	75.3E	25																
03121518		11.6S	73.9E	25																
03121600		11.2S	72.4E	25																
03121606		11.0S	71.1E	25																
03121612		11.0S	69.9E	25																
03121618		11.0S	68.9E	25																
03121700		10.9S	67.8E	25																
03121706		10.9S	66.8E	25																
03121712		11.0S	65.7E	25																
03121718		11.2S	65.0E	25																
			AVERAGE		16	33	59	91	123				1	6	12	15	21			
			BIAS										1	5	11	14	21			
			# CASES		11	11	10	10	9				11	11	10	10	9			

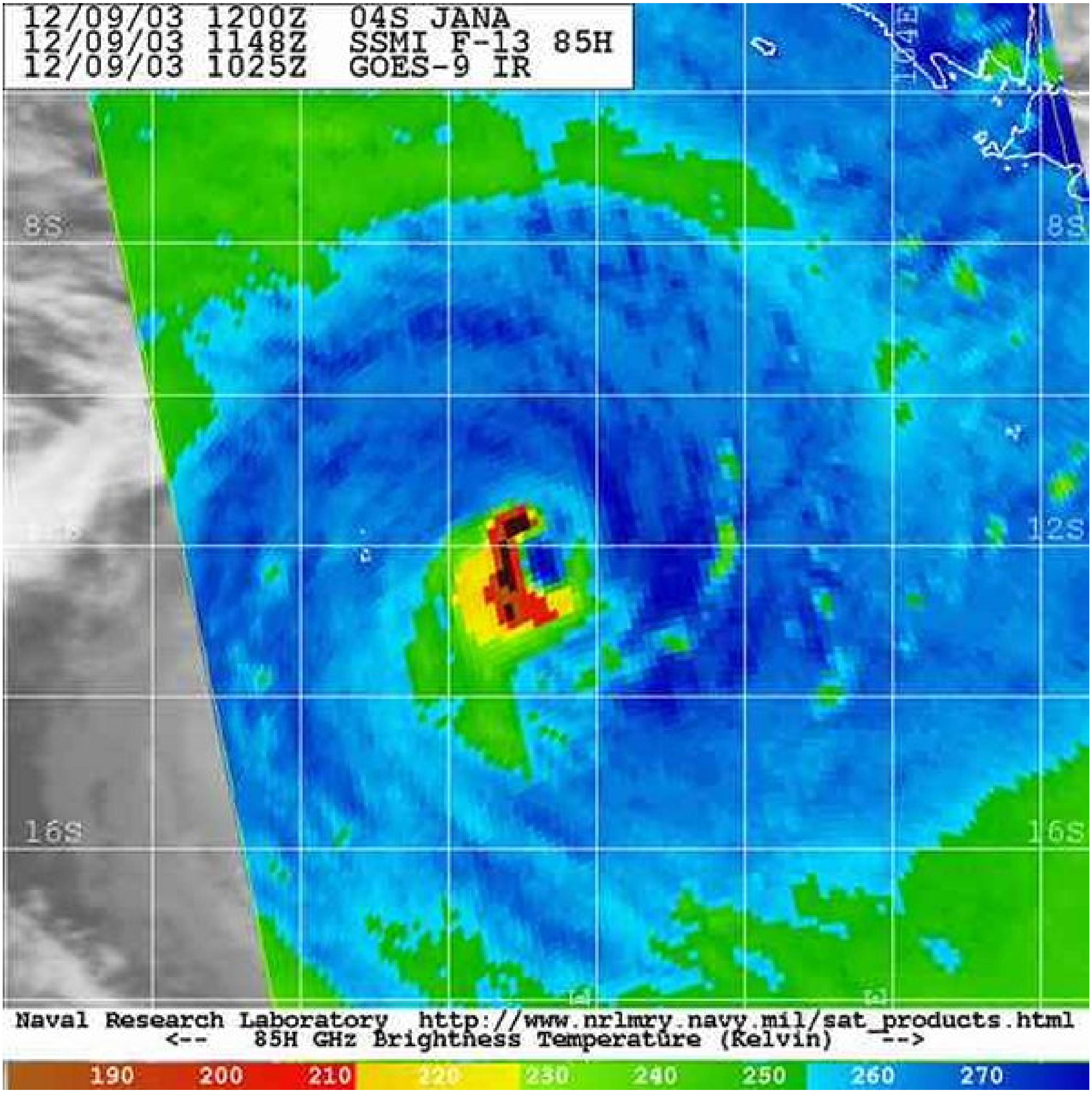
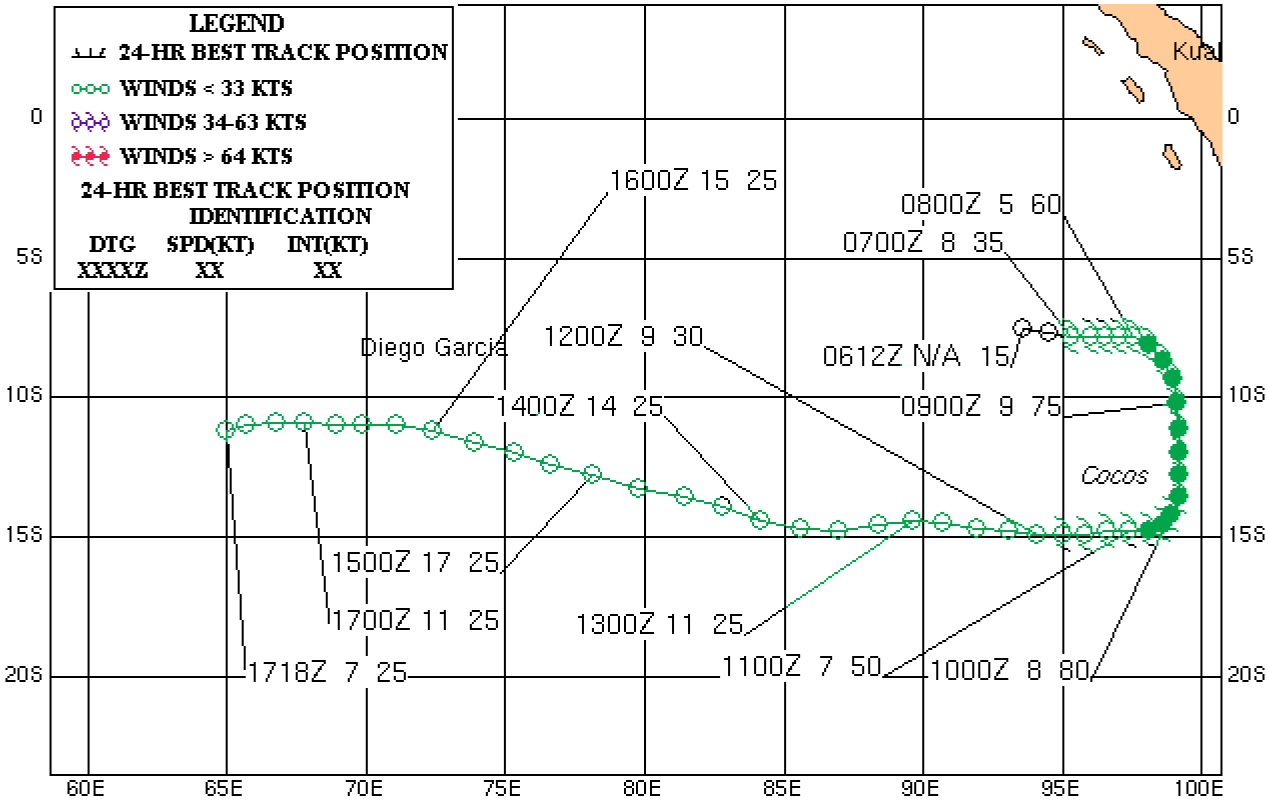
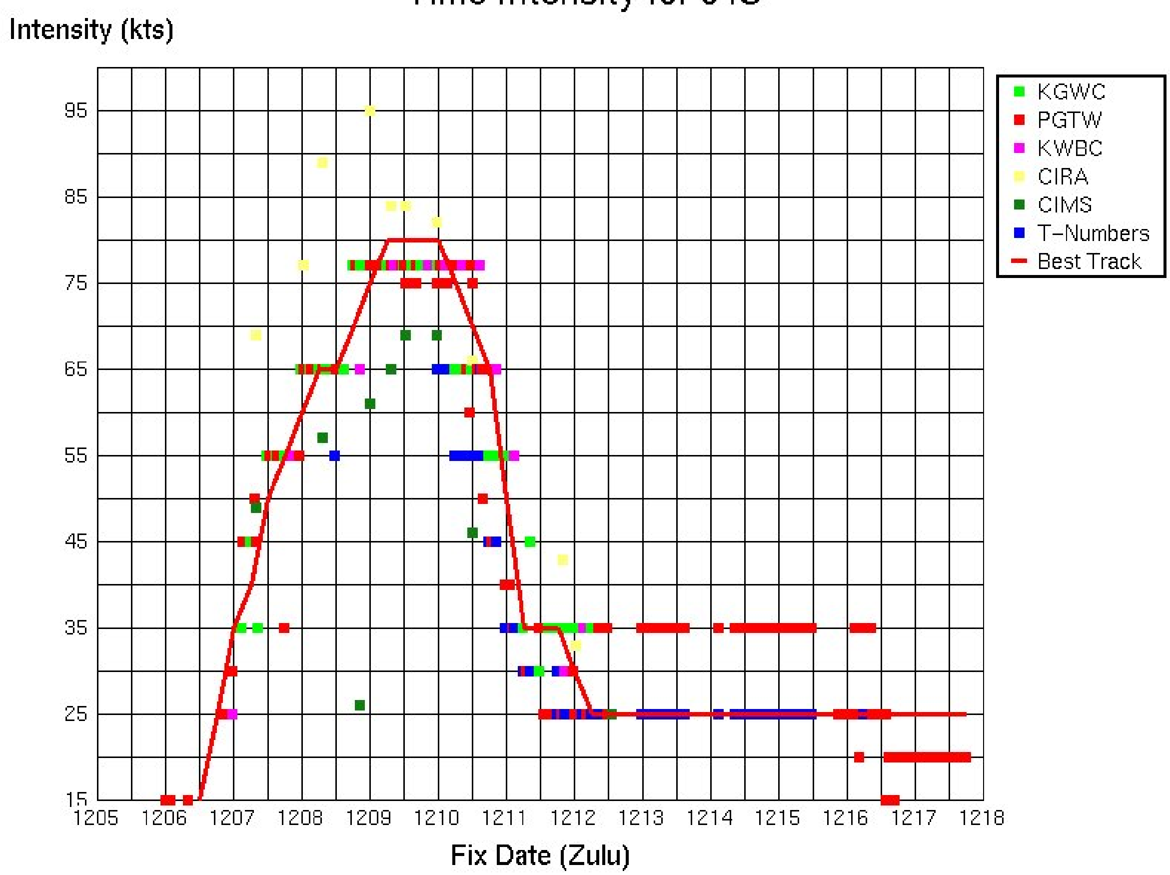


Figure 2-04S-1. 091148Z December 2003 SSM/I image of TC 04S (Jana), the northeast quadrant of the eye was weakening, located north of the Cocos Islands, with a maximum intensity of 80 knots.

TROPICAL CYCLONE 04S (JANA)
07 DEC 03 - 12 DEC 03



Time Intensity for 04S



Tropical Cyclone (TC) 05P (Debbie)

First Poor : 0600Z 17 Dec 03

First Fair : 1300Z 17 Dec 03

First TCFA : 0900Z 18 Dec 03

First Warning : 1800Z 18 Dec 03, Dissipated over land

Last Warning : 65 kts, gusts to 80 kts

Max Intensity : 0600Z 21 Dec 03

Landfall : Near Turner Point, Australia.

Total Warnings : 6

Remarks:

1) Tropical cyclone (TC) 05P formed in the Arafura Sea approximately 60 nm southeast of the coast of New Guinea on 17 Dec. TC 05P tracked slowly westward in a weak steering environment at tropical depression strength for approximately 36 hours. Early on 19 Dec, steering influences strengthened, allowing TC 05P to increase speed to the southwest along the periphery of a mid-level steering ridge centered to the southeast over Australia. The favorable environment of the northwestern quadrant of the steering ridge fostered a climotological increase in the intensity of TC 05P over the next 24 hours. TC 05P peaked at 65 kts intensity at approximately 0600Z on 20 Dec just prior to making landfall at about 1200Z on 20 Dec near Turner Point, Australia. The cyclone continued to track west-southwesterly inland along the western periphery of a steering ridge over Australia and dissipated.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC05P

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
03121700		9.3S	137.4E	20																
03121706		9.3S	136.6E	25																
03121712		9.3S	135.9E	25																
03121718		9.4S	135.5E	25																
03121800		9.5S	135.3E	25																
03121806		9.7S	135.3E	25																

03121812		9.8S	135.3E	30																
03121818	1	9.9S	135.2E	35	13	42	95	122	162				0	0	5	-5	10			
03121906	2	9.9S	134.7E	45	0	18	38	68	127				0	5	0	10	25			
03121918	3	10.3S	134.0E	50	13	21	56	104	131				0	-10	5	20	20			
03122006	4	11.3S	133.8E	65	0	32	78	108	123				0	5	10	10	10			
03122018	5	12.4S	133.5E	55	11	33	42	74					0	10	10	5				
03122106	6	13.6S	133.1E	35	16	23							0	0						
03122112		14.1S	132.9E	25																
03122118		14.4S	132.5E	25																
03122200		14.7S	132.1E	25																
03122206		15.0S	131.6E	25																
			AVERAGE		9	28	62	95	136				0	5	6	10	16			
			BIAS										0	2	6	8	16			
			# CASES		6	6	5	5	4				6	6	5	5	4			

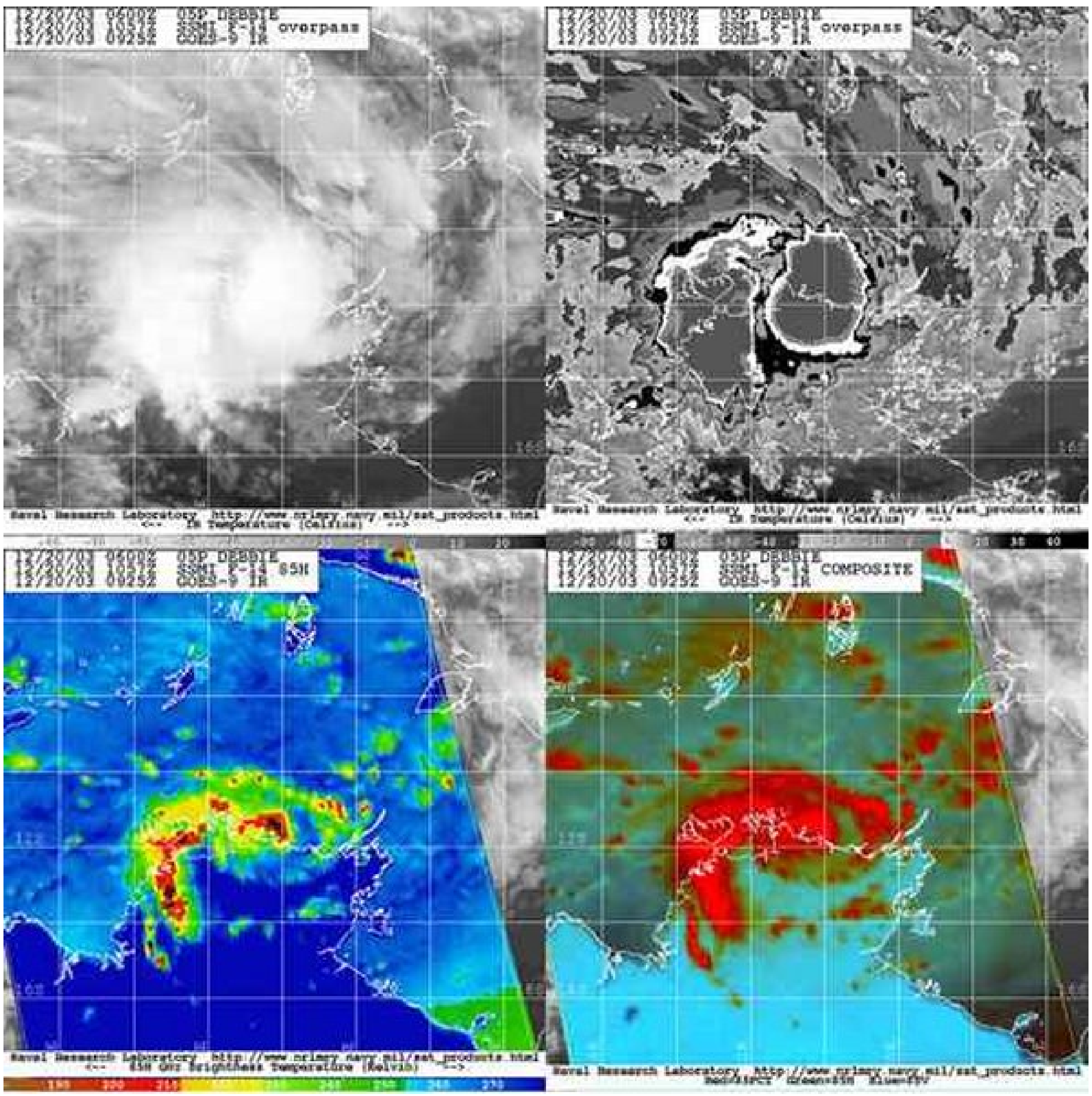
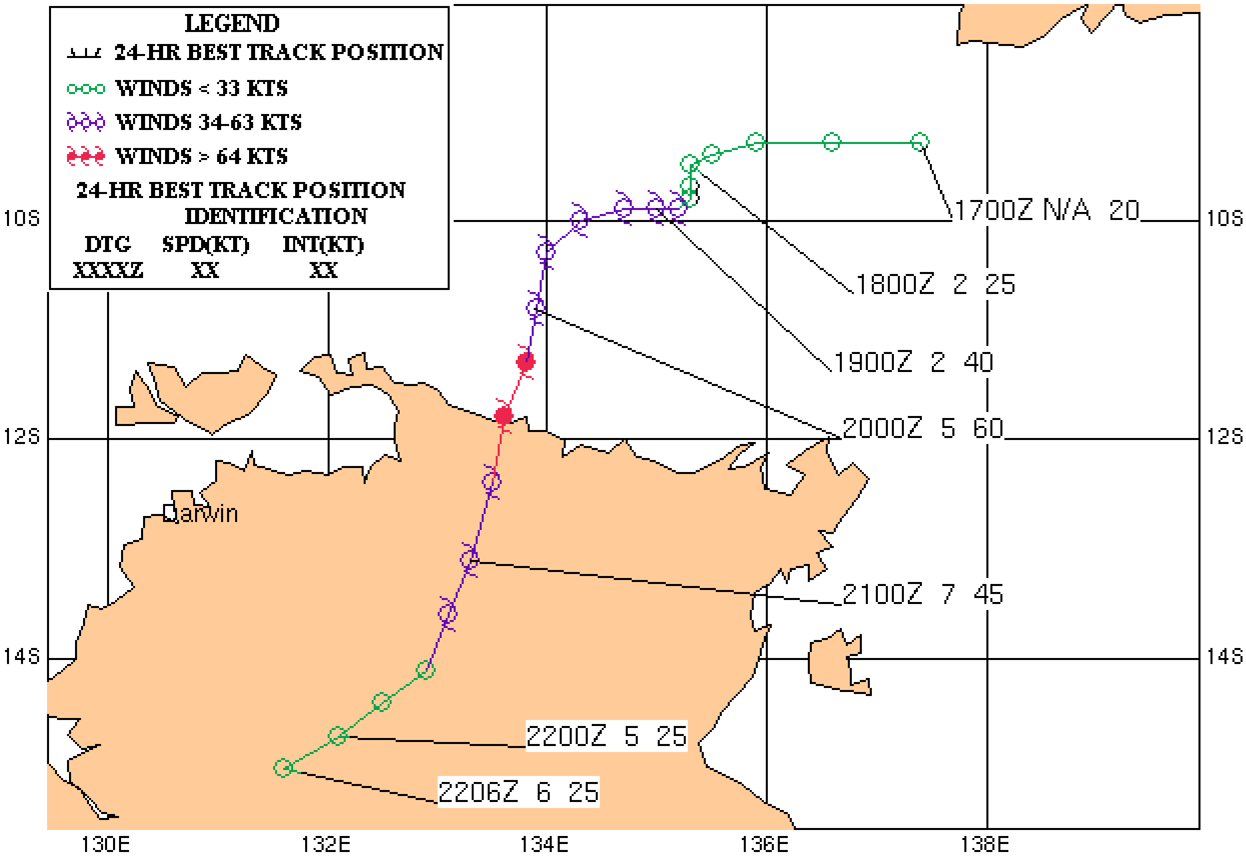
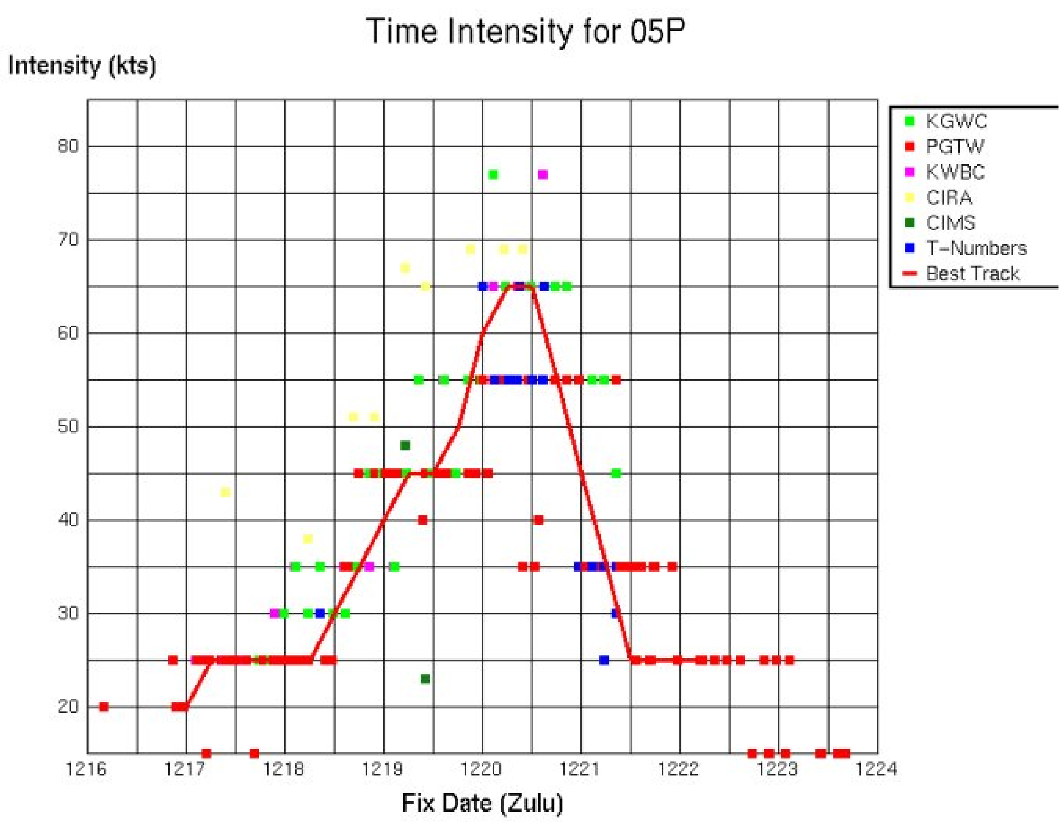


Figure 2-05P-1. 201057Z December 2003 SSM/I Multi-Sensor satellite images of TC 05P (Debbie), located directly off the north coast of Austraila approximately 185 nm to the Northeast of Darwin. At this time, TC 05P (Debbie) was about to make landfall with a peak intensity of 65kts.

TROPICAL CYCLONE 05P (DEBBIE)
18 DEC 03 - 21 DEC 03





Tropical Cyclone (TC) 06S (Darius)

First Poor : 1800Z 24 Dec 03

First Fair : 0130Z 23 Dec 03

First TCFA : 0000Z 29 Dec 03

First Warning : 0600Z 29 Dec 03

Last Warning : 1200Z 04 Jan 04, Dissipated over water

Max Intensity : 55 kts gusts to 70 kts

Landfall : None

Total Warnings : 14

Remarks:

1) TC 06S developed east of Diego Garcia and moved westward along the northwestern periphery of a low-level steering ridge while slowly developing. The first warning was issued six days after the tropical disturbance was first detected. After the initial warning, TC 06S intensified at a climatological rate, achieving a maximum intensity of 65 knots at 1800Z on 31 Dec and maintained that intensity for approximately 24 hours before weakening. This cyclone passed roughly 35 nm east of Mauritius on 02 Jan at approximately 1500Z and then began to slowly weaken as it entered a high vertical wind shear environment associated with the mid-latitude westerly flow. TC 06S dissipated as a significant tropical cyclone over water approximately 625 nm south-southeast of Mauritius.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC06S																				
	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
03122318		6.5S	66.9E	15																
03122400		6.6S	67.1E	15																
03122406		6.6S	67.3E	15																
03122412		6.5S	67.5E	15																
03122418		6.4S	67.8E	15																
03122500		6.4S	68.1E	15																
03122506		6.4S	68.4E	15																

03122512		6.5S	69.0E	15																
03122518		6.9S	69.7E	15																
03122600		7.4S	70.2E	20																
03122606		7.8S	70.6E	20																
03122612		8.1S	70.9E	20																
03122618		8.3S	70.9E	20																
03122700		8.5S	70.8E	20																
03122706		8.7S	70.6E	20																
03122712		8.8S	70.3E	20																
03122718		8.9S	69.8E	20																
03122800		9.0S	69.2E	20																
03122806		9.1S	68.3E	20																
03122812		9.3S	67.3E	20																
03122818		9.5S	66.3E	20																
03122900		9.8S	65.2E	25																
03122906	1	10.1S	64.2E	25	8	35	42	60	54				0	-5	-5	-5	-10			
03122918	2	11.5S	63.0E	35	11	66	106	109	99				0	5	10	10	20			
03123006	3	12.8S	61.3E	40	0	12	13	38	91				0	5	0	10	20			
03123018	4	14.2S	60.1E	45	16	54	79	104	141				0	0	5	15	25			
03123106	5	15.1S	59.3E	55	18	49	61	70	93				0	5	10	20	30			
03123118	6	16.0S	58.9E	55	5	8	8	32	51				10	15	25	30	30			
04010106	7	17.0S	58.7E	55	8	6	42	61	64				10	15	20	25	35			
04010118	8	18.0S	58.5E	55	8	36	49	61	69				5	5	0	5	5			
04010206	9	19.0S	58.3E	55	18	6	26	28	30				-10	-10	-10	-10	-10			
04010218	10	20.4S	58.1E	55	8	0	17	8					0	0	0	0				
04010306	11	22.0S	58.1E	50	5	6	32						5	5	5					
04010318	12	24.5S	58.8E	45	13	22							0	0						
04010406	13	27.9S	59.5E	40	0								0							
04010412	14	30.1S	61.7E	35	19								0							
			AVERAGE		10	25	43	57	77				3	6	8	13	21			
			BIAS										1	3	5	10	16			
			# CASES		14	12	11	10	9				14	12	11	10	9			

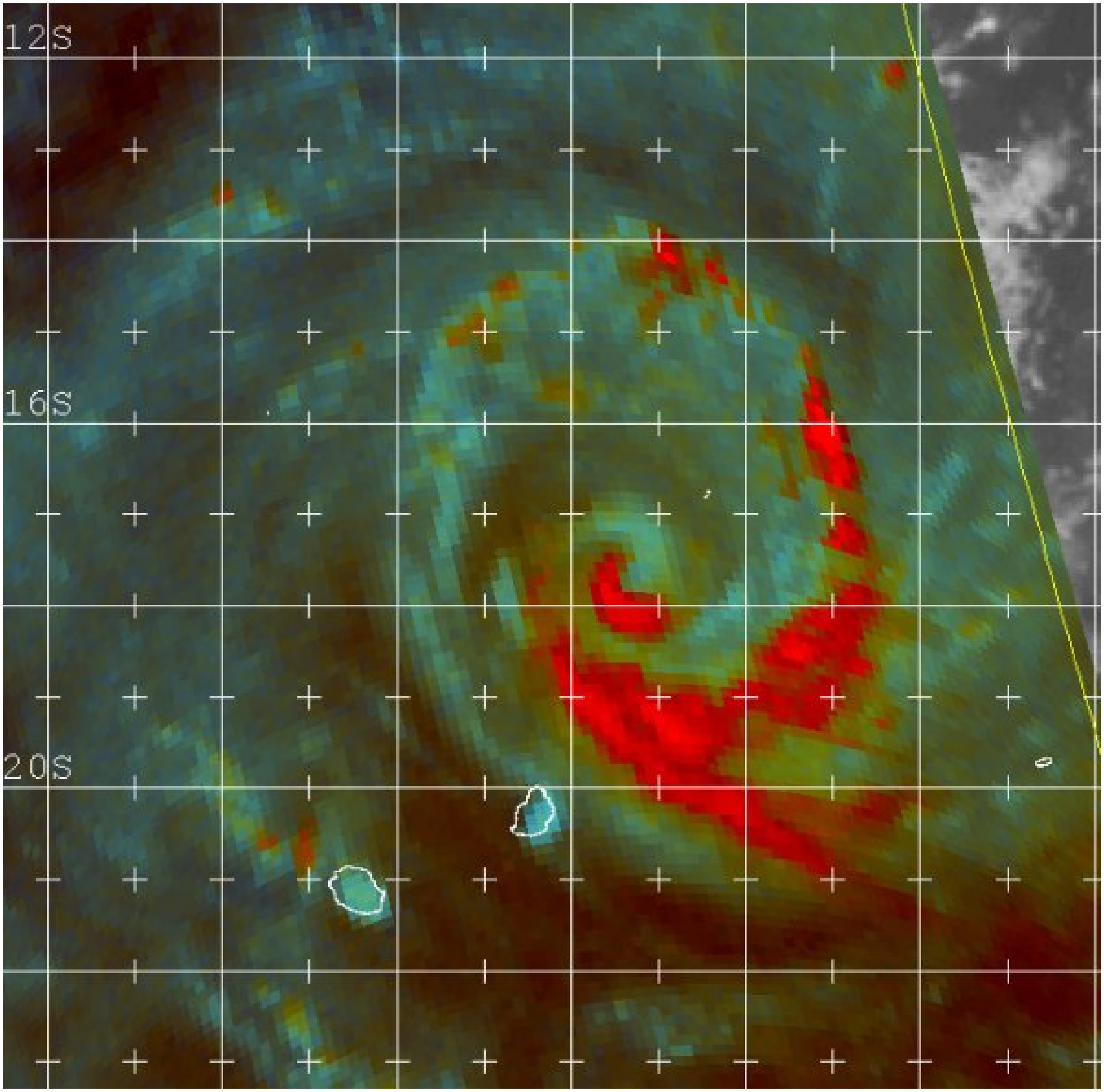
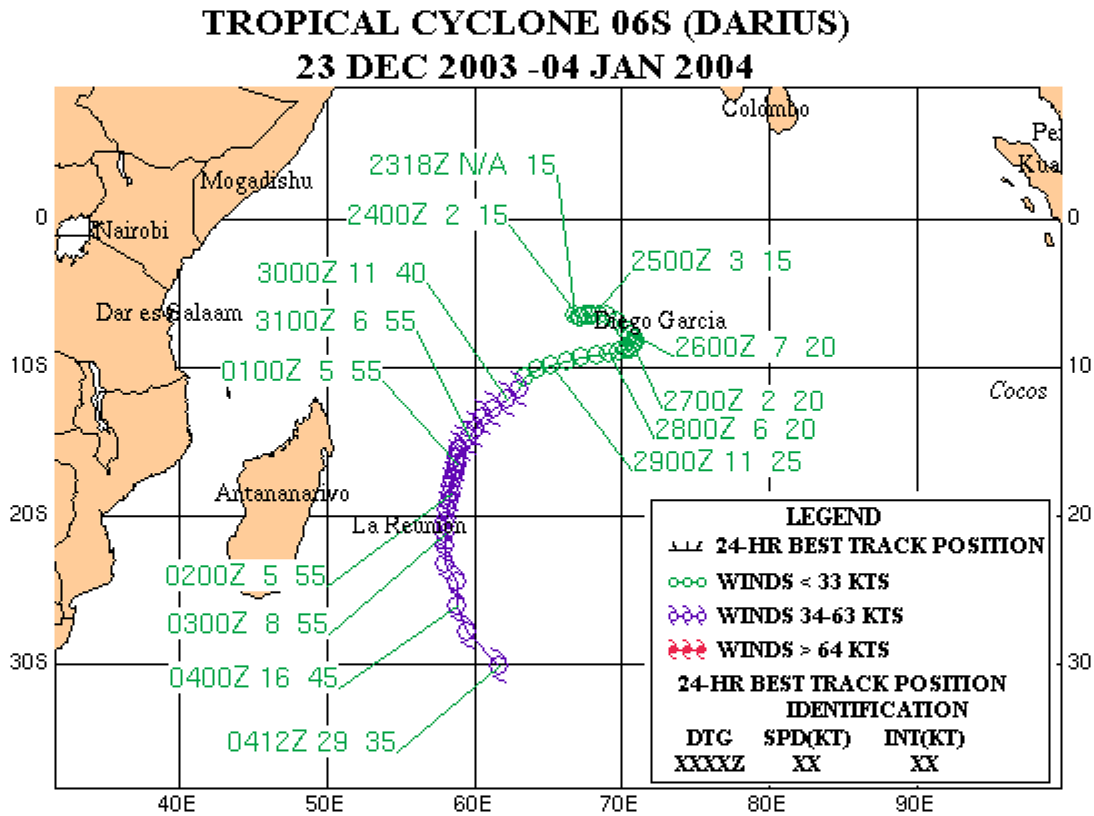
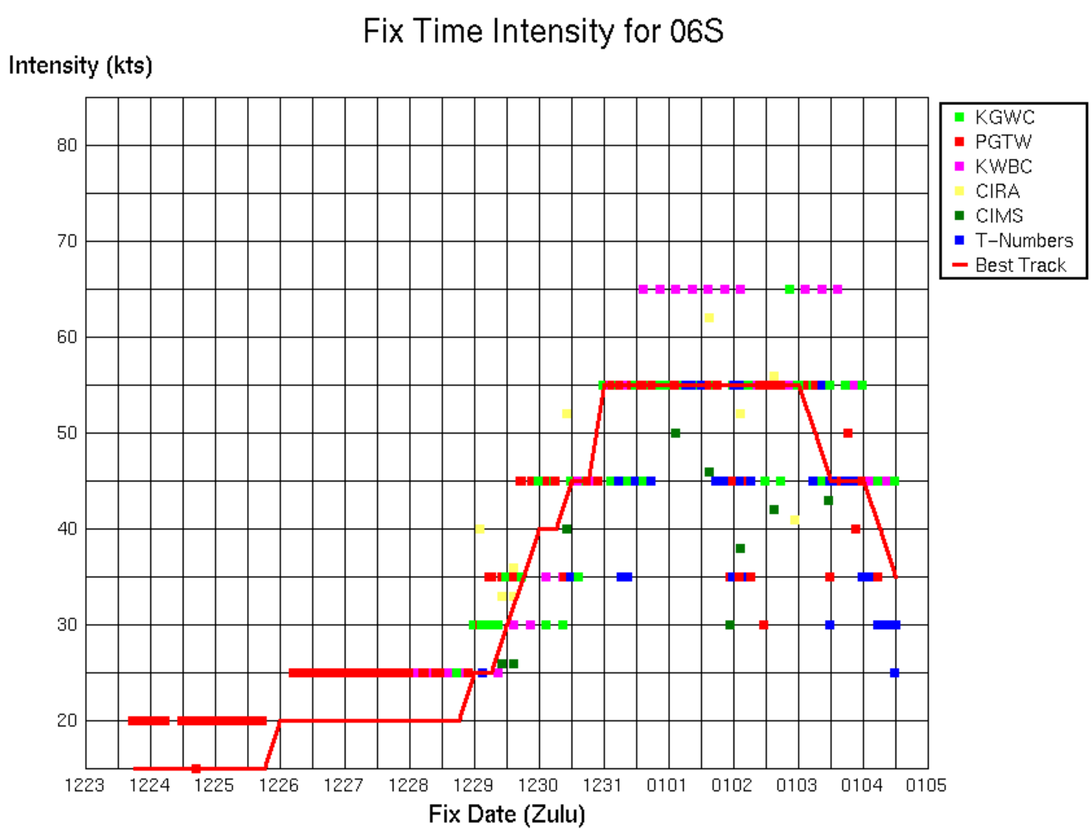


Figure 2-06S-1. 011450Z January 2004 SSM/I Color composite image of TC 06S (Darius), reveals a nearly decoupled Low-level circualtion center approximately 160 nm North of Mauritius with a peak intensity of 65kts


TROPICAL CYCLONE 06S (DARIUS)
23 DEC 2003 -04 JAN 2004
Colombo
Mogadishu
Nairobi
Dar es Salaam
Diego Garcia
Antananarivo
La Reunion
Cocos
2318Z N/A 15
2400Z 2 15
2500Z 3 15
2600Z 7 20
2700Z 2 20
2800Z 6 20
2900Z 11 25
3000Z 11 40
3100Z 6 55
0100Z 5 55
0200Z 5 55
0300Z 8 55
0400Z 16 45
0412Z 29 35
LEGEND
24-HR BEST TRACK POSITION
WINDS < 33 KTS
WINDS 34-63 KTS
WINDS > 64 KTS
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
0
10S
20S
30S
40E
50E
60E
70E
80E
90E


Fix Time Intensity for 06S
Intensity (kts)
80
70
60
50
40
30
20
KGWC
PGTW
KWBC
CIRA
CIMS
T-Numbers
Best Track
1223
1224
1225
1226
1227
1228
1229
1230
1231
0101
0102
0103
0104
0105
Fix Date (Zulu)

Tropical Cyclone (TC) 07P (Heta)

First Poor : 0600Z 26 Dec 03

First Fair : 1500Z 28 Dec 03

First TCFA : 1900Z 30 Dec 03

First Warning : 0000Z 01 Jan 04

Last Warning : 0600Z 08 Jan 04, Extra-tropical

Max Intensity : 140 kts, gusts to 170 kts

Landfall : No

Total Warnings : 26

Remarks:

1) TC 07P (Heta) was first detected about 350 nm Northwest of Suva, Fiji on 26 Dec and slowly intensified before the initial warning was issued on 01 Jan at 0000Z. On 02 Jan, the cyclone began to move more poleward and began to rapidly intensify (55 kt increase over eighteen hours) due to the establishment of extensive dual outflow channels. TC 07P passed west of Samoa with a maximum intensity of 140 kts gusting to 170 kts with Pago Pago reporting maximum gusts of 65 kts during the closest point of approach. The cyclone continued to track southeast and accelerate with the eyewall passing within 43 nm of Niue causing extensive damage to that island. Following the Niue passage, TC 07P began moving south-southeastward and rapidly weakened as it interacted with the mid-latitude westerlies. The final warning was issued on 08 Jan at 0600Z as TC 07P transitioned into an extra-tropical low.

2) Extensive damage and one death was reported for Samoa and Niue through news sources as well government reports (U.S., New Zealand, etc) and World Meteorological Organization publications for Samoa and Niue. Flooding, toppled power lines, damaged homes and flattened crops were reported with damages estimated at over $50 Million.

Statistics for JTWC on TC07P

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
03122912		14.3S	180.0W	20																
03122918		13.6S	179.7W	20																
03123000		13.2S	179.1W	25																
03123006		12.9S	178.6W	25																
03123012		12.7S	178.1W	25																

03123018		12.6S	177.7W	30																
03123100		12.6S	177.4W	30																
03123106		12.7S	177.1W	30																
03123112		12.3S	176.6W	30																
03123118		11.6S	176.1W	30																
04010100	1	10.5S	175.8W	30	26	122	175	222	241	315			5	5	5	-5	-10	-25		
04010106	2	9.5S	175.4W	35	0	54	95	126	185	227			0	5	0	-5	-10	-30		
04010112	3	8.6S	175.1W	35	8	30	44	74	127	172			0	0	-5	-10	-10	-45		
04010118	4	8.1S	174.8W	35	23	42	67	99	121	119			0	-5	-10	-15	-20	-70		
04010200	5	8.0S	174.4W	40	17	38	36	48	108	109			0	-5	-10	-10	-15	-75		
04010206	6	8.0S	174.1W	45	5	12	25	13	25	34			10	5	0	-5	-10	-60		
04010212	7	8.2S	173.9W	50	18	49	72	64	42	54			5	0	0	-5	-30	-60		
04010218	8	8.6S	173.8W	55	25	48	56	42	53	104			0	-5	0	0	-20	-15		
04010300	9	9.2S	173.8W	60	13	13	76	76	90	119			0	0	0	-15	-35	-35		
04010306	10	9.8S	173.9W	65	13	47	53	53	81	84			0	0	5	-20	-45	-40		
04010312	11	10.5S	174.0W	65	16	51	49	24	27	72			0	0	-15	-35	-45	-40		
04010318	12	10.6S	174.6W	75	13	42	48	30	0	109			0	0	-30	-35	-40	-35		
04010400	13	11.2S	174.8W	75	21	54	58	50	95	134			0	-20	-45	-40	-40	-35		
04010406	14	11.7S	174.5W	85	18	40	24	36	97	180			-5	-35	-45	-30	-40	-30		
04010412	15	12.3S	174.3W	105	0	21	30	21	79	123			-5	-30	-30	-35	-35	-15		
04010418	16	13.2S	174.1W	125	0	30	17	19	51	124			0	0	-5	-15	-15	5		
04010500	17	14.0S	173.9W	140	21	39	108	144	163	145			0	15	0	-5	-10	10		
04010506	18	14.6S	173.4W	140	13	47	95	114	159	132			0	10	0	0	5	25		
04010512	19	15.6S	172.9W	140	6	66	91	130	160	52			0	0	0	0	15	20		
04010518	20	16.8S	171.9W	130	11	54	114	186	223	146			0	-5	-5	5	15	10		
04010600	21	18.2S	170.8W	130	12	70	142	206	227	171			0	0	10	30	30	25		
04010606	22	19.8S	169.7W	120	8	29	82	115	86				5	-5	0	15	20			
04010618	23	22.9S	167.1W	105	36	71	91	82	56				10	10	30	35	5			
04010706	24	26.2S	164.0W	80	16	25	52	154					0	0	0	-10				
04010718	25	28.9S	160.8W	50	12	46	109	187					15	20	0	0				
04010806	26	31.6S	158.9W	30	11	45							5	-15						
04010812		32.5S	158.2W	30																
04010818		33.2S	157.7W	40																
04010900		33.7S	157.3W	35																
04010906		34.2S	156.9W	30																
04010912		34.8S	156.4W	30																
			AVERAGE		14	46	72	93	108	130			3	8	10	15	23	34		
			BIAS										2	-2	-6	-8	-15	-25		
			# CASES		26	26	25	25	23	21			26	26	25	25	23	21		

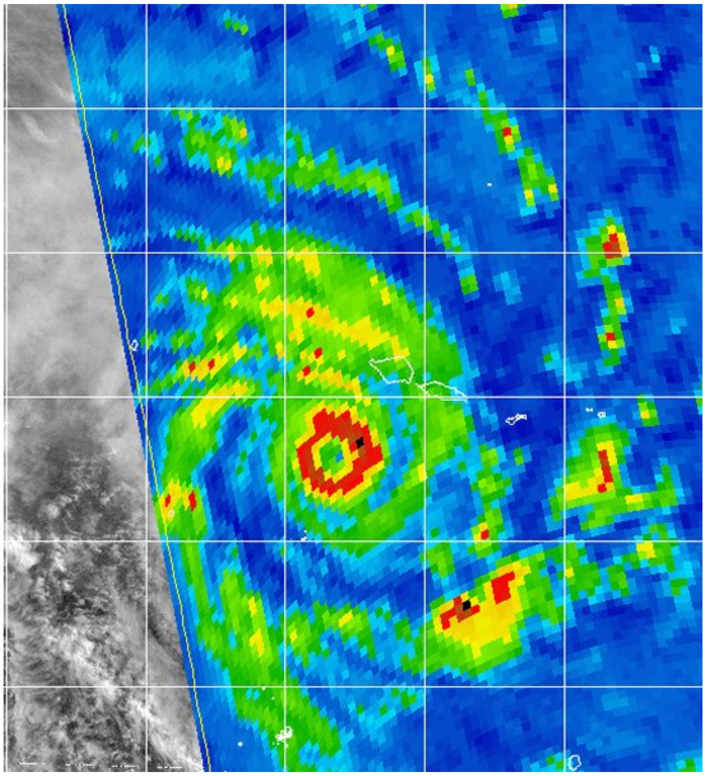


Figure 2-07P-1. 050705Z January 2004 85GHZ SSM/I image of TC 07P (Heta), reveals a slightly cloud filled eye approximately 80 nm to the west-southwest of Western Somoa and Pago Pago with a peak intensity of 140kts.

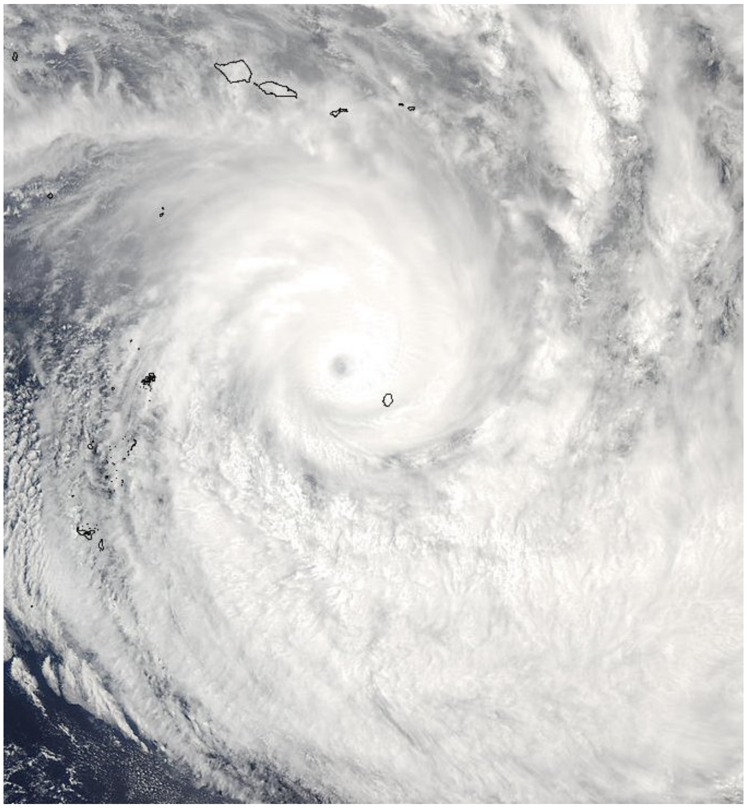
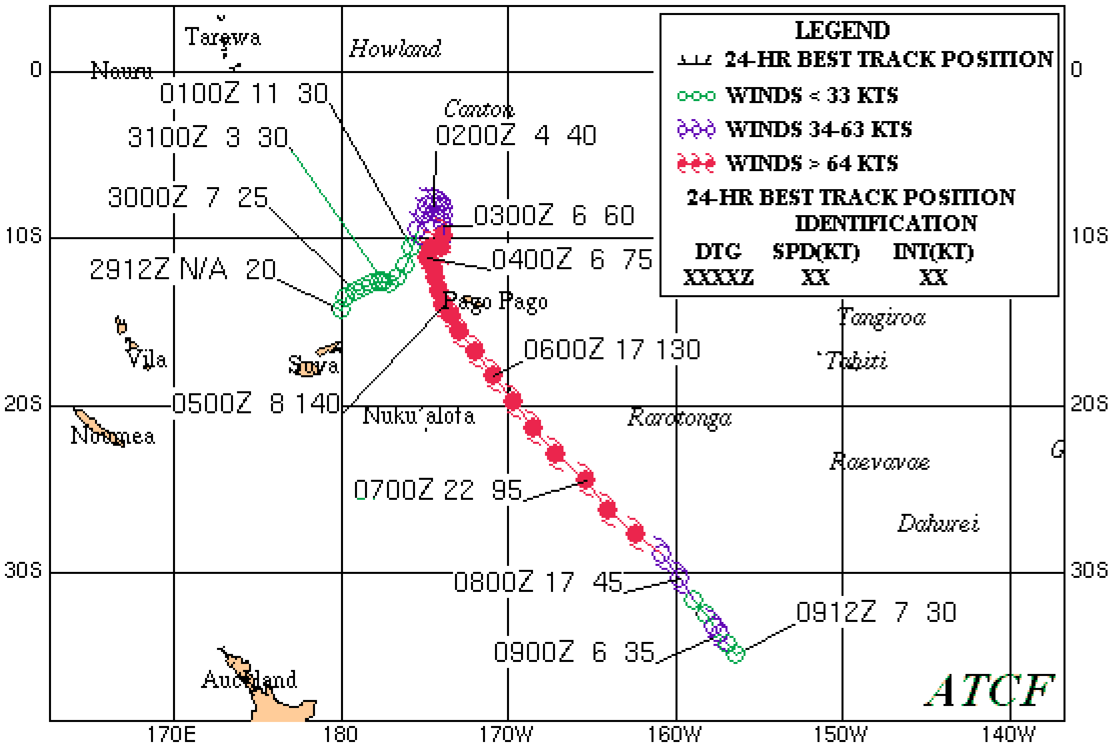
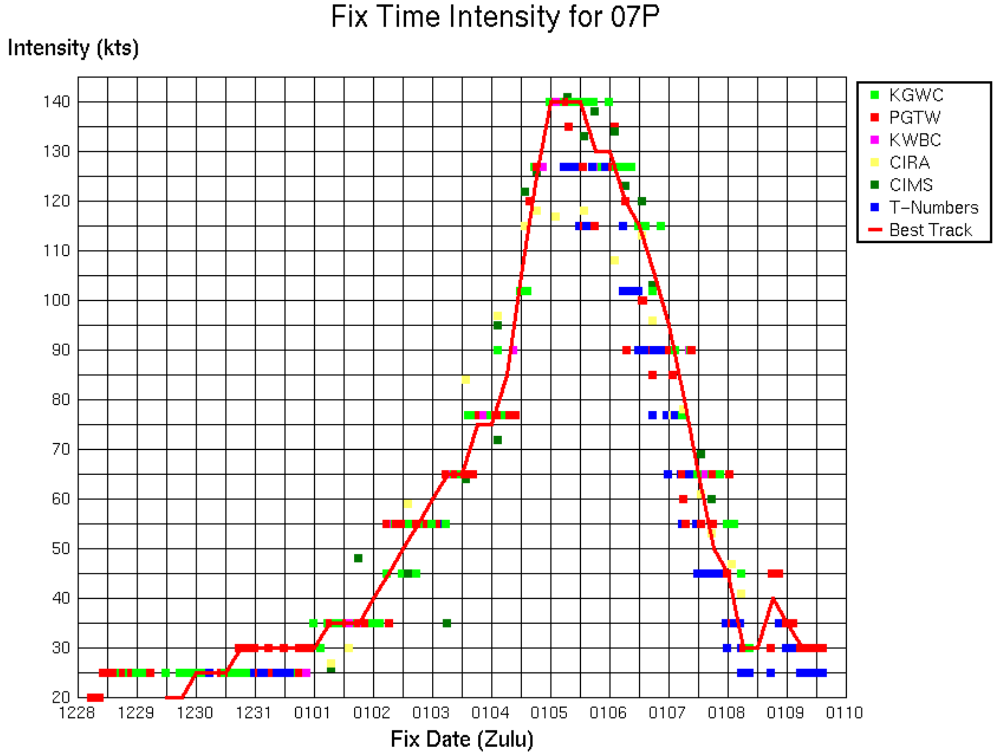


Figure 2-07P-2. 060100Z January 2004 MODIS true-color image of TC 07P (Heta), located 40 nm west-northwest of the Niue Island with an intensity of 125 knots.

TROPICAL CYCLONE 07P (HETA)
29 DEC 2003 -09 JAN 2004



Fix Time Intensity for 07P



Tropical Cyclone (TC) 08S (Ken)

First Poor : NA

First Fair : NA

First TCFA : 1500Z 01 Jan 04

First Warning : 1800Z 01 Jan 04

Last Warning : 1200Z 06 Jan 04, Dissipated over water

Max Intensity : 35 kts, gusts to 45 kts

Landfall : None

Total Warnings : 18

Remarks:

1) Tropical cyclone (TC) 08S formed over land near Yampi Sound, Australia on 01 Jan. Development of the circulation center over land hampered early efforts to determine the cyclone position. However, sufficient development had occurred to warrant a Tropical Cyclone Formation Alert (TCFA) by 1500Z on 01 Jan. Within three hours of the TCFA issuance the cyclone center had tracked westward over water and a first warning was issued at 1800Z on 01 Jan. Despite the rapid initial development, moderate vertical wind shear hindered subsequent intensification of this cyclone and it never exceeded weak tropical storm strength. Subsequently, TC 08S dissipated over water and the final warning was issued at 1200Z on 06 Jan.

2) No damage reports were received for this system.

Statistics for JTWC on TC08S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04010106		16.4S	124.2E	15																
04010112		16.4S	123.1E	20																
04010118	1	16.5S	122.1E	25	0	13	46	92	125				0	0	5	10	15			
04010206	2	16.5S	120.2E	35	18	19	38	46	72	161			-5	0	5	10	15	20		
04010212	3	16.4S	119.4E	35	8	21	40	84	96	206			0	5	10	15	20	30		
04010218	4	16.4S	118.6E	35	5	19	46	76	116	231			0	10	20	25	30	50		
04010300	5	16.4S	117.8E	35	11	41	91	114	192	289			0	10	15	20	30	45		
04010306	6	16.4S	117.2E	35	0	38	59	79	149	226			0	5	10	10	15	30		

04010312	7	16.7S	116.8E	35	13	61	64	108	165	127			0	5	5	10	20	30		
04010318	8	17.2S	116.5E	35	12	17	18	64	78				0	0	5	10	20			
04010400	9	17.7S	116.2E	35	8	21	34	34	17				0	5	10	15	25			
04010406	10	17.9S	115.7E	35	34	43	64	64	68				0	5	5	20	20			
04010412	11	18.1S	115.3E	35	57	99	102	79	68				0	0	5	10	15			
04010418	12	18.5S	115.1E	35	5	41	67	46					0	0	10	10				
04010500	13	19.0S	115.1E	35	12	48	64	45					0	5	10	15				
04010506	14	19.7S	115.0E	35	8	8	38						0	10	10					
04010512	15	20.3S	114.7E	30	26	36	58						5	10	15					
04010518	16	20.9S	114.3E	25	12	46							0	0						
04010600	17	21.2S	113.8E	25	8	45							0	5						
04010612	18	21.3S	113.0E	20	29								0							
			AVERAGE		15	36	55	72	104	207			1	4	9	14	20	34		
			BIAS										0	4	9	14	20	34		
			# CASES		18	17	15	13	11	6			18	17	15	13	11	6		

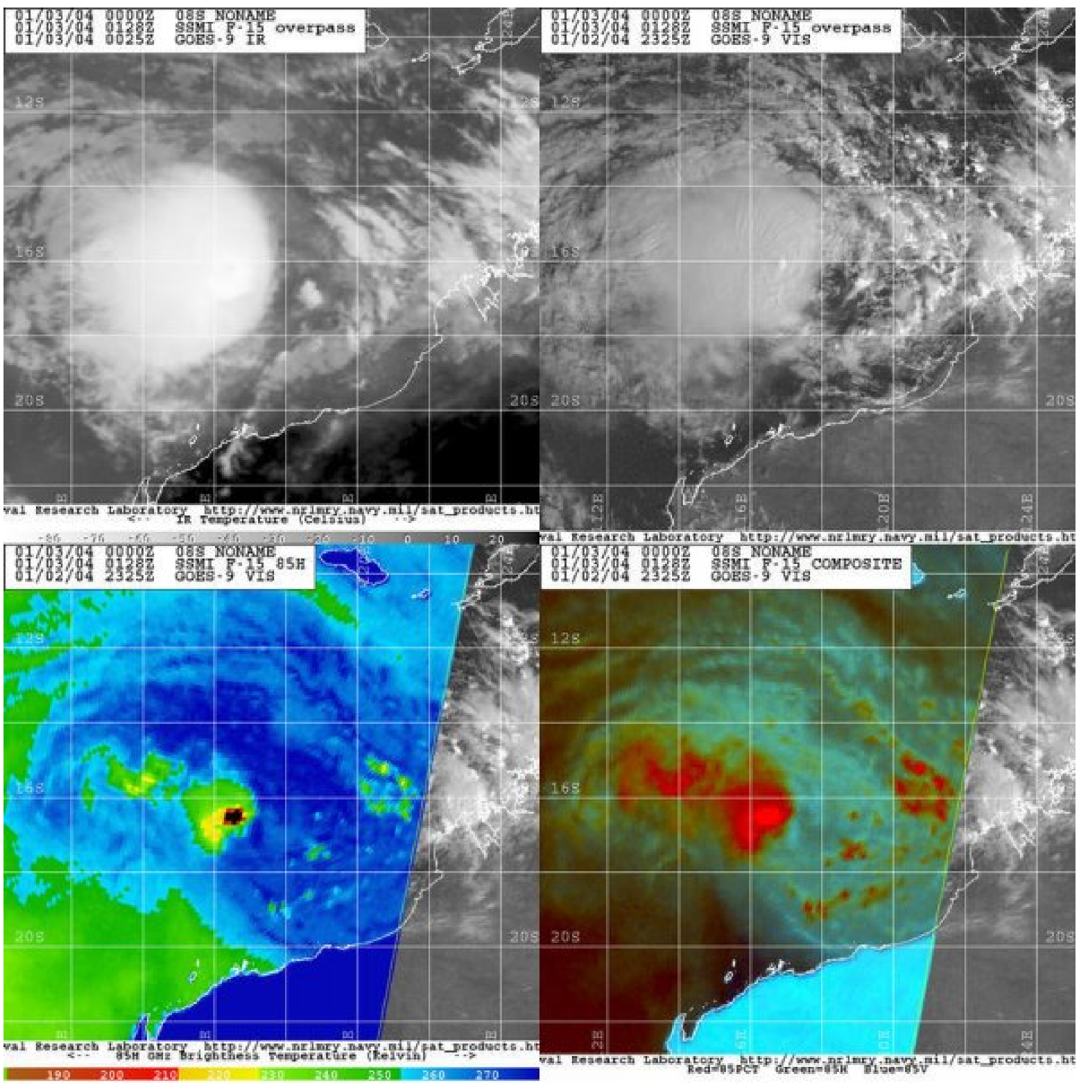
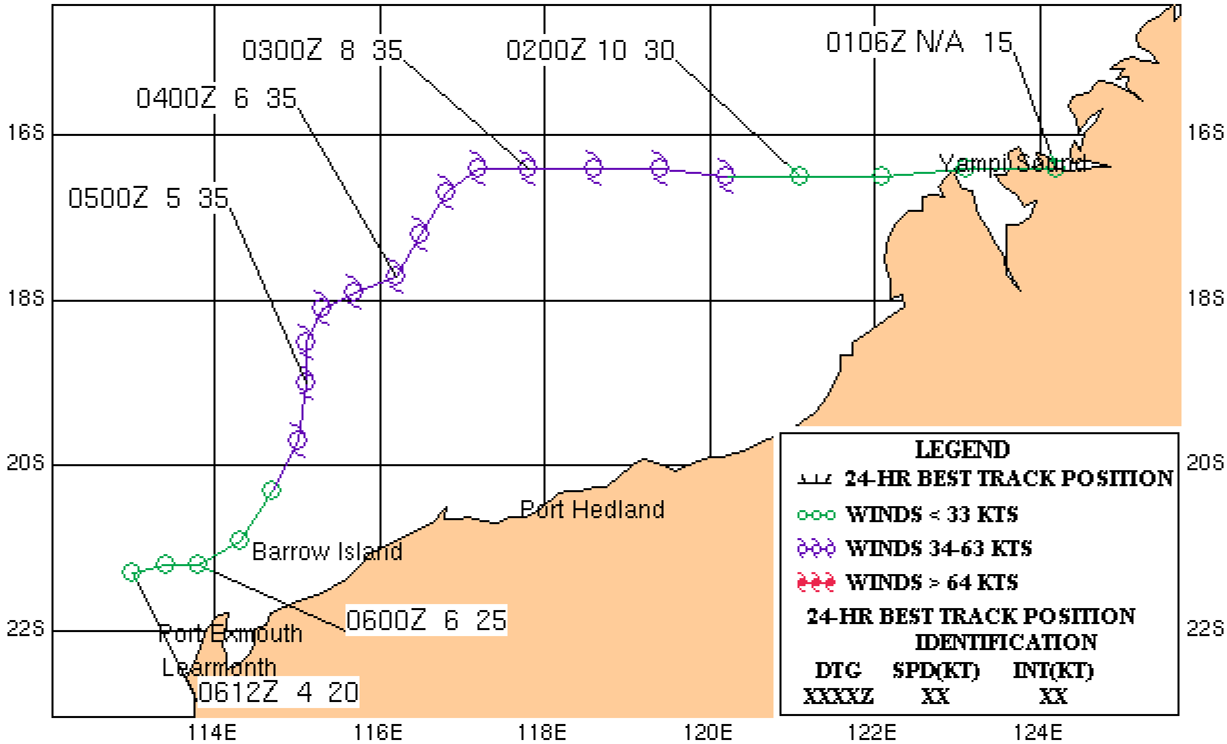
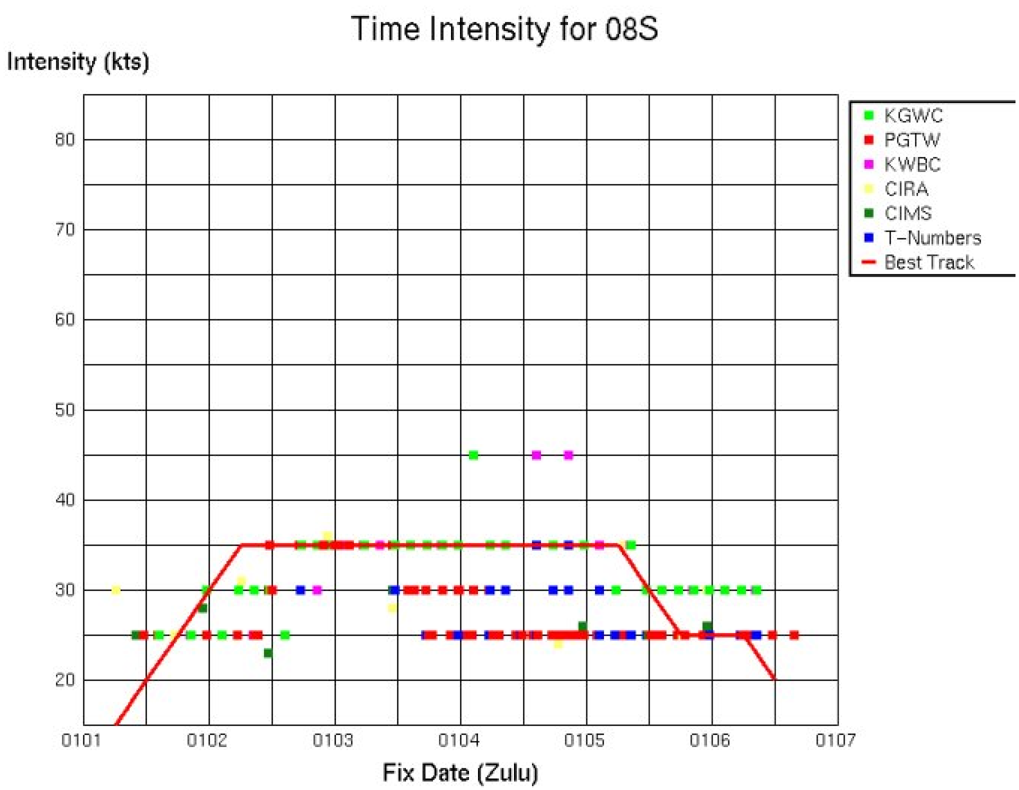


Figure 2-08S-1. 030128Z January 2004 SSM/I Multi-Sensor satellite images of TC 08S (Ken), reveal that the systems low-level circulation center is partially exposed to the East of the associated deep convection with an intensity of 35kts.

TROPICAL CYCLONE 08S (KEN)
01 JAN 04 - 06 JAN 04





Tropical Cyclone (TC) 09S (Elita)

First Poor : 1000Z 25 Jan 04

First Fair : 1800Z 25 Jan 04

First TCFA : 1300Z 26 Jan 04

First Warning : 1800Z 26 Jan 04

Last Warning : 0000Z 29 Jan 04, Extra-tropical

Max Intensity : 65 kts, gusts to 80 kts

Landfall : West of Mahajanga, Madagascar, Mananjary, Madagascar and near Morondava, Madagascar.

Total Warnings : 15

Remarks:

1) Tropical cyclone (TC) 09S was first identified on the Significant Tropical Weather Advisory on 25 Jan at 1000Z as an area of persistent convection in the Mozambique Channel, approximately 50 nm off the western shore of Madagascar. The first Tropical Cyclone Formation Alert (TCFA) was issued on 26 Jan at 1300Z followed by the first warning issued five hours later at 1800Z on 26 Jan. The system was initially forecast to track southeastwards into central Madagascar. However, a mid-level ridge to the west moved the system equatorward and resulting in a "relocated" third warning issued on 27 Jan at 1200Z. TC 09S subsequently began to move southeast over Madagascar and ultimately crossed Madagascar three separate times. First landfall occurred around 28 Jan at 1500Z at an intensity of 60 kts near Mahajanga, Madagascar and a final warning was issued on the system on 29 Jan at 0000z. The remnants of TC 09S then traversed the interior of Madagascar and entered the southwest Indian Ocean where it slowed in response to a weak steering environment. TC 09S then began to move on a westward track and reintensify resulting in the issuance of a second TCFA on 30 Jan at 2200Z.

The system made a second landfall near Mananjary, Madagascar while moving toward the Mozambique Channel. The cyclone became quasi-stationary in a weak steering environment approximately 125 nm off of western Mozambique and on 02 Feb reached an intensity of 55 kts, and then reversed course back towards the Mozambique Channel. TC 09S made its third landfall near Morondava, Madagascar on 03 Feb at 0200Z with an intensity of 65 kts. The system moved across Madagascar in approximately one day, weakened and reentered the southwest Indian Ocean on 04 Feb at approximately 0200Z. The system exited land near Mananjary, the same community that the cyclone made

landfall at almost four days earlier. TC 09S then accelerated rapidly southeastward, became fully exposed and second final warning was issued on 04 Feb at 1800Z.

2) The multiple crossings of TC 09S brought significant damage to Madagascar. The first landfall of TC 09S caused the deaths of two citizens, cut water and electricity resources, left 5,000 homeless and damaged 90 percent of the buildings in northwestern Mahajanga Province. The return of TC 09S a second and third time caused the deaths of four more people and left 13,000 more people homeless.

Statistics for JTWC on TC09S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04012506		16.6S	43.1E	15																
04012512		17.0S	42.9E	15																
04012518		17.4S	42.5E	20																
04012600		17.8S	42.1E	20																
04012606		18.1S	42.7E	25																
04012612		18.4S	43.1E	30																
04012618	1	18.6S	43.5E	35	20	54	144	223	222				0	5	0	-5	5			
04012706	2	17.6S	43.5E	35	78	181	269	268	280				0	-5	-10	-5	0			
04012712	3	16.9S	43.5E	35	6	70	109	161	233				0	-15	-20	-5	0			
04012800	4	15.5S	44.1E	55	44	130	209	270	335				0	5	35	25	10			
04012812	5	15.5S	45.7E	60	0	51	74	92					0	5	5	0				
04012900	6	17.1S	47.1E	40	20	40							-5	-5						
04013118	7	20.3S	44.6E	35	21	53	36	23	78				0	0	10	15	20			
04020106	8	19.2S	43.2E	45	0	6	36	48	95				0	-5	0	-10	5			
04020118	9	19.0S	42.6E	55	6	16	31	94	191				0	5	0	15	0			
04020206	10	19.3S	42.8E	55	11	16	70	184	317				0	-5	10	0	-5			
04020218	11	19.7S	43.4E	65	18	82	183	316	232				0	10	5	10	5			
04020306	12	20.7S	45.0E	55	8	103	200	138					0	-10	-5	10				
04020318	13	21.7S	47.6E	45	27	154	115						0	15	25					
04020406	14	24.5S	50.3E	35	21	269							0	5						
04020418	15	25.8S	48.9E	30	27								5							
04020500		25.3S	49.4E	30																
			AVERAGE		21	88	123	165	220				1	7	10	9	6			
			BIAS										0	0	5	5	4			
			# CASES		15	14	12	11	9				15	14	12	11	9			

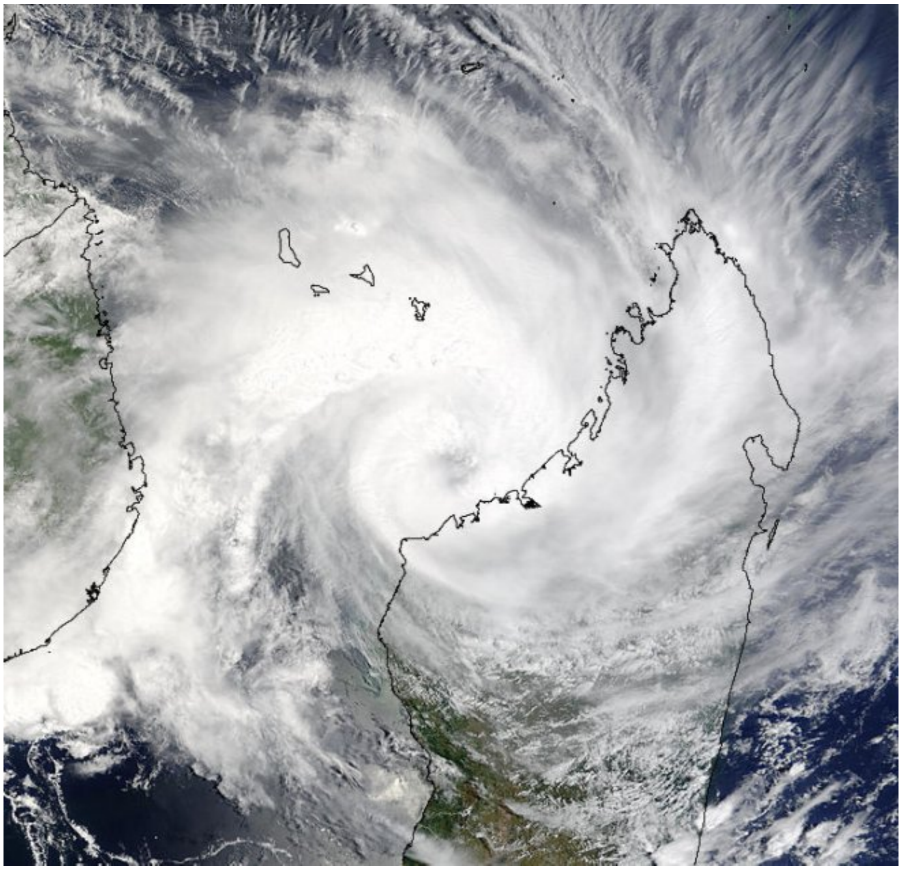


Figure 2-09S-2. 280735Z January 2004 MODIS true-color image of TC 09S (Elita), located just off the coast of Madagascar, within the Mozambique Channel with an intensity of 60 knots.

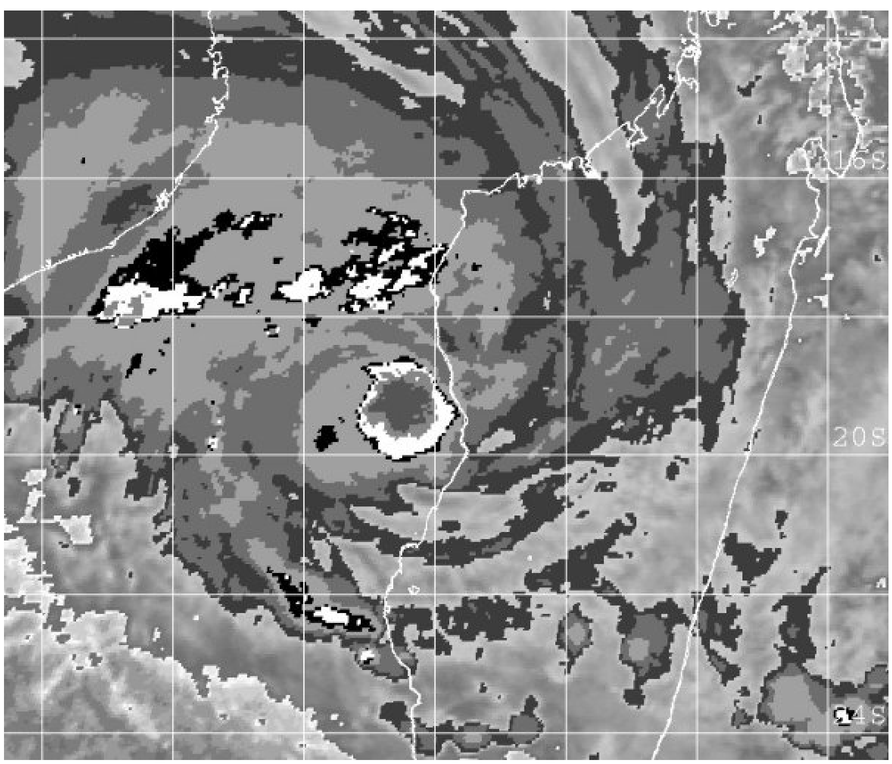
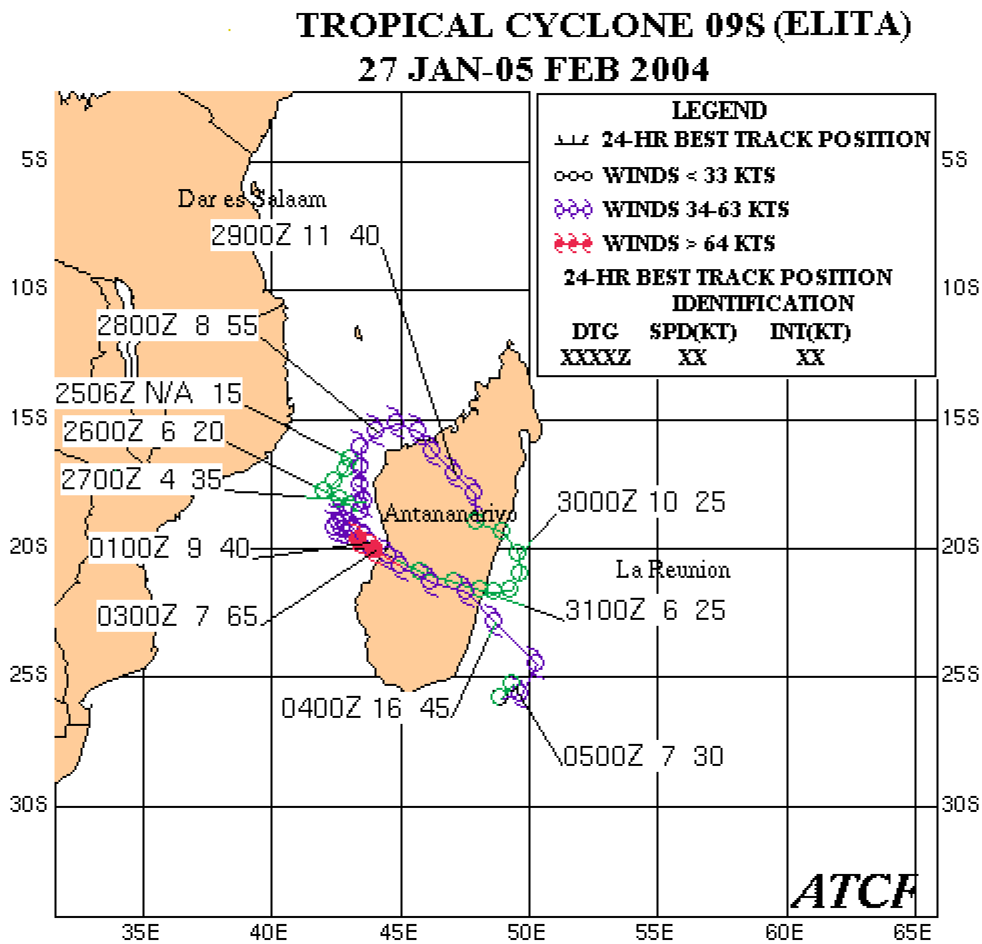
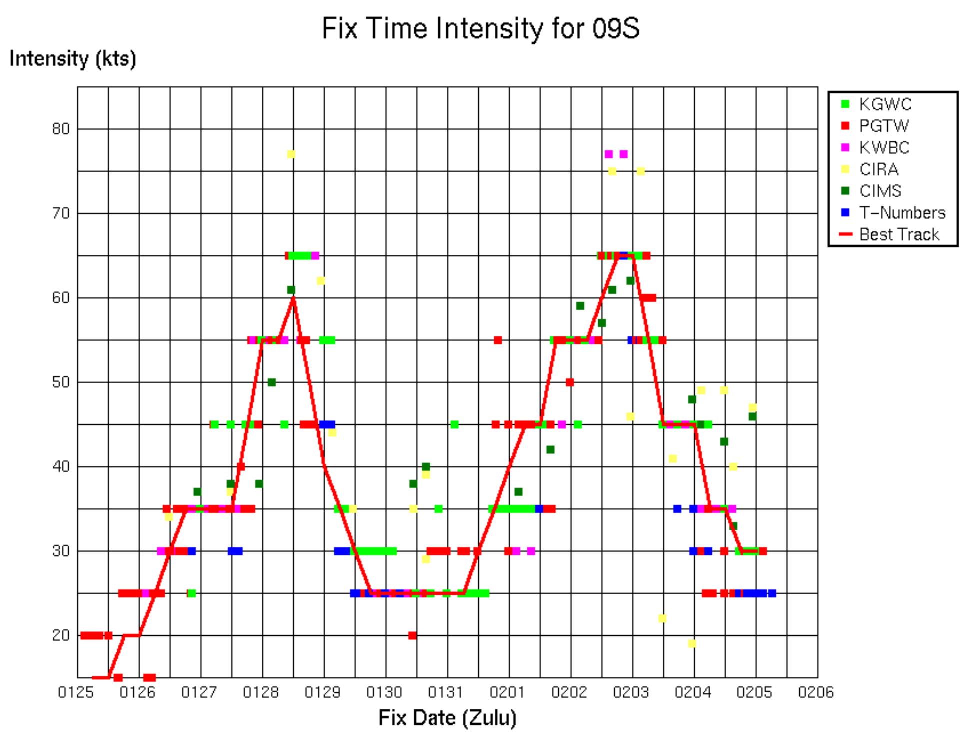


Figure 2-09S-1. 021717Z February 2004 EIR BD curve image of TC 09S (Elita), reveals the systems overall convective coverage extending throughout most of the Mozambique channel with outer bands on the Northeast side reaching the Northern tip of Madagascar. Peak intensity at this time was 65kts.


TROPICAL CYCLONE 09S (ELITA)
27 JAN-05 FEB 2004
LEGEND
24-HR BEST TRACK POSITION
WINDS < 33 KTS
WINDS 34-63 KTS
WINDS > 64 KTS
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
Dar es Salaam
2900Z 11 40
2800Z 8 55
2506Z N/A 15
2600Z 6 20
2700Z 4 35
0100Z 9 40
0300Z 7 65
0400Z 16 45
0500Z 7 30
3000Z 10 25
3100Z 6 25
Antananarivo
La Reunion
5S
10S
15S
20S
25S
30S
35E
40E
45E
50E
55E
60E
65E
ATCF


Fix Time Intensity for 09S
Intensity (kts)
80
70
60
50
40
30
20
KGWC
PGTW
KWBC
CIRA
CIMS
T-Numbers
Best Track
0125
0126
0127
0128
0129
0130
0131
0201
0202
0203
0204
0205
0206
Fix Date (Zulu)

Tropical Cyclone (TC) 10S (Frank)

First Poor : 1800Z 24 Jan 04

First Fair : 1000Z 26 Jan 04

First TCFA : 0130Z 27 Jan 04

First Warning : 1200Z 27 Jan 04

Last Warning : 1800Z 06 Feb 04, Dissipated over water

Max Intensity : 125 kts, gusts to 150 kts

Landfall : No

Total Warnings : 21

Remarks:

1) Tropical cyclone (TC) 10S was initially detected as a tropical disturbance approximately 780 nm east-northeast from the northern tip of Madagascar. After the first warning, TC 10S moved poleward for the next nine days reaching two periods of maximum intensity. TC 10S reached a first intensity maximum of 125 kts on 02 Feb at 0000Z, weakened to 90 kts as the system experienced dry air entrainment and then re-intensified to 115 kts two days later on 04 Feb at 0000Z as the upper level outflow improved. TC 10S then tracked more rapidly poleward and encountered the mid-latitude westerlies which then caused the cyclone to rapidly weaken. The final warning was issued on 06 Feb at 1800z as TC 10S encountered high vertical shear conditions and cooler waters which produced an exposed low level circulation center and subsequent dissipation.

2) No damage reports were received for this system.

Statistics for JTWC on TC10S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04012600		11.7S	63.2E	15																
04012606		11.7S	63.5E	15																
04012612		11.7S	63.8E	20																
04012618		11.6S	64.1E	25																
04012700		11.4S	64.3E	30																
04012706		11.2S	64.5E	30																
04012712	1	11.5S	64.7E	35	13	51	115	166	187				-5	-15	-20	-35	-45			
04012718	2	11.9S	64.9E	45	8	26	79	110	128				0	0	0	-10	0			
04012806	3	13.2S	64.6E	55	11	58	75	88	75				-5	-5	-15	-5	0			
04012818	4	14.8S	64.0E	65	5	8	17	61	127				0	-10	10	15	5			
04012906	5	15.8S	63.6E	90	0	0	40	96	172				0	15	20	15	15			
04012918	6	16.4S	63.1E	90	6	61	115	176	210				0	5	0	10	15			
04013006	7	16.1S	62.1E	95	11	53	128	174	250				-5	-15	-10	-5	5			
04013018	8	15.6S	61.7E	110	6	24	69	128	199				-5	5	15	20	15			
04013106	9	15.2S	61.7E	110	0	8	42	91	103				0	5	20	10	-15			
04013118	10	15.7S	62.1E	110	0	30	78	109	134				5	15	20	0	0			
04020106	11	16.1S	63.1E	105	13	46	59	83	113				10	15	0	-5	5			
04020118	12	16.7S	65.0E	105	6	13	55	114	186				10	-5	-5	5	0			
04020206	13	17.1S	67.1E	120	6	48	93	126	209				5	10	20	10	-15			
04020218	14	17.3S	69.1E	115	5	40	76	148	230				10	20	10	-15	-15			
04020306	15	17.5S	70.6E	100	0	23	58	113	164				0	-10	-35	-35	-35			
04020318	16	18.1S	70.8E	100	8	42	86	95	74				0	-25	-20	-25	-5			
04020406	17	18.5S	70.4E	115	0	17	18	29	85				0	5	10	30	45			
04020418	18	19.1S	69.9E	105	6	19	49	96	180				5	10	30	50	55			
04020506	19	20.1S	70.1E	100	16	64	121	227	354				-5	15	30	35	40			
04020518	20	21.2S	71.2E	75	5	39	139	290					0	15	20	25				
04020606	21	22.2S	73.0E	50	0	61	181						5	10	15					
04020618	22	23.9S	75.9E	40	6	60							5	10						
04020700		25.1S	77.4E	30																
04020706		26.4S	79.0E	30																
			AVERAGE		6	36	81	126	167				4	11	15	18	17			
			BIAS										1	3	5	5	4			
			# CASES		22	22	21	20	19				22	22	21	20	19			

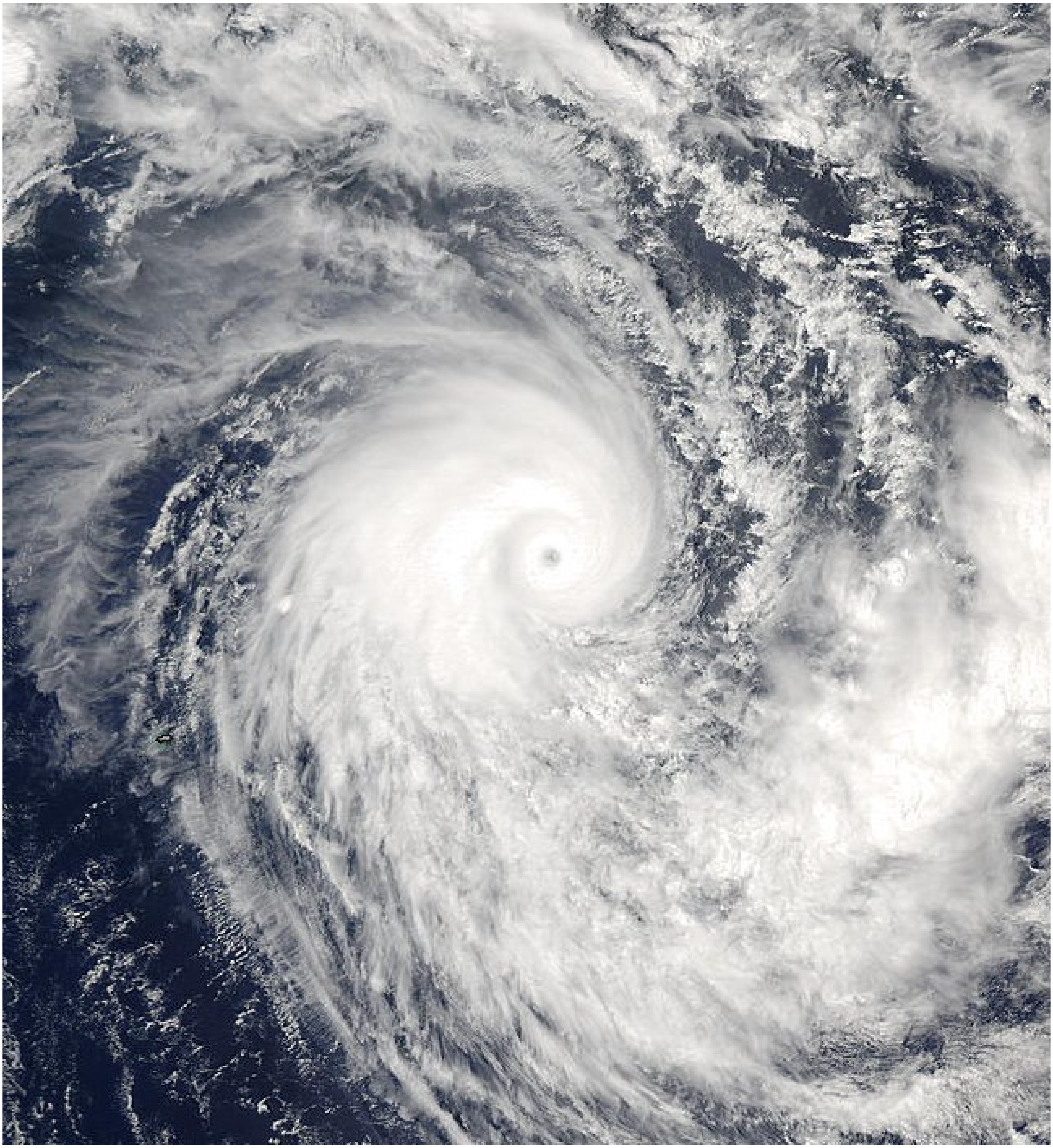


Figure 2-10S-2. 020900Z February 2004 MODIS true-color image of TC 10S (Frank), located in the South Indian Ocean with an intensity of 125 knots.

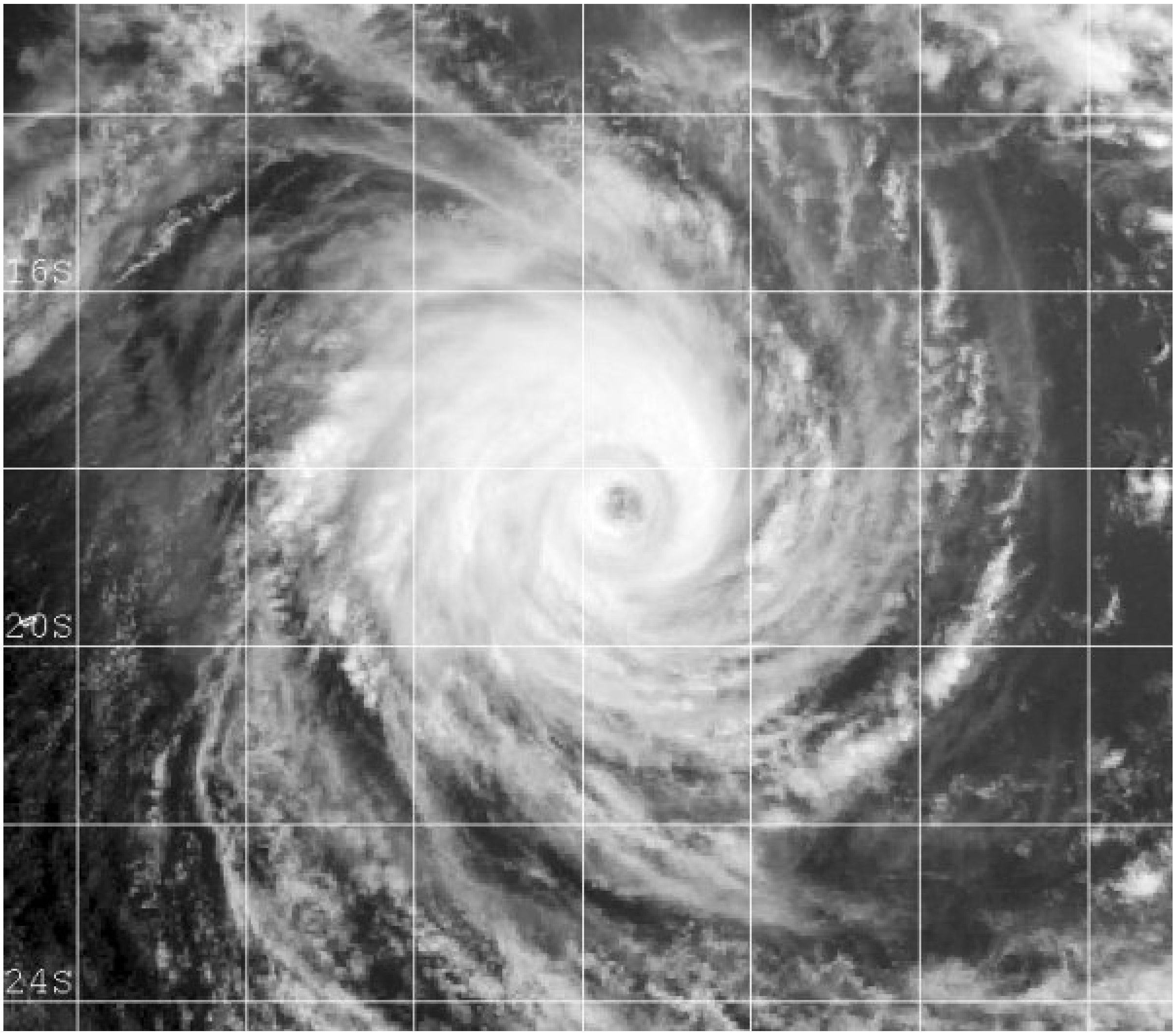
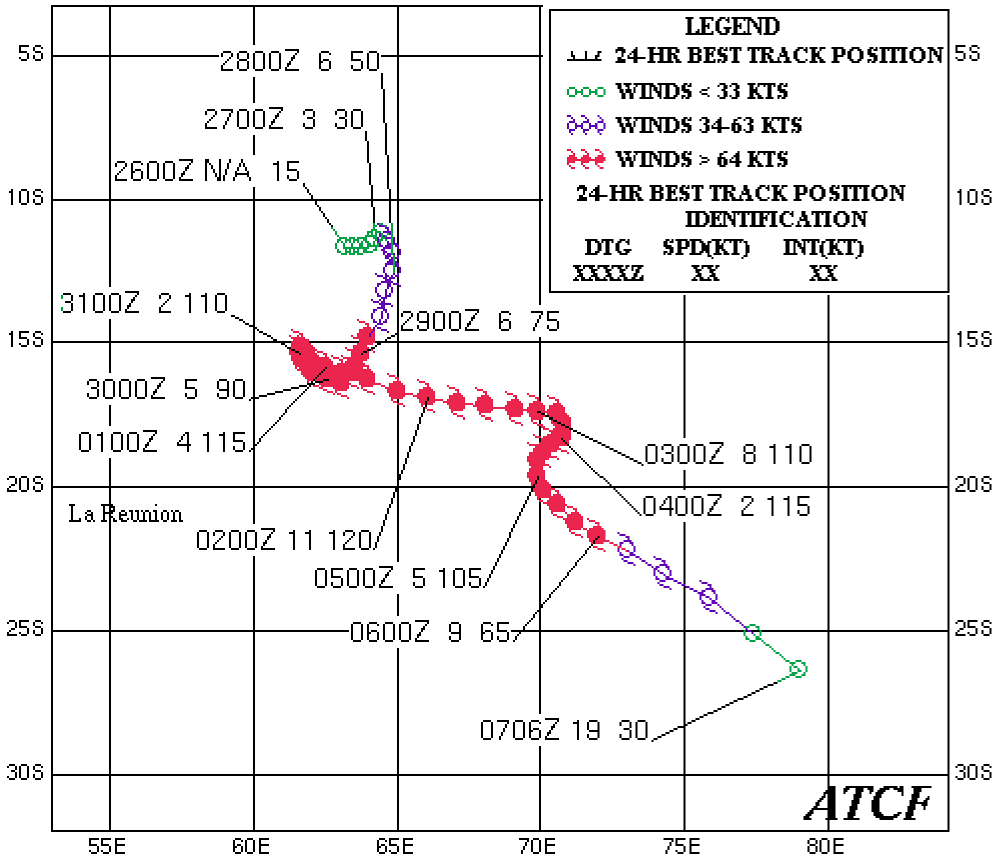
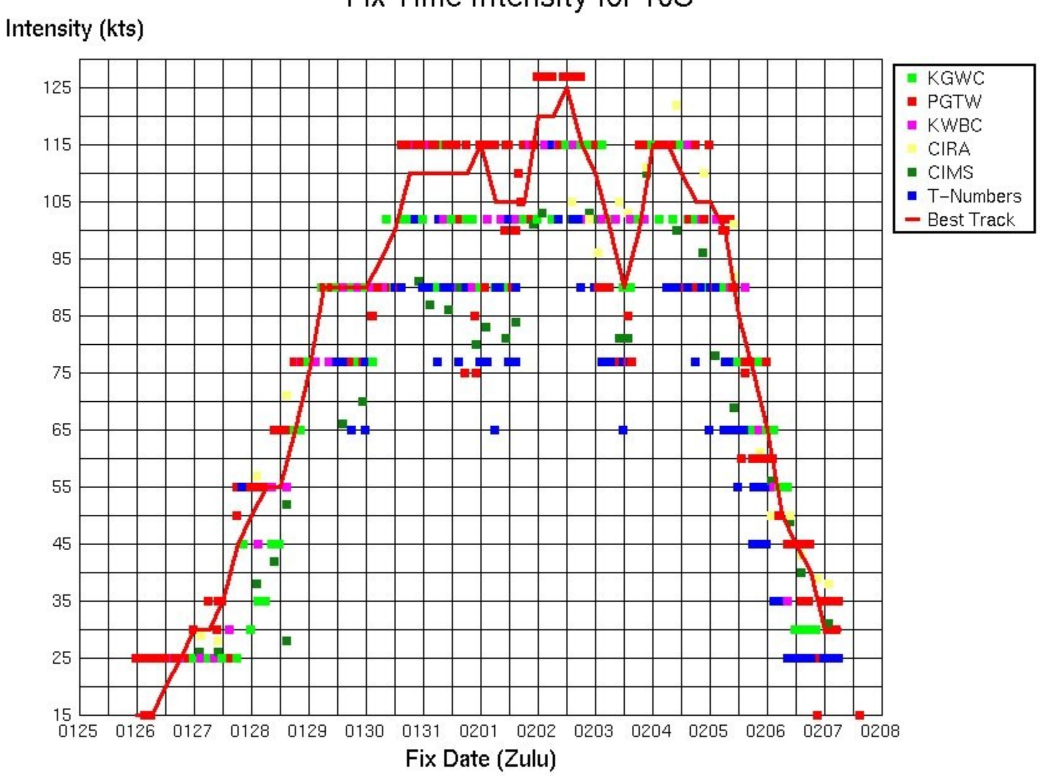


Figure 2-10S-1. 040600Z February 2004 Met-5 visible image of TC 10S (Frank), reveals a pinhole eye with small amounts of dry air invading the east side of the system. At this time, the peak intensity was 115kts.

TROPICAL CYCLONE 10S (FRANK)
26 JAN-07 FEB 2004





Tropical Cyclone (TC) 11S (Linda)

First Poor : 1800Z 27 Jan 04

First Fair : 0300Z 28 Jan 04

First TCFA : 0500Z 28 Jan 04

First Warning : 0000Z 29 Jan 04

Last Warning : 1800Z 01 Feb 04, Dissipated over water

Max Intensity : 45 kts, gusts to 55 kts

Landfall : None

Total Warnings : 9

Remarks:

1) Tropical cyclone (TC) 11S developed approximately 400 nm northwest of the Cocos Islands on 29 Jan. The cyclone slowly intensified and tracked southeastward under the influence of ridging to the northeast. On 30 Jan, TC 11S turned due south and passed approximately 70 nm west of the Cocos Islands with an intensity of 35 kts. TC 11S achieved a maximum intensity of 45 kts on 31 Jan which it maintained for approximately 24 hours as it continued to track poleward. Subsequently, the system entered an increased vertical wind shear regime and the upper level convection decoupled from the low level circulation center and then dissipated over water.

2) No known impacts.

Statistics for JTWC on TC11S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04012800		6.0S	89.5E	25																
04012806		6.5S	90.0E	25																
04012812		7.1S	90.6E	30																
04012818		7.7S	91.4E	30																
04012900	1	8.1S	92.4E	35	26	76	93	148	170				0	10	15	25	25			
04012912	2	9.5S	93.6E	35	21	35	90	100	102				0	5	10	5	10			
04013000	3	11.0S	94.6E	35	8	83	126	162	173				0	5	0	5	10			
04013012	4	12.5S	96.0E	35	29	78	98	115	110				0	-5	0	5	20			

04013100	5	14.7S	96.2E	45	18	13	18	29	66				0	5	5	20	30			
04013112	6	16.4S	96.1E	45	0	8	50	83					0	5	20	25				
04020100	7	17.8S	95.6E	45	8	21	40						0	10	10					
04020112	8	18.8S	95.3E	35	5	34							0	0						
04020118	9	19.3S	95.1E	30	11	54							0	-5						
04020200		19.8S	94.8E	30																
04020206		20.5S	94.8E	30																
			AVERAGE		15	45	73	106	124				0	6	9	14	19			
			BIAS										0	3	9	14	19			
			# CASES		9	9	7	6	5				9	9	7	6	5			

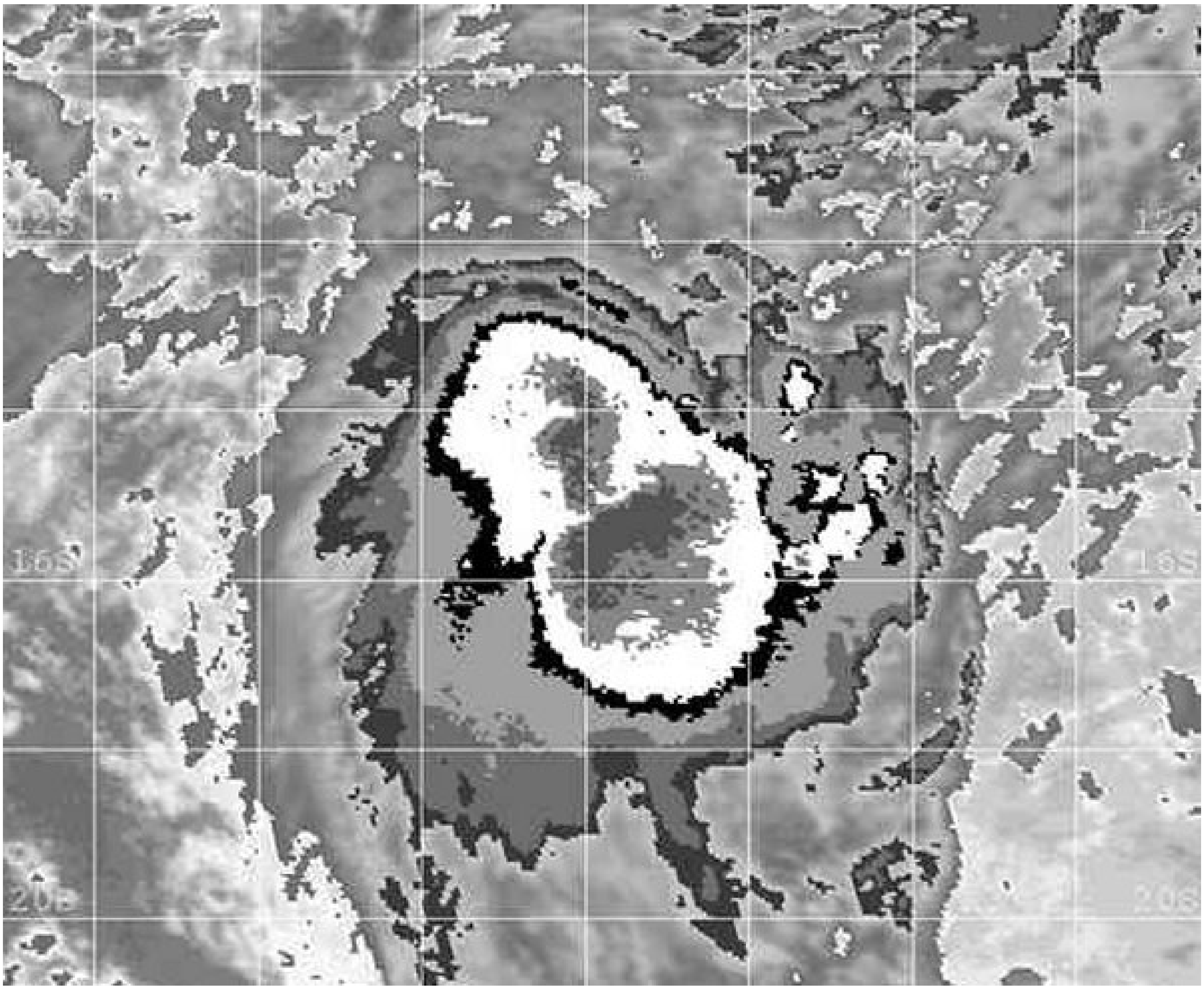
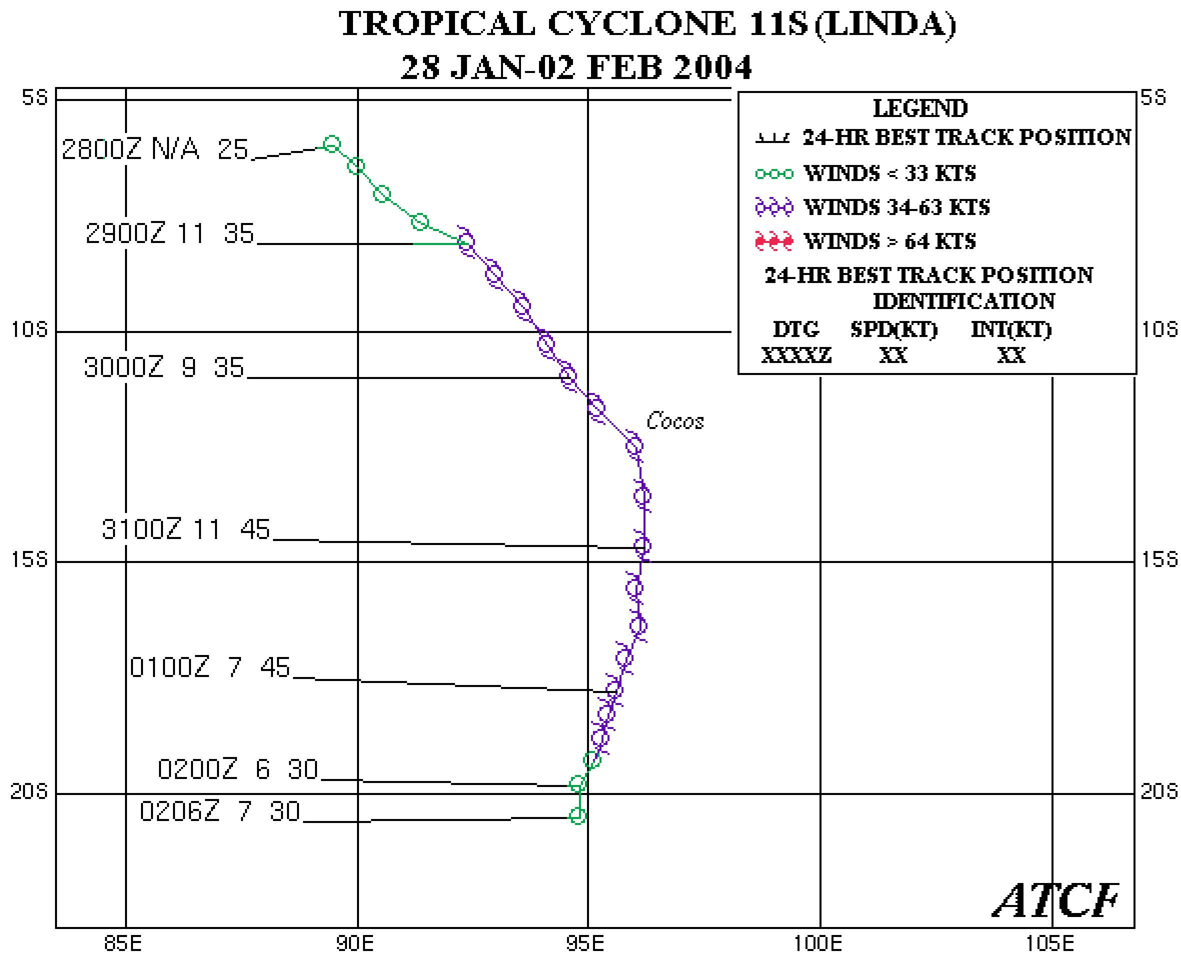
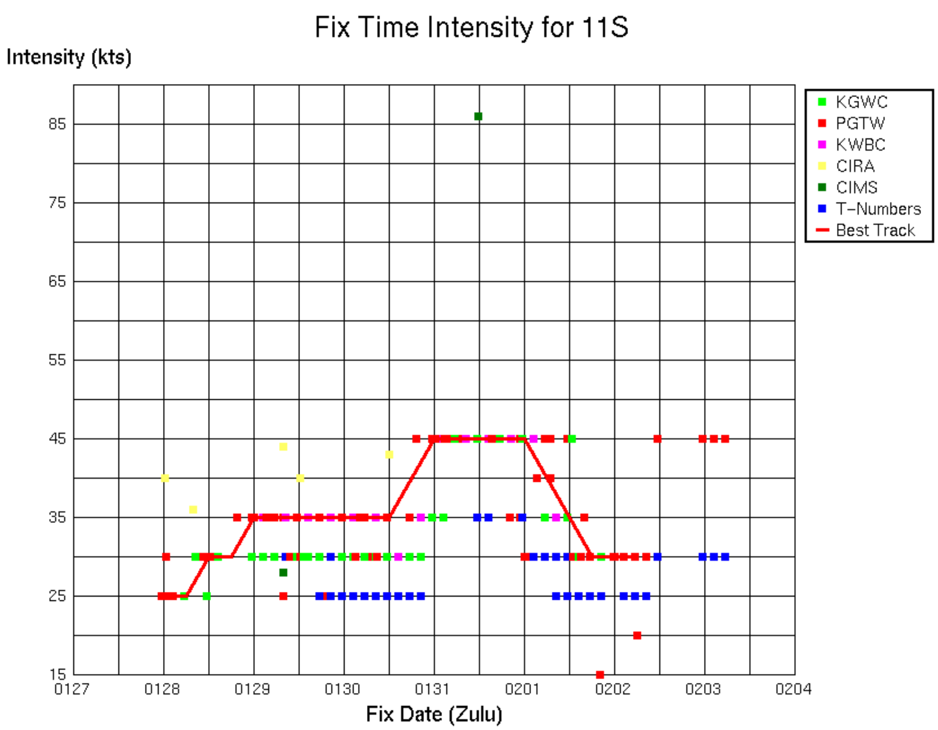


Figure 2-11S-1. 302330Z January 2004 Met-5 Enhanced Infrared BD image of TC 11S (Linda), at this time, the systems Low-level circulation was embedded in a large CDO and approximately 145 nm south of the Cocos Islands with a peak intensity of 45kts.



TROPICAL CYCLONE 11S (LINDA)
28 JAN-02 FEB 2004
LEGEND
24-HR BEST TRACK POSITION
WINDS < 33 KTS
WINDS 34-63 KTS
WINDS > 64 KTS
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
2800Z N/A 25
2900Z 11 35
3000Z 9 35
3100Z 11 45
0100Z 7 45
0200Z 6 30
0206Z 7 30
Cocos
5S
10S
15S
20S
85E
90E
95E
100E
105E
ATCF



Fix Time Intensity for 11S
Intensity (kts)
85
75
65
55
45
35
25
15
0127
0128
0129
0130
0131
0201
0202
0203
0204
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
T–Numbers
Best Track

Tropical Cyclone (TC) 12P (Fritz)

First Poor : 2000Z 09 Feb 04

First Fair : 1030Z 10 Feb 04

First TCFA : 1700Z 10 Feb 04

First Warning : 0000Z 12 Feb 04

Last Warning : 1200Z 12 Feb 04, Dissipated over land

Max Intensity : 35 kts, gusts to 45 kts

Landfall : North of Burketown, Queensland

Total Warnings : 2

Remarks:

1) Tropical Cyclone (TC) 12P was first detected in the Coral Sea on 09 Feb and remained at or below tropical depression strength as it tracked westward across the Cape York Peninsula and into the Gulf of Carpentaria, where it briefly intensified to minmal tropical storm strength. A first warning was issued on 12 Feb at 0000Z. Just before 0700Z on 12 Feb, the system made landfall a second time north of Burketown, Queensland and a final warning on the system was issued on 12 Feb at 1200Z. JTWC continued to monitor the remnants of TC 12P as it tracked southwestward across northern Australia. The remnants then moved back over water south of Denham Sound on 16 Feb around 1800Z and rapidly merged with a passing shortwave trough. One hundred eighty three (183) satellite fixes were produced during the TC 12P remnant passage across Australia.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC12S																				
	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04021012		13.9S	145.7E 20																	
04021018		14.5S	144.3E 20																	
04021100		15.2S	143.3E 20																	
04021106		16.0S	142.2E 20																	
04021112		16.2S	141.2E 25																	
04021118		16.5S	140.6E 30																	
04021200	1	16.7S	140.0E 35	5	42							0	5							
04021212	2	17.0S	138.2E 25	60								0								

04021218		17.2S	136.9E 25																	
			AVERAGE	33	42							0	5							
			BIAS									0	5							
			# CASES	2	1							2	1							

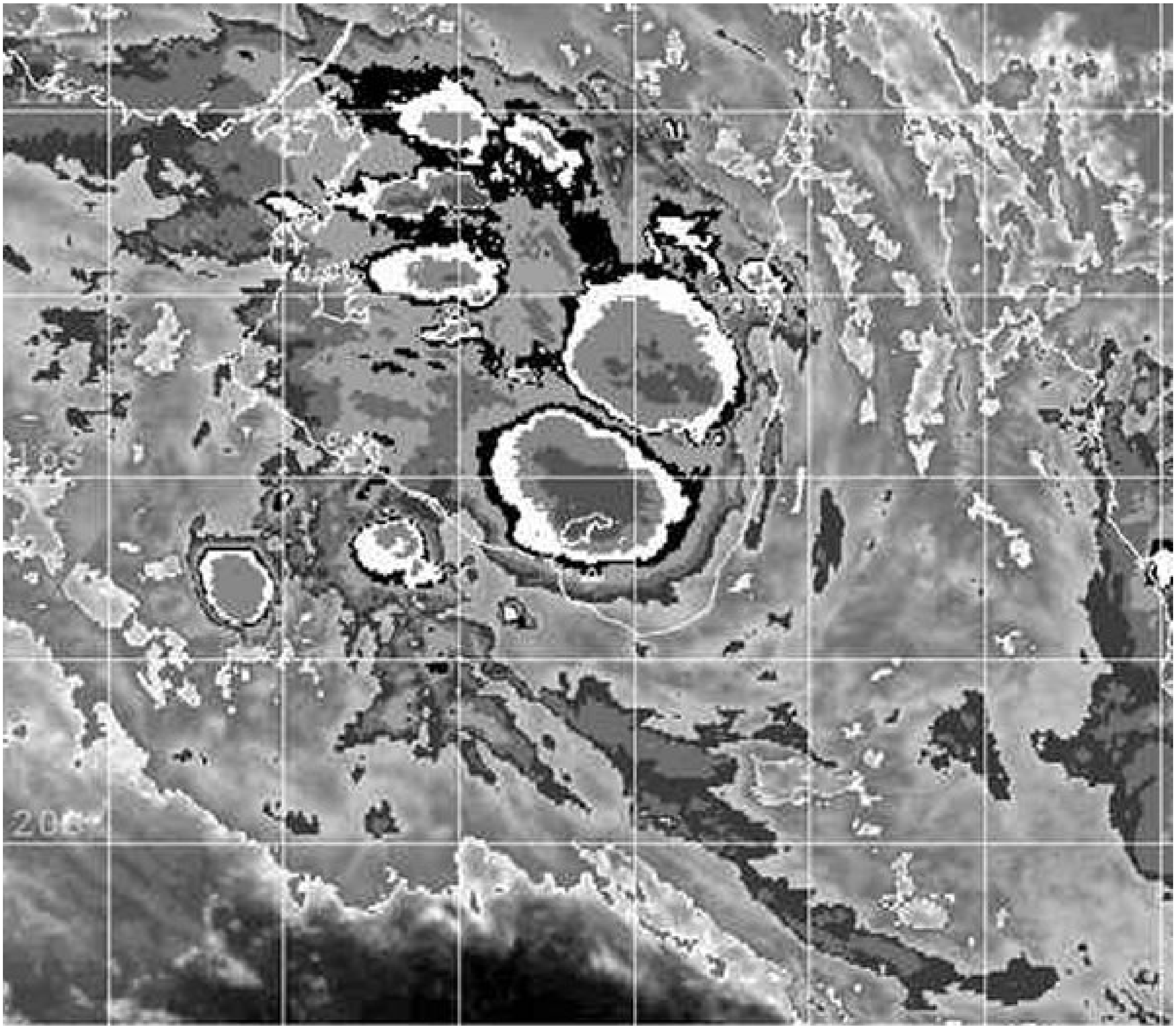
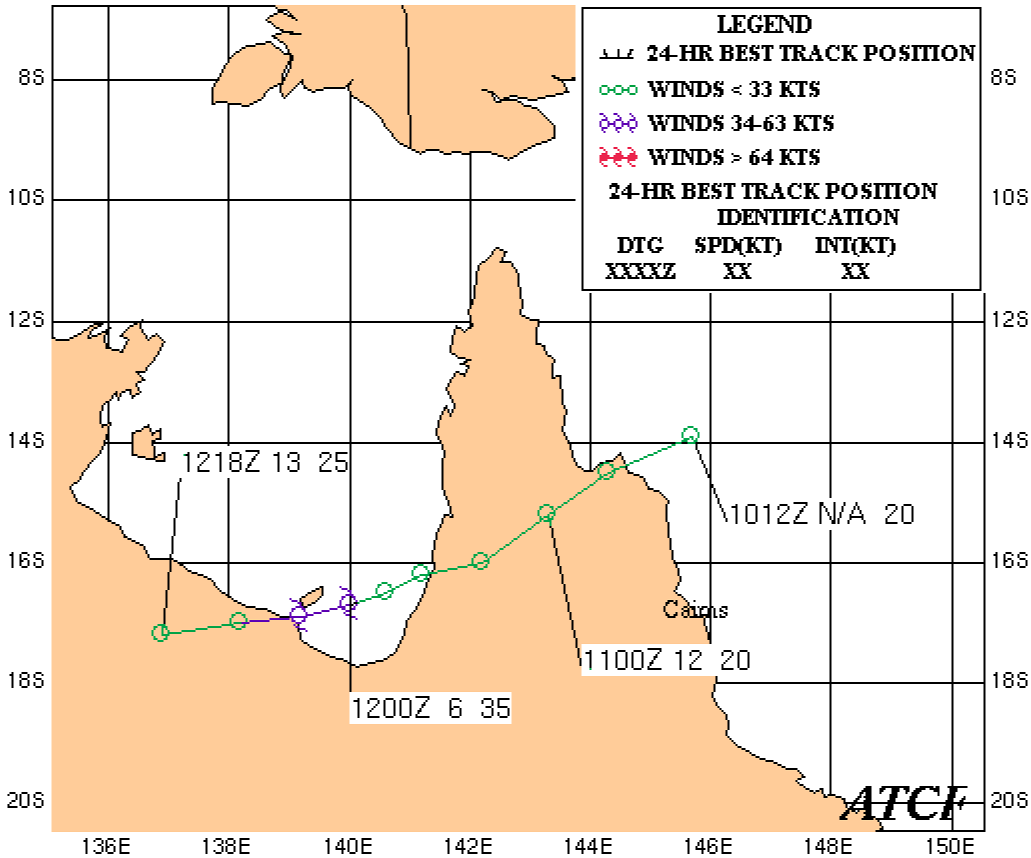
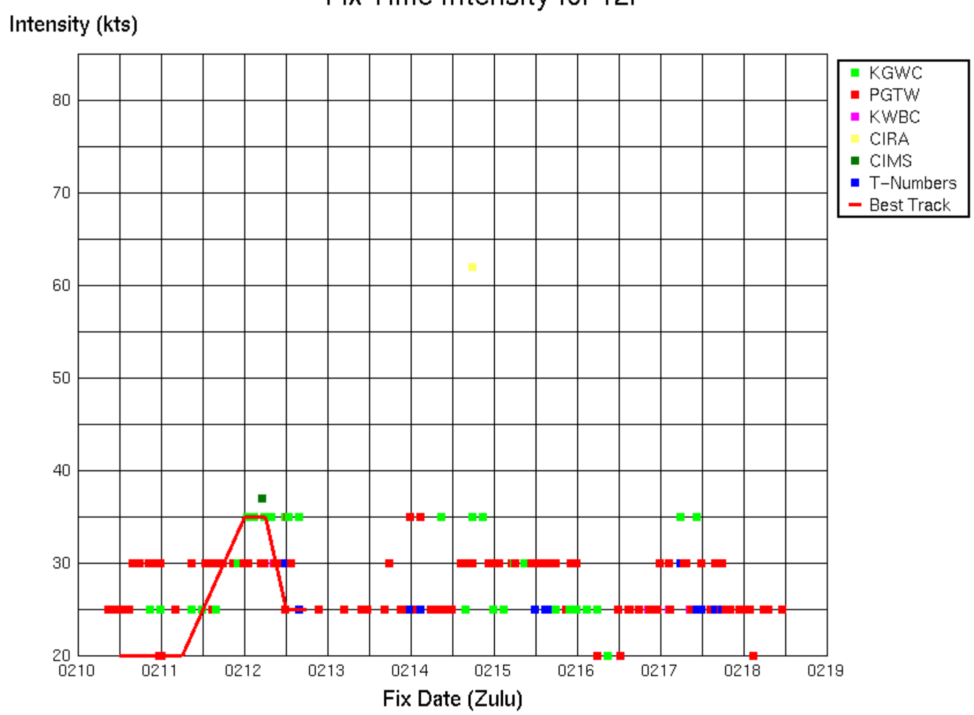


Figure 2-12P-1. 112213Z February 2004 Goes-9 BD image of TC 12P (Fritz), at this time, the systems Low-level circulation is embedded amongst the associated deep convection. The system is tracking through the Gulf of Carpentaria and into Central Austrailia with a peak intensity of 45kts.

TROPICAL CYCLONE 12P (FRITZ)
10-12 FEB 2004



Fix Time Intensity for 12P



Tropical Cyclone (TC) 13P (Ivy)

First Poor : 2200Z 20 Feb 04

First Fair : 0600Z 21 Feb 04

First TCFA : 2030Z 21 Feb 04

First Warning : 1800Z 22 Feb 04

Last Warning : 0600Z 29 Feb 04, Extra-tropical

Max Intensity : 105 kts, gusts to 130 kts

Landfall : Near Port Vila, Vanuatu

Total Warnings : 14

Remarks:

1) Tropical cyclone (TC) 13P formed approximately 300 nm northeast of Vanuatu along the northern periphery of a low to mid level ridge located south of the system. Prior to the first warning, TC 13P made a cyclonic loop as it slowly tracked in a weak steering environment and consolidated. On 22 Feb at 1800Z a first warning was issued and the cyclone tracked northeastward along the steering ridge for the next 36 hours. As the steering ridge weakened the system began to move southward and remained on this course until becoming an extratropical cyclone. TC 13P intensified at a rate in excess of climatology over the first 72 hours after the initial warning due to enhanced upper level outflow conditions. The system peaked at an intensity of 105 kts and passed near Vanuatu between 25 and 26 Feb. Subsequently, TC 13P transitioned into an extra-tropical system approximately 370 nm southeast of Auckland, New Zealand on 29 Feb.

2) Reports indicated that villages in outlying islands of Vanuatu sustained major damage, including the uprooting trees and significant communications outages. Many houses were reported destroyed and approximately 2,000 people were evacuated from coastal and low lying areas in Port Vila. Reports confirm one injury but no other casualties.

Statistics for JTWC on TC13P

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04022100		15.4S	172.2E	20																
04022106		15.8S	172.0E	20																
04022112		16.1S	172.2E	20																
04022118		16.4S	172.7E	25																
04022200		16.3S	173.3E	30																
04022206		16.1S	173.8E	25																
04022212		15.5S	173.8E	30																
04022218	1	15.1S	173.3E	35	53	101	150	187	204				0	0	-15	-10	-10			
04022306	2	14.3S	171.7E	45	37	74	90	93	104				0	-15	-10	-10	-5			
04022318	3	13.6S	170.3E	70	8	13	18	34	71				0	15	20	25	20			
04022406	4	13.7S	169.1E	75	0	8	12	30	72				0	0	5	5	20			
04022418	5	14.4S	168.3E	85	13	42	86	142	213				0	5	5	15	0			
04022506	6	15.4S	167.7E	90	12	57	85	132	181				0	-5	10	-5	-15			
04022518	7	16.4S	167.8E	105	6	21	43	46	67				5	15	15	0	-10			
04022606	8	17.7S	168.3E	100	8	8	0	49	151				0	-10	-15	-25	-20			
04022618	9	19.3S	168.9E	105	0	12	27	92	197				0	-5	-15	-20	0			
04022706	10	21.3S	169.4E	100	5	33	76	193	299				0	-5	0	20	15			
04022718	11	24.3S	170.7E	100	0	34	80	120					0	-5	10	5				
04022806	12	28.7S	173.1E	85	7	58	104						0	20	15					
04022818	13	34.4S	176.9E	55	0	44							0	0						
04022906	14	40.3S	178.2W	45	13								0							
			AVERAGE		12	39	64	102	156				0	8	11	13	12			
			BIAS										0	1	2	0	-1			
			# CASES		14	13	12	11	10				14	13	12	11	10			

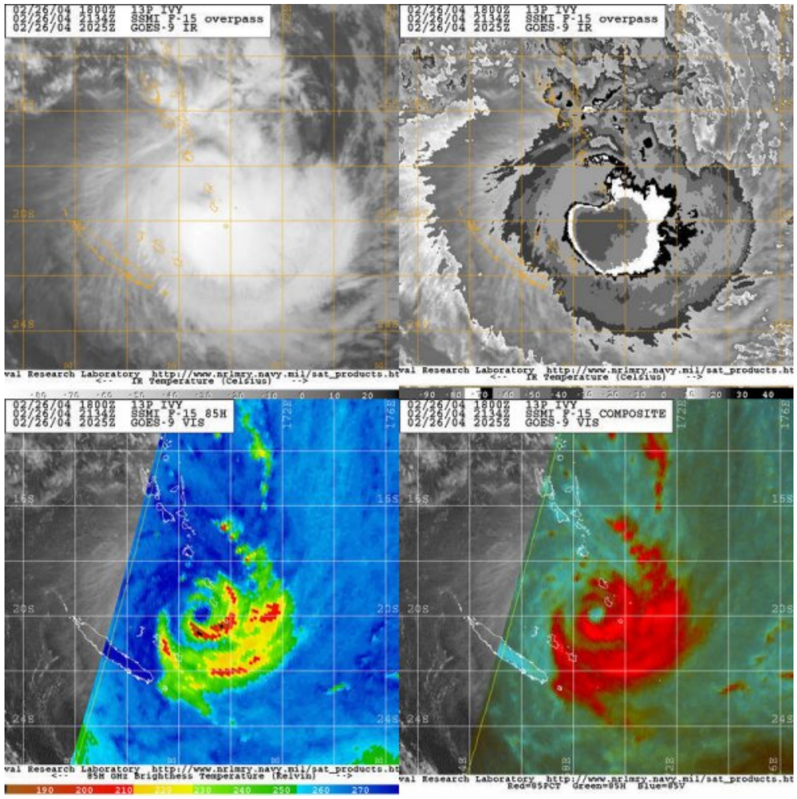


Figure 2-13P-1. 262134Z February 2004 SSM/I Multi-Sensor imagery of TC 13P (IVY), reveals the northwest eye wall was beginning to weaken as the system tracked south. At this time, the system was approximately 175 nm to the east of New Caledonia.

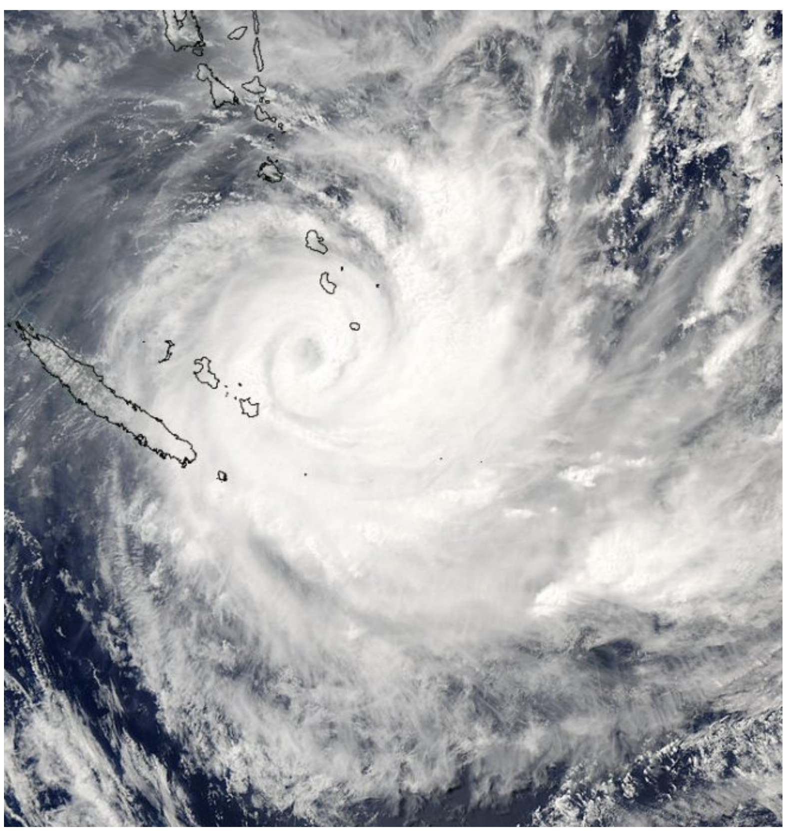
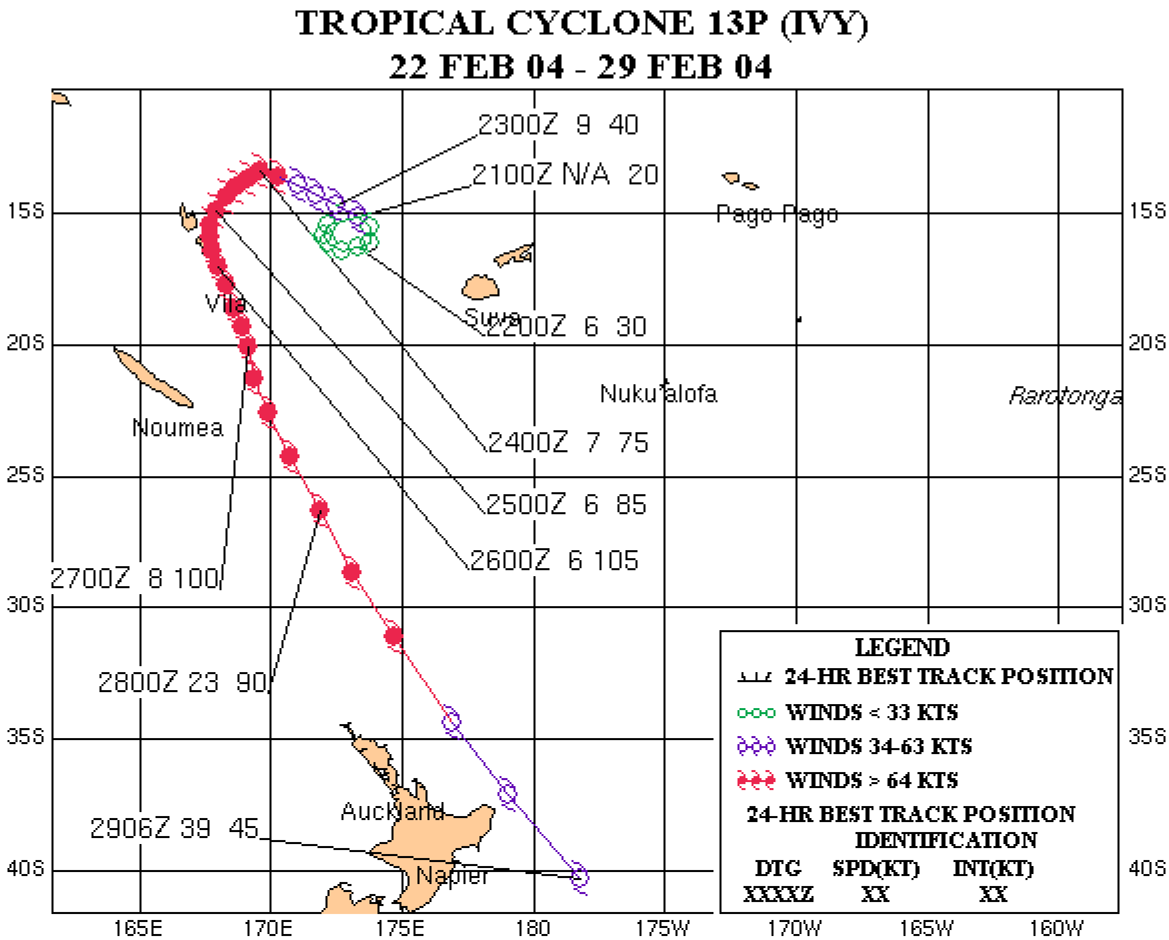
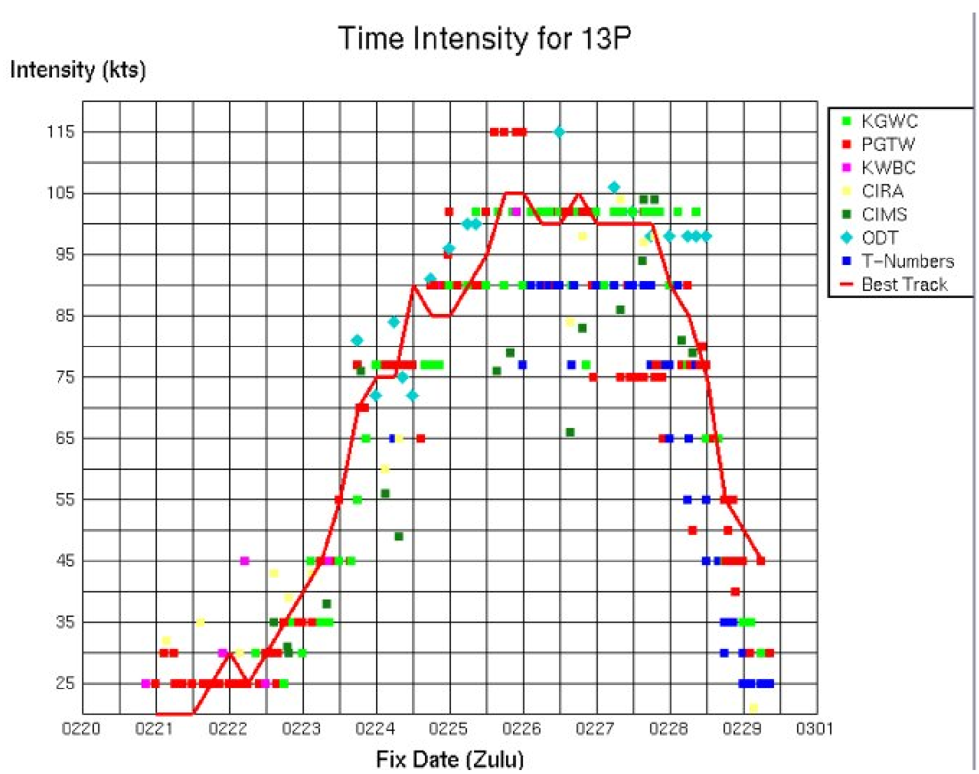


Figure 2-13P-2. 270215Z February 2004 MODIS true-color image of TC 13P (Ivy), located 150 nm east-northeast of New Caledonia with an intensity of 100 knots.



TROPICAL CYCLONE 13P (IVY)
22 FEB 04 - 29 FEB 04
2300Z 9 40
2100Z N/A 20
2200Z 6 30
2400Z 7 75
2500Z 6 85
2600Z 6 105
2700Z 8 100
2800Z 23 90
2906Z 39 45
Pago Pago
Vila
Suva
Nuku'alofa
Rarotonga
Noumea
Auckland
Napier
15S
20S
25S
30S
35S
40S
165E
170E
175E
180
175W
170W
165W
160W
LEGEND
24-HR BEST TRACK POSITION
WINDS < 33 KTS
WINDS 34-63 KTS
WINDS > 64 KTS
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX



Time Intensity for 13P
Intensity (kts)
115
105
95
85
75
65
55
45
35
25
0220
0221
0222
0223
0224
0225
0226
0227
0228
0229
0301
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
ODT
T-Numbers
Best Track

Tropical Cyclone (TC) 14S (Monty)

First Poor : N/A

First Fair : 2330Z 26 Feb 04

First TCFA : 0200Z 27 Feb 04

First Warning : 0600Z 27 Feb 04

Last Warning : 0000Z 02 Mar 04, Dissipated over land

Max Intensity : 110 kts, gusts to 130 kts

Landfall : Mardie, Australia

Total Warnings : 15

Remarks:

1) Tropical Cyclone (TC) 14S was first detected as a tropical disturbance just off the northern coast of Western Australia, northeast of Port Hedland on 26 Feb. The cyclone rapidly intensified as it tracked westward along the southern periphery of the subtropical ridge through 28 Feb. A passing mid-latitude trough weakened the steering ridge and shifted the track poleward while enhancing outflow allowing TC 14S to reach an intensity of 110 kts on 29 Feb at 1200Z. Subsequently, TC 14S weakened slowly as it tracked southeast before making landfall near Mardie, Australia on 01 Mar. Intensity at landfall was estimated by satellite at 90 kts but Mardie station reported maximum winds of 60 kts with a central pressure of 968mb. The system continued tracking over land and weakened rapidly and a final warning was issued by 0000Z on 02 Mar. The low level circulation center was readily apparent as the system tracked inland over the Great Sandy Desert for 12 hours before dissipating completely.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC14S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04022618		19.7S	120.9E	15																
04022700		19.5S	120.4E	30																
04022706	1	19.2S	120.0E	35	13	18	38	42	48				-5	-15	-30	-35	-70			
04022718	2	19.3S	119.0E	50	22	29	51	64	70				0	-15	-10	-30	-20			
04022800	3	19.3S	118.5E	65	8	13	13	16	29	82			0	5	-5	-15	-25	-15		
04022806	4	19.2S	117.8E	70	5	13	33	38	57	158			-5	5	-15	-10	-25	-5		
04022812	5	19.2S	117.2E	70	12	29	51	64	108	279			0	-10	-15	-20	-40	-10		
04022818	6	19.2S	116.7E	75	8	13	29	58	96				0	-20	-15	-25	-30			
04022900	7	19.3S	116.2E	90	8	8	13	45	96				-5	-5	-5	-5	-10			
04022906	8	19.5S	115.8E	105	12	6	25	73	160				0	10	-15	-15	-15			
04022912	9	19.8S	115.4E	110	11	21	54	116	197				0	-10	-25	-25	-15			
04022918	10	20.1S	115.1E	105	0	25	66	133					0	-20	-20	-15				
04030100	11	20.5S	115.2E	105	0	21	60	108					0	-10	-10	-5				
04030106	12	20.9S	115.3E	105	13	21	41						0	5	5					
04030112	13	21.3S	115.6E	90	6	43	62						5	5	0					
04030118	14	21.6S	115.8E	75	6	21							0	10						
04030200	15	21.9S	116.2E	60	8	25							5	10						
04030206		22.4S	116.5E	45																
04030212		23.0S	116.9E	35																
			AVERAGE		9	20	41	69	96	173			2	10	13	18	28	10		
			BIAS										0	-4	-12	-18	-28	-10		
			# CASES		15	15	13	11	9	3			15	15	13	11	9	3		

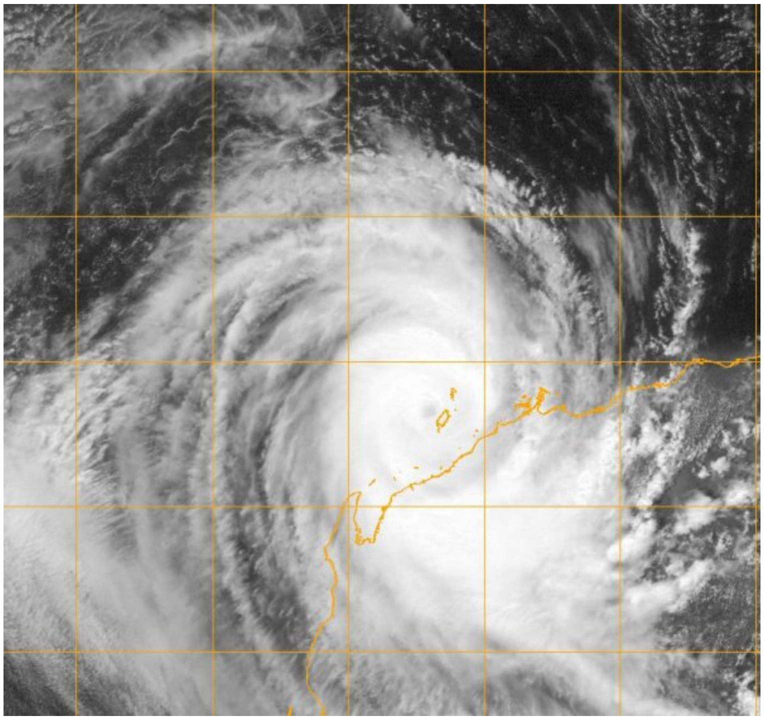


Figure 2-14S-1. 010449Z March 2004 Goes-9 visible image of TC 14S (Monty), reveals the eye approximately 44 nm for them northwest coast of Australia just before the system makes landfall with a peak intensity of 105kts.

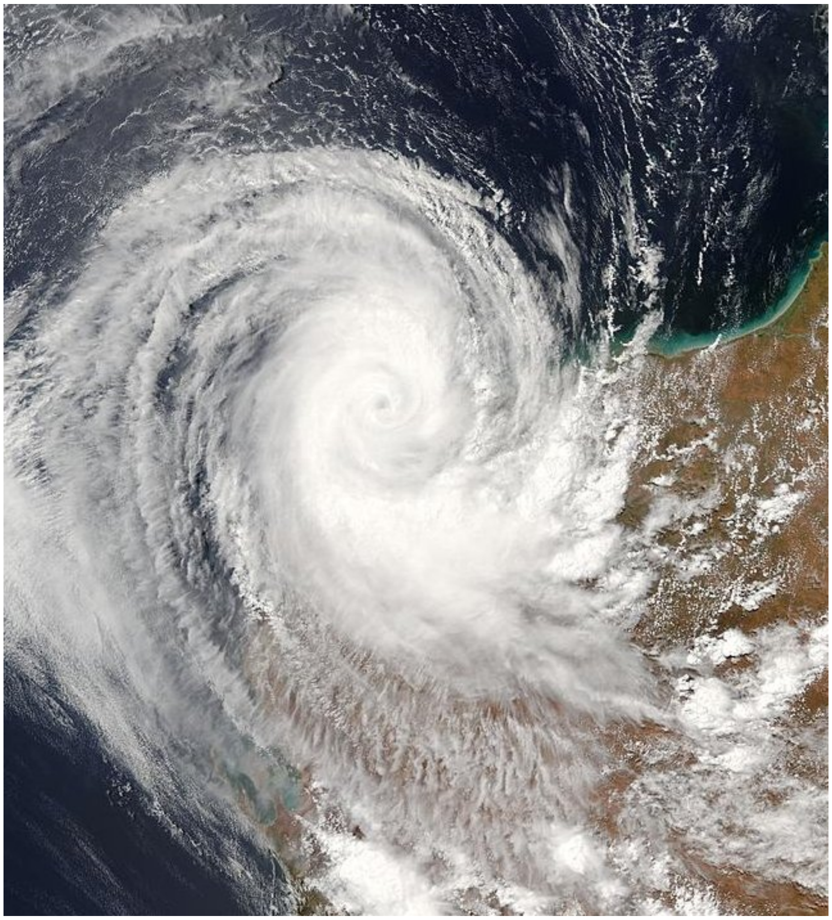
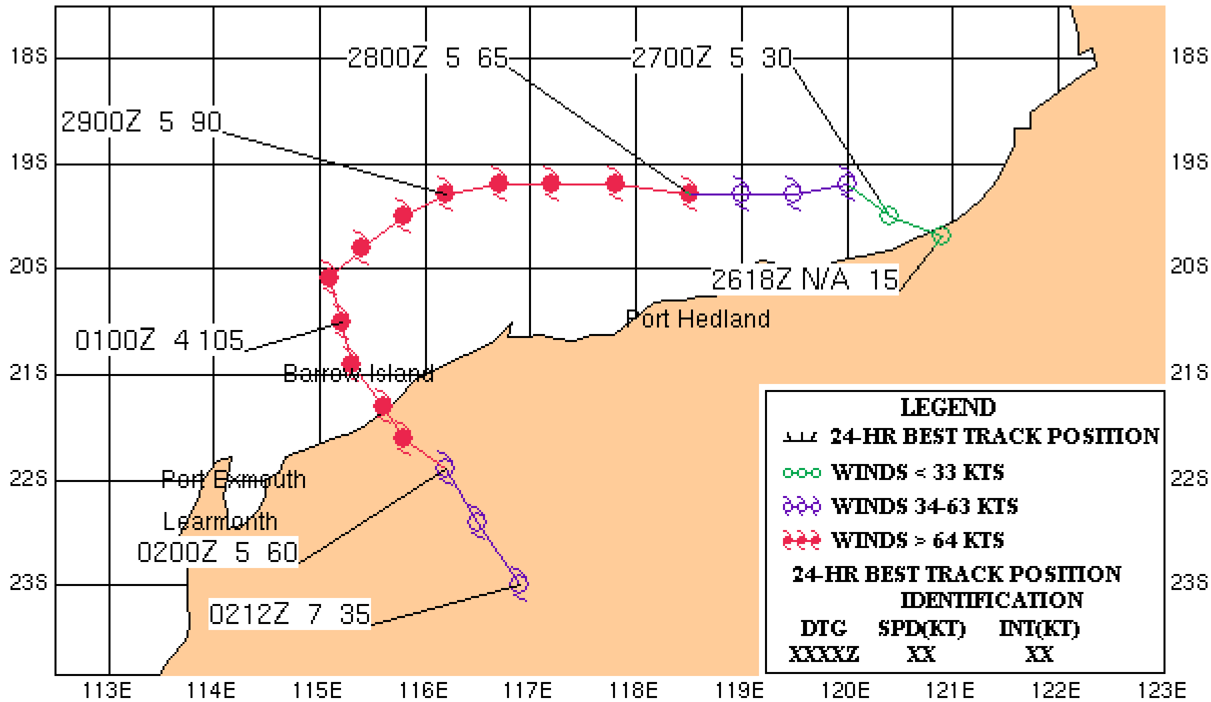
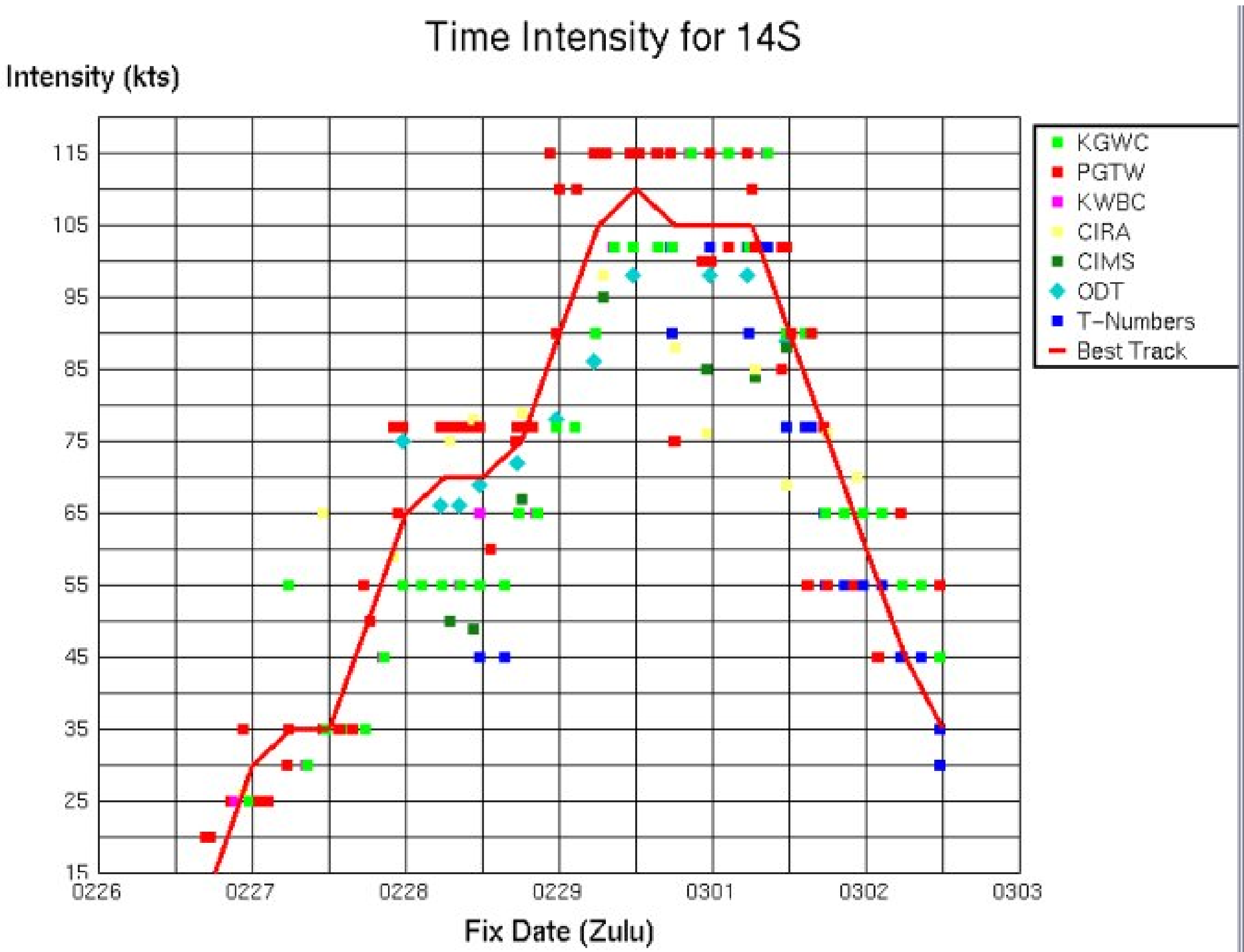


Figure 2-14S-2. 010605Z March 2004 MODIS true-color image of TC 14S (Monty), approaching landfall over Australia with an intensity of 105 knots.

TROPICAL CYCLONE 14S (MONTY)
27 FEB 04 - 02 MAR 04





Tropical Cyclone (TC) 15S (Evan)

First Poor : 0600Z 29 Feb 04

First Fair : 2330Z 29 Feb 04

First TCFA : 0300Z 01 Mar 04

First Warning : 0600Z 01 Mar 04

Last Warning : 0600Z 02 Mar 04, Dissipated over land

Max Intensity : 30 kts, gusts to 40 kts

Landfall : Multiple Events: North of Numbulwar, Australia and near Forrest River, Australia

Total Warnings : 4

Remarks:

1) Tropical Cyclone (TC) 15P was first detected in the Gulf of Carpentaria on 29 Feb as a tropical disturbance with heavy convection displaced from the low level circulation. The cyclone developed and moved west passing over Groote Eylandt before making landfall as a 30 kt cyclone, north of Numbulwar. Remnants of this cyclone were tracked and monitored for 72 hours as it moved west over land then emerged in the Indian Ocean near Collier Bay. Once the cyclone emerged along the northwest coast, the intensity remained at or below 25 kts, below warning criteria.

2) Damage reports indicate the cyclone brought heavy rains and strong winds to the town of Alyangula, approximately 600 km ESE of Darwin. No casualties were reported.

Statistics for JTWC on TC15P

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04022912		14.7S	139.3E	25																
04022918		14.4S	138.6E	25																
04030100		13.9S	138.1E	25																
04030106	1	13.9S	137.4E	30	13	33	38						0	5	10					
04030118	2	14.0S	135.6E	30	5	53							5	10						
04030200	3	14.2S	134.8E	30	5								0							
04030206	4	14.2S	134.3E	25	18								0							
			AVERAGE		11	43	38						1	8	10					
			BIAS										1	8	10					
			# CASES		4	2	1						4	2	1					

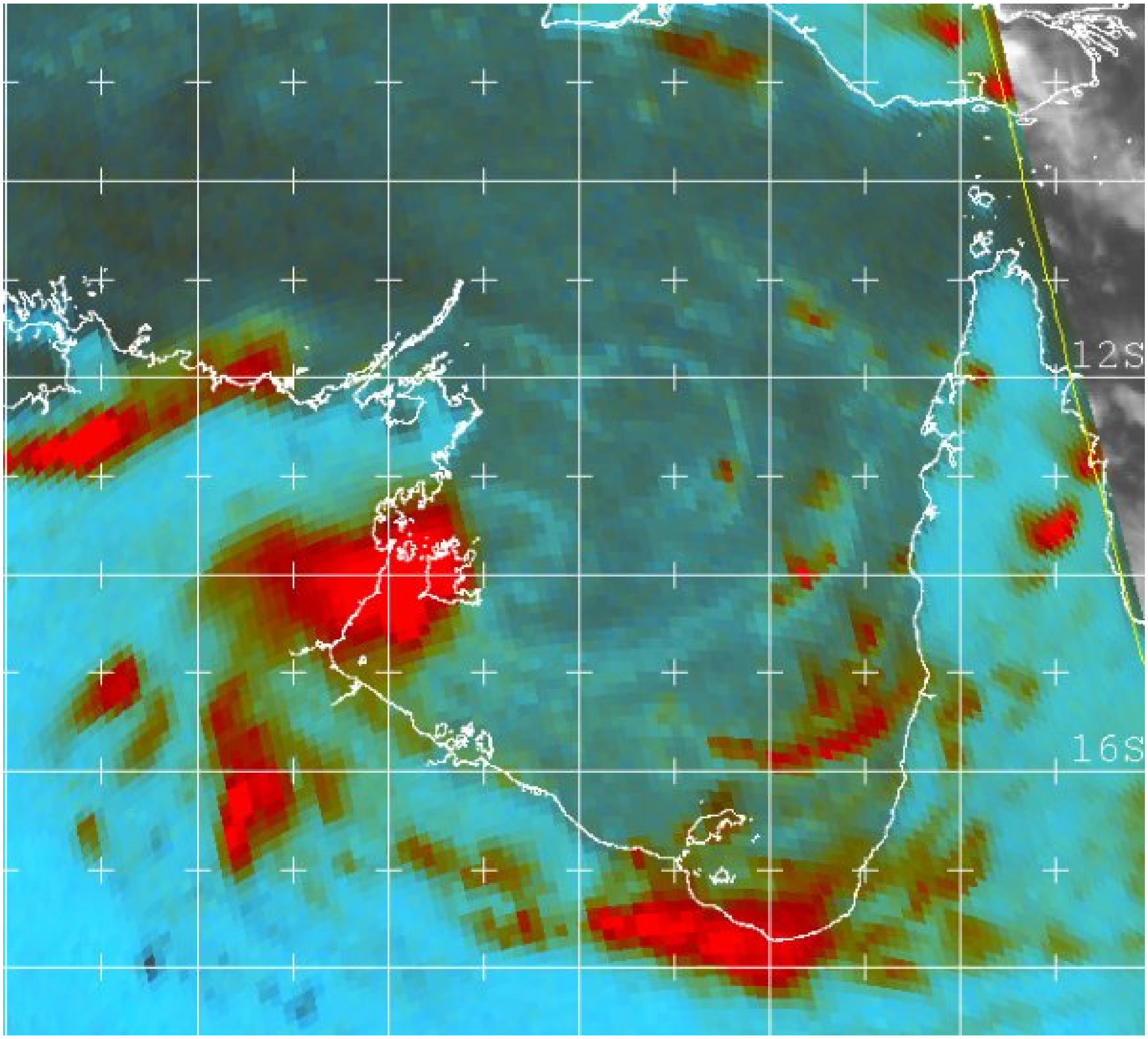
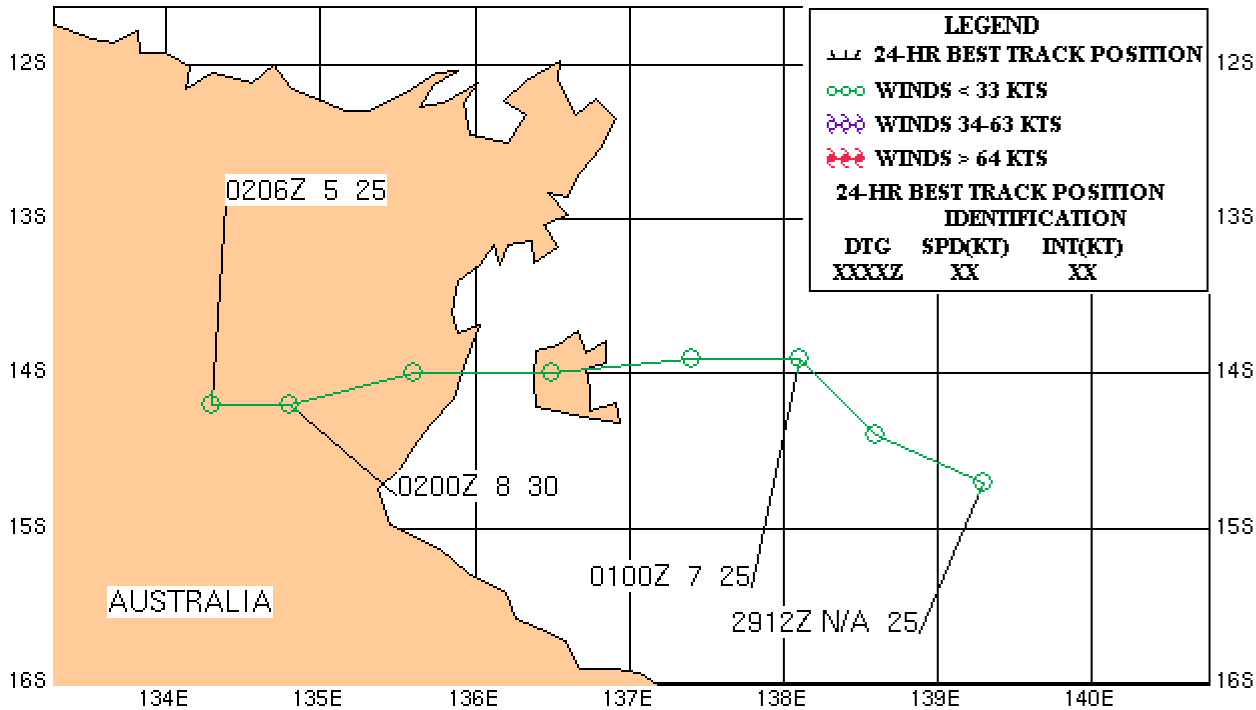
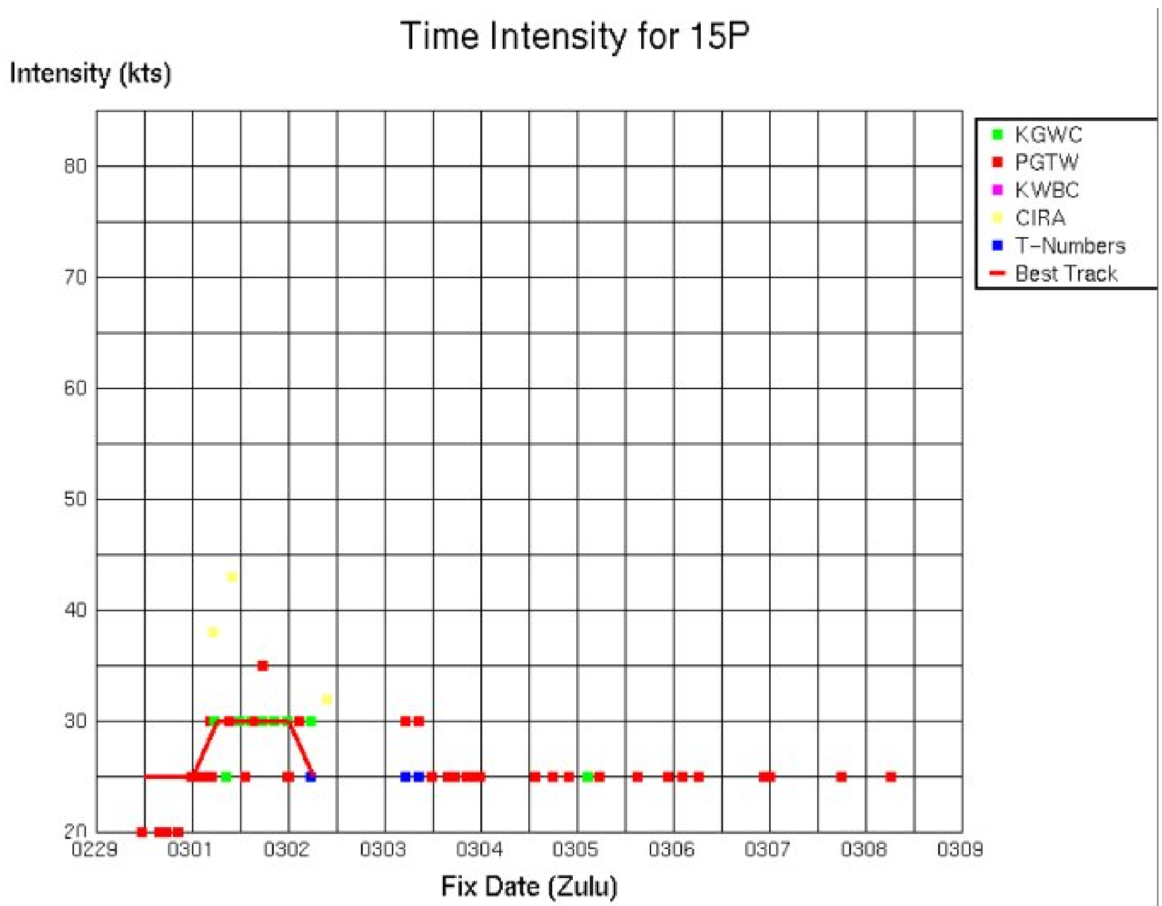


Figure 2-15P-1. 011034Z March 2004 SSM/I color composite image of TC 15P (Evan), reveals the convection is decoupled from the Low-level circulation center prior to landfall with a peak intensity of 30kts.

TROPICAL CYCLONE 15P (EVAN)
01 MAR 04 - 02 MAR 04





Tropical Cyclone (TC) 16S (Gafilo)

First Poor : 1800Z 29 Feb 04

First Fair : 0400Z 01 Mar 04

First TCFA : 0830Z 02 Mar 04

First Warning : 1800Z 02 Mar 04

Last Warning : 1800Z 11 Mar 04, Dissipated over land

Max Intensity : 140 kts, gusts to 170 kts

Landfall : Just north of Morombe, Madagascar

Total Warnings : 20

Remarks:

1) Tropical cyclone (TC) 16S formed approximately 240 nm south of Diego Garcia on 29 Feb. Following the issuance of the first warning on 02 Mar the cyclone moved southwest towards Madagascar. TC 16S made landfall along the northeast coast of Madagascar near the city of Antalaha on 07 Mar at 0000Z with maximum winds of 140 kts. After passing over Madagascar into the Mozambique Channel, TC 16S maintained an intensity of 65 kts and continued to track southwestward. At approximately 0006Z on 09 Mar, TC 16S began to track southeastward across southern Madagascar. As the system tracked across southern Madagascar it steadily weakened and dissipated over land. The final warning was issued on 11 Mar at 1800Z.

2) TC 16S was reported to be one of the worst tropical cyclones to hit Madagascar in the past decade and left widespread damage and destruction. Reports indicated that 25 people were killed and at least 100,000 left homeless. A ferry carrying 91 passengers and 21 crewmembers sank as it crossed from the Comoran Island of Anjouan to Mahajanga, Madagascar with only 2 survivors found.

Statistics for JTWC on TC16S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04030106		11.6S	72.2E	20																
04030112		11.6S	71.8E	20																
04030118		11.7S	71.3E	20																
04030200		12.2S	70.9E	25																
04030206		13.1S	70.6E	25																
04030212		13.8S	69.8E	30																
04030218	1	14.1S	68.2E	30	31	194	278	291	253				0	-15	-30	-25	-25			
04030306	2	13.4S	64.0E	45	5	57	109	163	236	250			0	-10	0	5	0	-75		
04030312	3	13.1S	62.4E	55	17	69	112	156	160	118			5	10	15	25	-15	-20		
04030318	4	12.7S	61.1E	65	42	101	157	168	140				0	15	15	10	-15			
04030406	5	12.2S	59.4E	65	0	38	67	61	24				0	5	0	-20	-25			
04030418	6	12.9S	58.0E	75	12	30	42	43	66				10	5	-15	-20	-30			
04030506	7	13.5S	56.7E	90	0	0	13	42	107				0	-25	-15	-30	-20			
04030518	8	14.2S	55.2E	125	6	25	63	141	195				0	0	0	20	50			
04030606	9	14.7S	53.5E	140	8	12	78	133	220				0	0	10	25	15			
04030618	10	15.0S	51.6E	140	0	50	99	170	230				0	10	35	25	5			
04030706	11	15.1S	49.2E	115	5	25	62	98	166				-20	10	10	0	-10			
04030718	12	16.3S	46.6E	75	8	55	86	145	135				0	0	-5	-10	-10			
04030806	13	17.8S	44.1E	65	18	40	91	107	134				-10	0	10	5	5			
04030818	14	18.8S	42.8E	65	12	34	21	70	42				0	5	10	20	10			
04030906	15	19.6S	42.2E	65	12	36	100	105	96				0	5	15	15	15			
04030918	16	20.9S	43.2E	60	0	71	98	110					0	5	5	10				
04031006	17	22.4S	45.0E	45	0	16	50						0	0	5					
04031018	18	23.4S	45.8E	40	0	8							5	10						
04031106	19	24.1S	46.5E	30	13								5							
			AVERAGE		10	48	90	125	147	184			3	7	11	17	17	48		
			BIAS										0	2	4	3	-3	-48		
			# CASES		19	18	17	16	15	2			19	18	17	16	15	2		

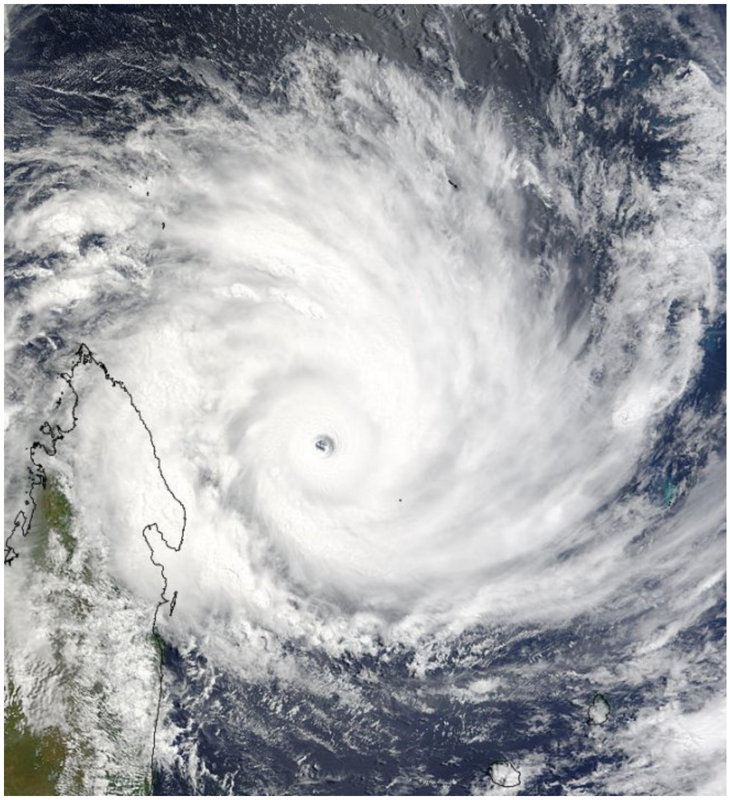


Figure 2-16S-1. 060655Z March 2004 MODIS true-color image of TC 16S (Gafilo), located approximately 180 nm east of Madagascar with an intensity of 140 knots.

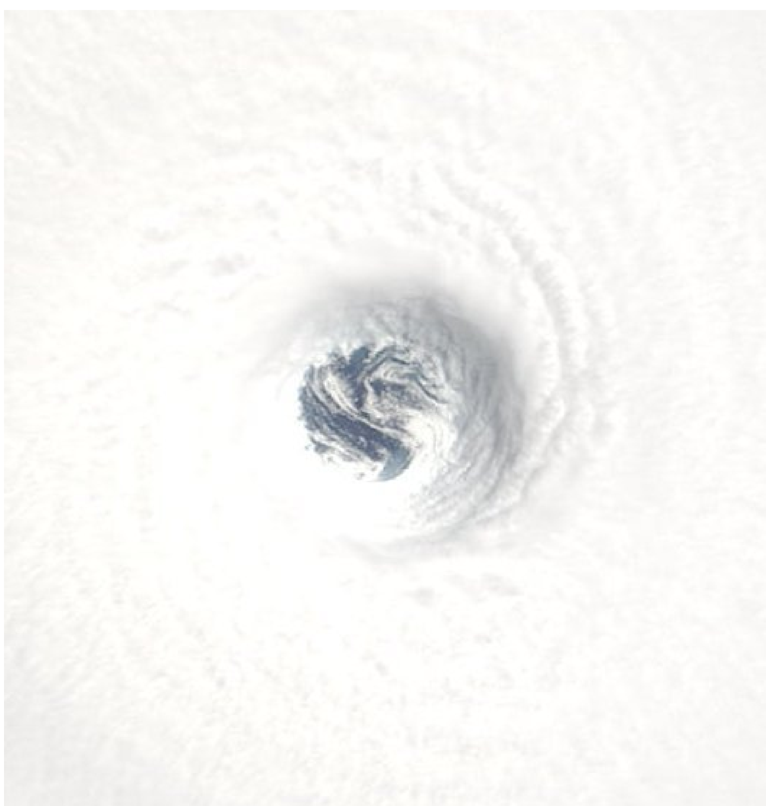


Figure 2-16S-2. 060655Z March 2004 MODIS true-color image of TC 16S (Gafilo) showing eye detail at 250m resolution. System located approximately 180 nm east of Madagascar with an intensity of 140 knots

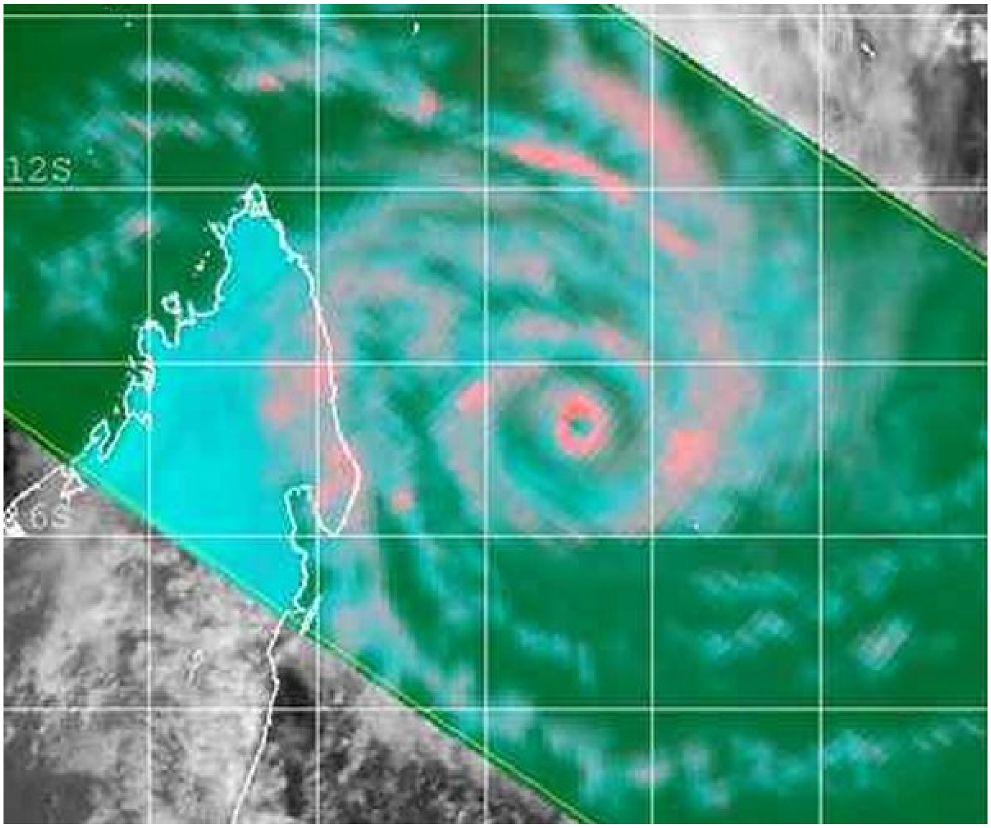


Figure 2-16S-3. 06/0801Z March 2004 Color 37 TRMM image of TC 16S (Gafilo), at this time, the system had concentric eyewalls with a peak intensity of 140kts.

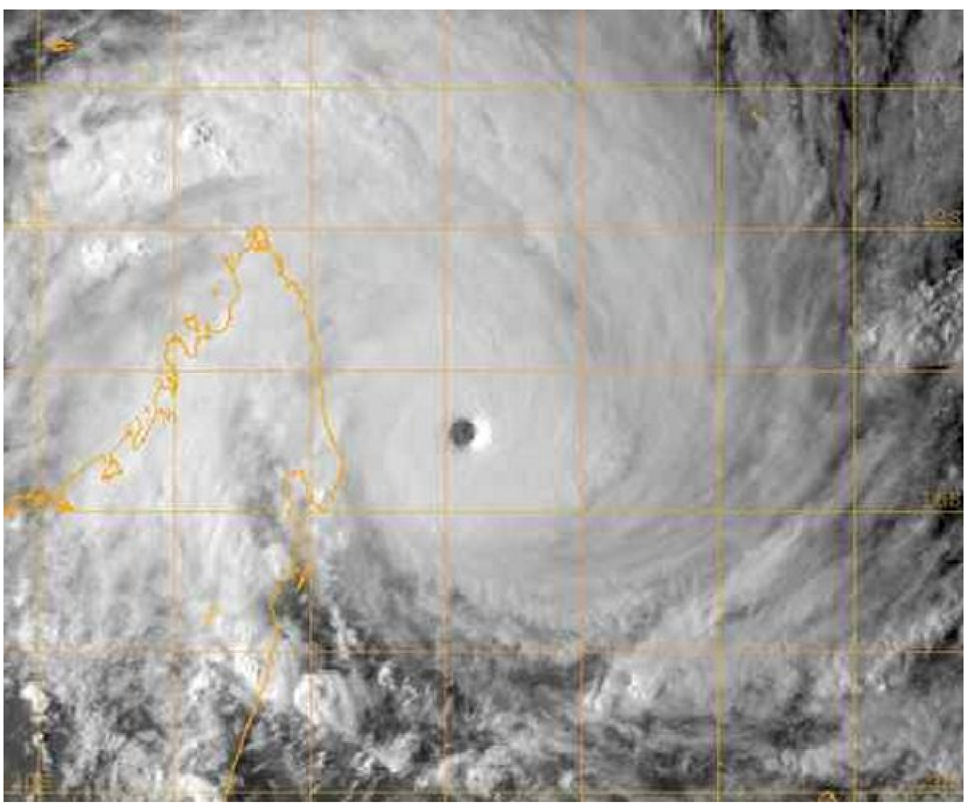
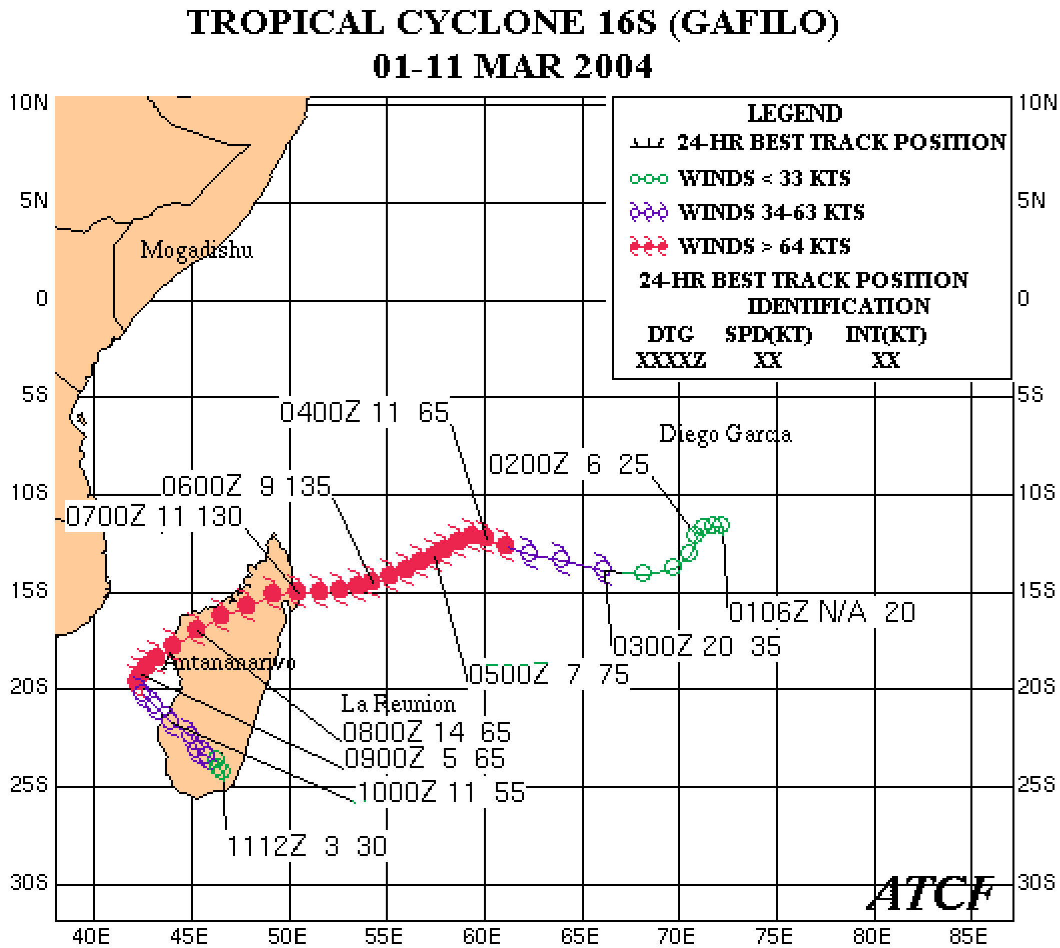
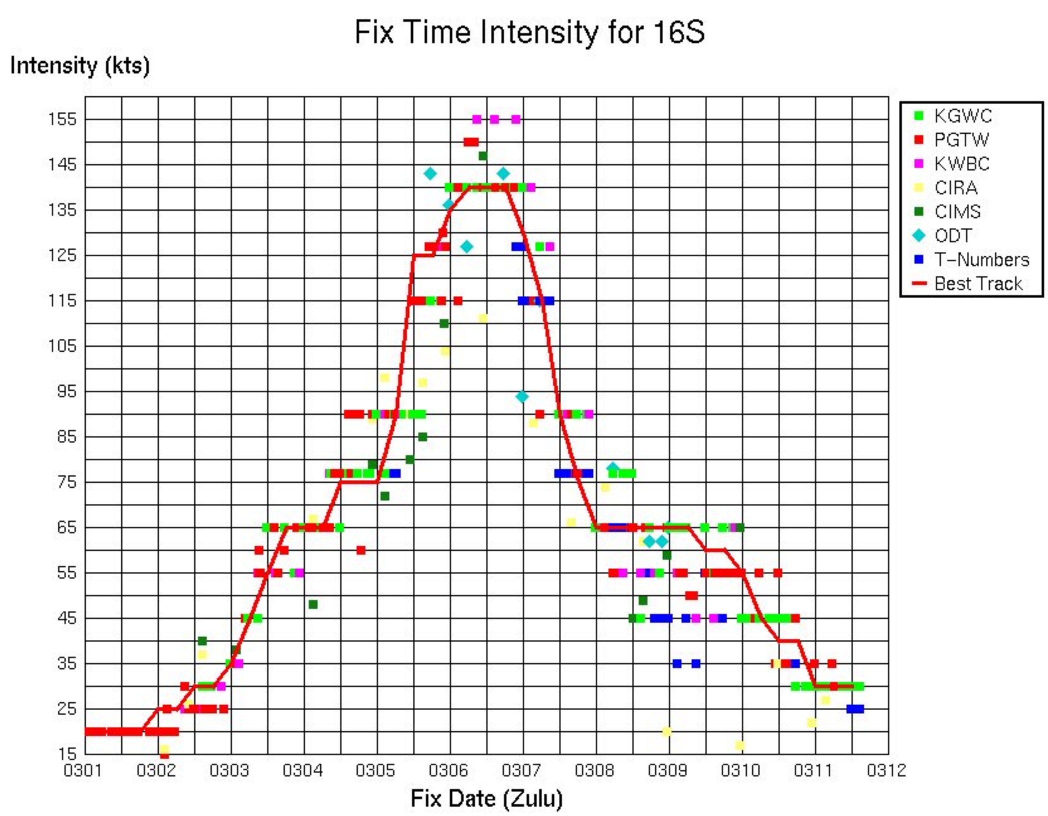


Figure 2-16S-4. 061330Z March 2004 Met-5 visible image of TC 16S (Gafilo), reveals a well defined symmetrical eye approximately 110 nm from the northeast coast of Madagascar with a peak intensity of 145kts.


TROPICAL CYCLONE 16S (GAFILO)
01-11 MAR 2004
LEGEND
24-HR BEST TRACK POSITION
WINDS < 33 KTS
WINDS 34-63 KTS
WINDS > 64 KTS
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
Mogadishu
Diego Garcia
Antananarivo
La Reunion
0106Z N/A 20
0200Z 6 25
0300Z 20 35
0400Z 11 65
0500Z 7 75
0600Z 9 135
0700Z 11 130
0800Z 14 65
0900Z 5 65
1000Z 11 55
1112Z 3 30
ATCF
10N
5N
0
5S
10S
15S
20S
25S
30S
40E
45E
50E
55E
60E
65E
70E
75E
80E
85E


Fix Time Intensity for 16S
Intensity (kts)
155
145
135
125
115
105
95
85
75
65
55
45
35
25
15
0301
0302
0303
0304
0305
0306
0307
0308
0309
0310
0311
0312
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
ODT
T-Numbers
Best Track

Tropical Cyclone (TC) 17S (Nicky-Helma)

First Poor : 0930Z 07 Mar 04

First Fair : 0130Z 08 Mar 04

First TCFA : 0300Z 08 Mar 04

First Warning : 1200Z 08 Mar 04

Last Warning : 1200Z 13 Mar 04, Dissipated over water

Max Intensity : 65 kts, gusts to 80 kts

Landfall : None

Total Warnings : 11

Remarks:

1) Tropical Cyclone (TC) 17S was initially detected as a tropical disturbance approximately 455 nm west of Cocos on 07 Mar at 1200Z. The cyclone initially tracked eastward for 24 hours and then made a small loop moving westward before turning poleward on 09 Mar. The first warning for TC 17S was issued on 08 Mar as the cyclone became organized and intensified to 30 kts. TC 17S was slow to intensify until it turned poleward and began to track along the northwest periphery of the low to mid level steering ridge. On 10 Mar, TC 17S reached maximum intensity of 65 kts and maintained that intensity for 42 hours before weakening. Subsequently, the cyclone continued to track poleward along the western periphery of the steering ridge and by 1200Z on 12 Mar increasing vertical shear began to decouple the low level circulation center from the convection and the cyclone began to rapidly weaken.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC17S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04030712		13.1S	89.1E	15																
04030718		13.1S	89.6E	15																
04030800		13.2S	90.1E	20																
04030806		13.2S	90.6E	25																
04030812	1	13.0S	91.2E	25	17	0	39	52	88				5	5	0	5	15			
04030900	2	12.9S	90.5E	30	5	61	90	131	146				-5	-15	-15	-25	-25			
04030912	3	13.6S	90.8E	45	11	12	39	54	45				5	10	5	0	0			
04031000	4	14.4S	90.5E	50	16	47	75	75	131				0	-5	-5	-10	-20			

04031012	5	15.6S	90.1E	60	21	34	21	49	37				5	-5	-10	-15	-10			
04031100	6	17.2S	89.0E	65	5	24	61	126	167				0	-5	-10	-5	0			
04031112	7	18.4S	87.7E	65	12	70	134	187	222				0	-5	0	5	10			
04031200	8	19.5S	86.9E	65	8	87	131	96					5	10	15	20				
04031212	9	19.9S	85.4E	55	12	48	40						0	5	10					
04031300	10	21.3S	83.9E	45	13	114							0	5						
04031312	11	23.3S	84.4E	30	16								0							
			AVERAGE		13	50	70	96	120				2	7	8	11	11			
			BIAS										1	0	-1	-3	-4			
			# CASES		11	10	9	8	7				11	10	9	8	7			

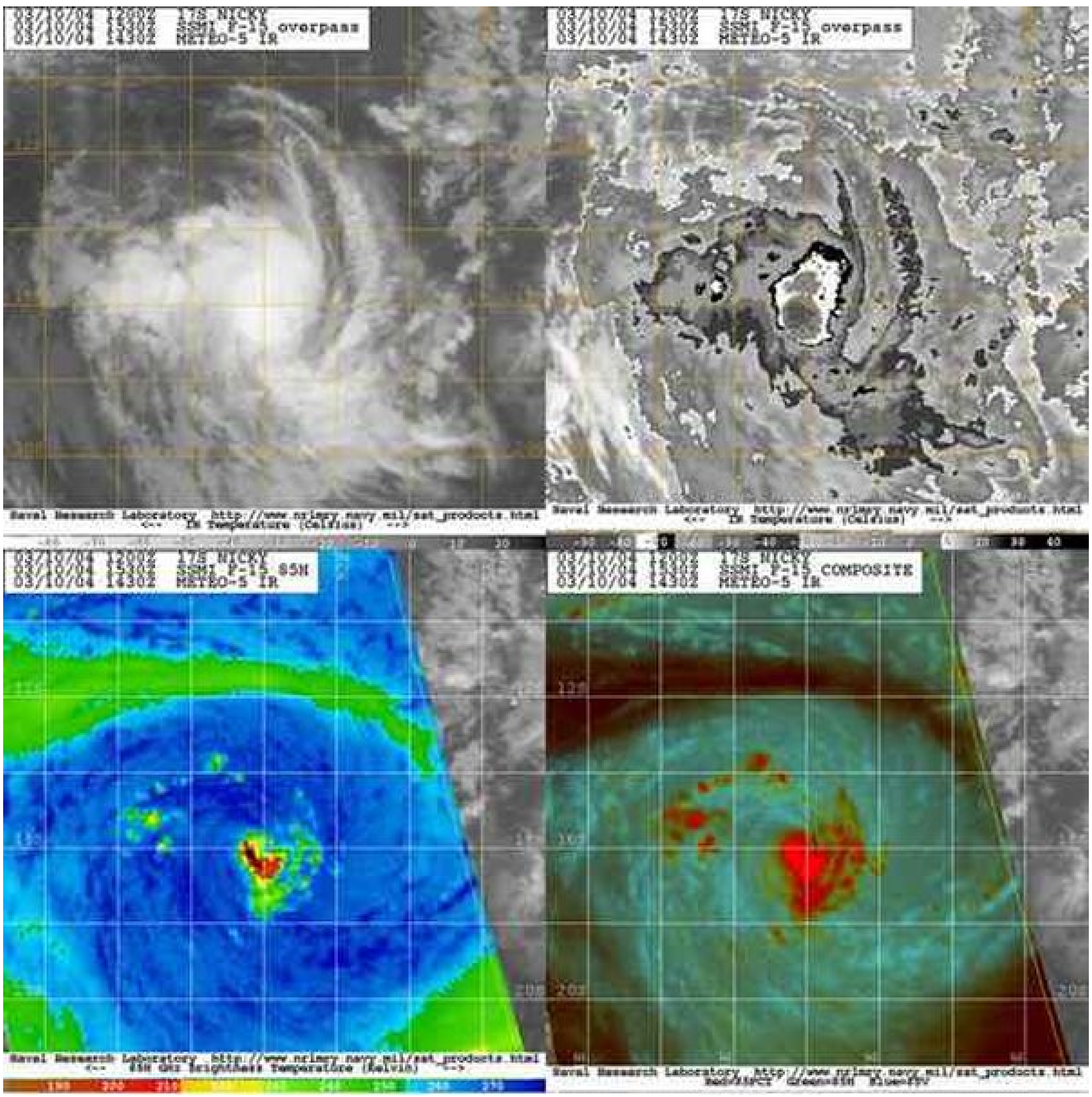
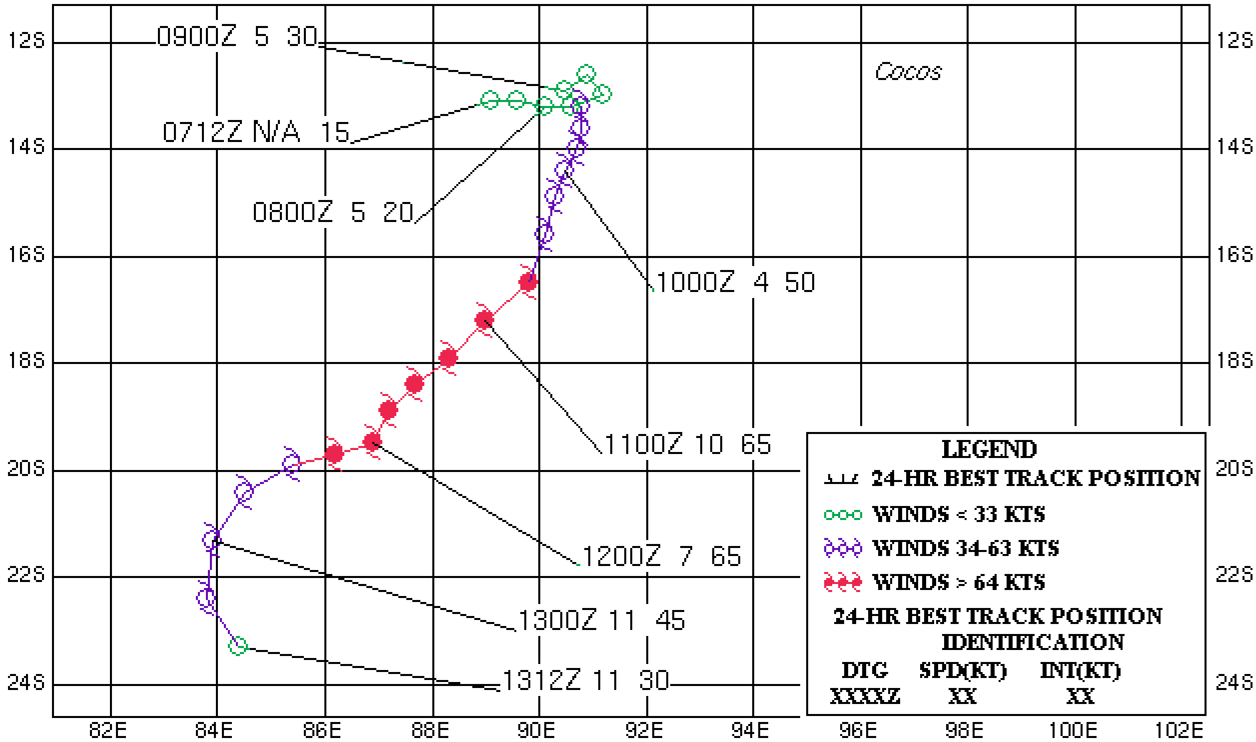
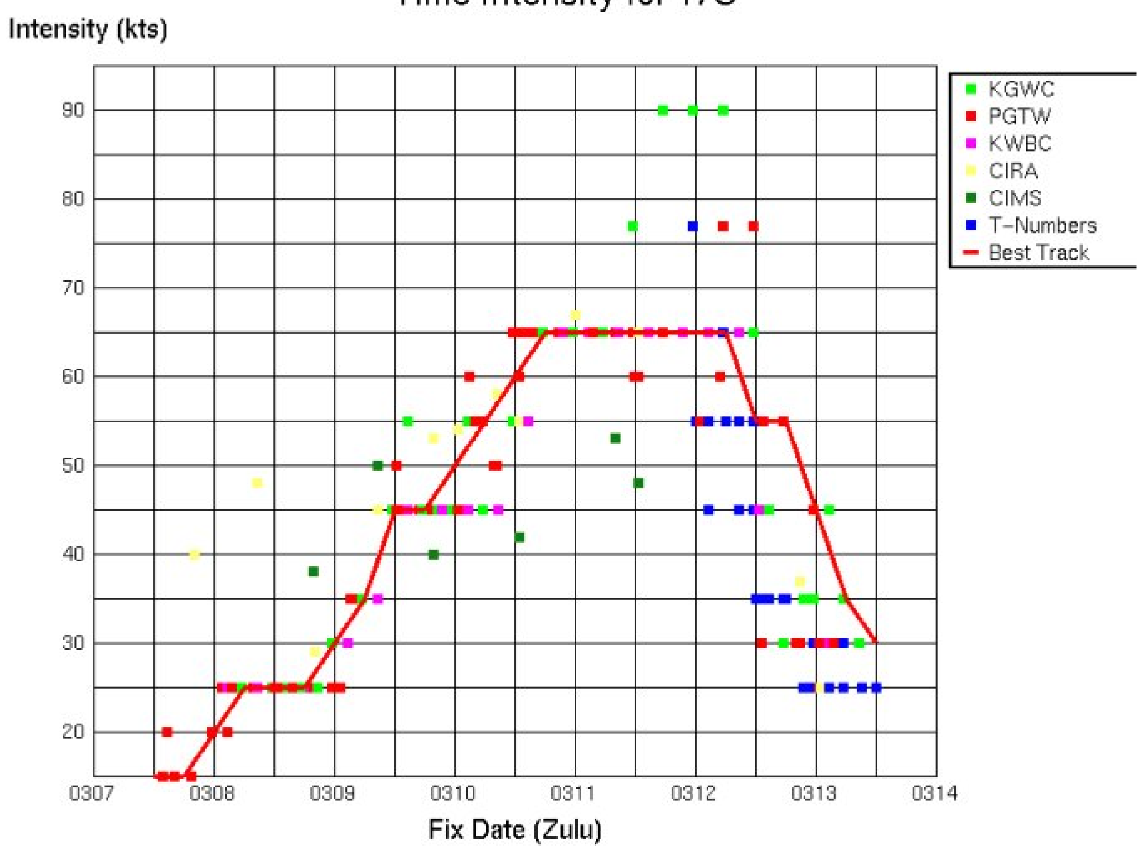


Figure 2-17S-1. 101530Z March 2004 SSm/I Multi-sensor imagery of TC 17S (Nicky-Helma), at this time, the systems Low-level circulation center is decoupling from the deep convection with a peak intensity of 65kts.

TROPICAL CYCLONE 17S (NICKY-HELMA)
08 MAR 04 - 13 MAR 04



Time Intensity for 17S



Tropical Cyclone (TC) 18S (Fay)

First Poor : 2100Z 14 Mar 04

First Fair : 0200Z 15 Mar 04

First TCFA : 2030Z 15 Mar 04

First Warning : 0600Z 16 Mar 04

Last Warning : 1800Z 27 Mar 04, Dissipated over land

Max Intensity : 120 kts, gusts to 145 kts

Landfall : 85 nm ENE of Port Hedland, Australia

Total Warnings : 26 warnings

Remarks:

1) Tropical Cyclone (TC) 18S first developed as a 25 kt tropical disturbance in the Arafura Sea on 14 Mar. As a weak cyclone, TC 18S tracked across the northwestern corner of Melville and Bathurst Islands. Then entered the Timor Sea, while continuing to intensify. As the track turned southward after 0600Z on 17 Mar, the intensity rapidly increased to 75 kts in response to increased outflow and a decrease in vertical wind shear. After 0600Z On 18 Mar, the cyclone turned northwestward as the steering ridge built, and the intensification rate decreased to a slightly less than climatological rate. By 0600Z on 19 Mar, TC 18S again began to track west-southwestward and reached its maximum intensity of 120 kts at 1200Z on 21 Mar as a passing shortwave trough enhanced poleward outflow. Another passing mid-latitude trough weakened the mid-latitude steering ridge causing TC 18S to turn poleward. TC 18S attained a second intensity peak of 115 kts at 1800Z on 26 Mar while in an environment of favorable vertical wind shear and enhanced poleward outflow.

Following this second maximum, the intensity of TC 18S began to steadily decrease as the cyclone approached the northwestern coast of Australia. TC 18S made landfall just after 0000Z on 27 Mar, about 85 nm east-northeast of Port Hedland, Australia, with sustained winds of 115 kts. The weakening cyclone moved southward for 06 hours before turning southeast and dissipating over land.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC18S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04031500		10.7S	133.5E	20																
04031506		10.7S	132.3E	25																
04031512		11.0S	131.1E	25																
04031518		11.3S	130.3E	25																
04031600		11.5S	129.6E	30																
04031606	1	11.7S	128.9E	30	13	35	63	88	167				0	0	5	0	-15			
04031618	2	11.9S	127.6E	35	47	87	106	152	176				0	10	5	-5	-5			
04031700	3	11.8S	128.0E	35	26	24	87	137	179				0	10	-5	-10	-5			
04031706	4	12.1S	127.5E	35	17	45	89	115	164				0	0	-10	-10	-5			
04031718	5	12.7S	126.9E	45	25	51	53	82	108				0	-10	-10	-10	-15			
04031806	6	13.1S	126.6E	65	13	30	72	76	109				0	0	0	0	10			
04031818	7	13.0S	125.9E	75	13	49	69	104	130				0	5	5	10	5			
04031906	8	12.7S	125.5E	80	11	30	61	88	100				-5	0	10	10	0			
04031918	9	13.0S	125.0E	90	0	33	53	72	93				0	10	10	5	10			
04032006	10	13.1S	124.3E	90	5	13	21	57	118				0	0	-5	0	15			
04032018	11	13.5S	123.6E	100	6	25	42	84	86				0	-5	-5	5	5			
04032106	12	13.8S	122.6E	115	8	13	25	33	102				0	-5	5	5	25			
04032118	13	14.0S	121.6E	120	13	62	70	109	129				0	10	15	30	45			
04032206	14	13.7S	120.8E	115	18	26	83	142	195	227			0	5	20	35	55	50		
04032218	15	14.1S	120.4E	115	23	82	143	196	237				0	20	35	55	55			
04032306	16	14.4S	120.8E	100	16	37	81	109	138	119			5	15	30	35	40	20		
04032318	17	15.0S	121.3E	90	11	24	25	59	78	115			0	15	20	25	5	-60		
04032406	18	15.7S	121.7E	75	6	18	46	61	84				5	5	10	0	-25			
04032418	19	16.6S	121.7E	75	5	24	19	36	54				5	10	-5	-25	-65			
04032506	20	17.4S	121.5E	75	0	36	54	64	74				0	-5	-15	-50	-55			
04032518	21	18.0S	120.5E	85	5	44	72	74					-10	-15	-50	-60				
04032606	22	18.5S	120.0E	95	5	42	82	140					-5	-35	-35	-10				
04032618	23	19.3S	120.0E	115	0	13	38						0	-20	5					
04032706	24	20.4S	120.0E	105	5	21							-10	0						
04032718	25	21.4S	120.9E	70	8								-5							
			AVERAGE		12	36	63	95	126	153			2	9	14	18	23	43		
			BIAS										-1	1	2	2	4	3		
			# CASES		25	24	23	22	20	3			25	24	23	22	20	3		

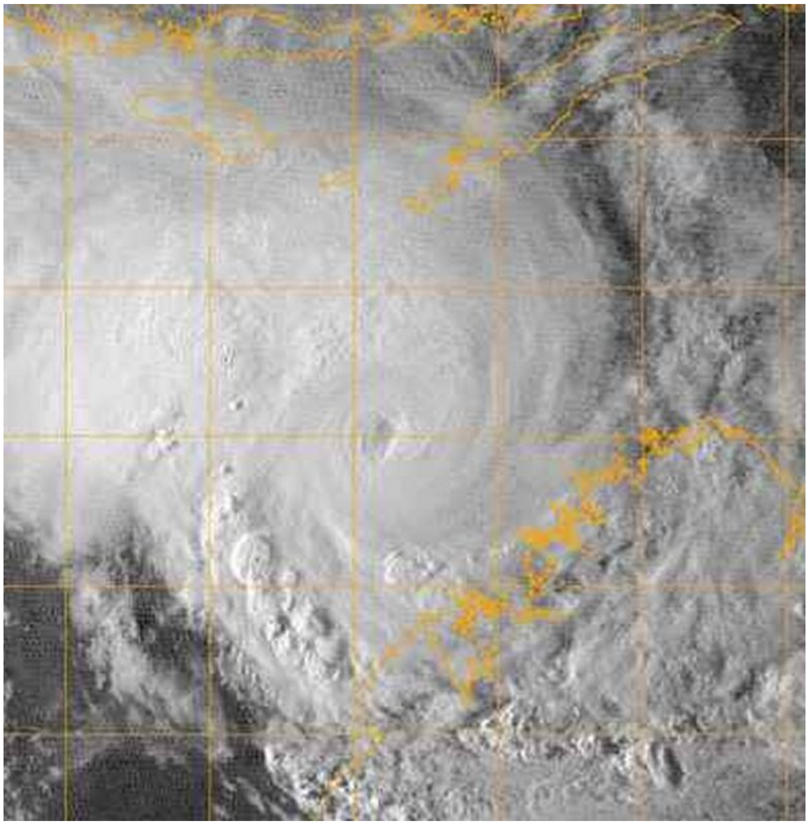


Figure 2-18S-1. 210825Z March 2004 Goes-9 visible image of TC 18S (Fay), reveals a irregular cloud filled eye approximately 170 nm to the north of Yampi Sound with a peak intensity of 115kts.

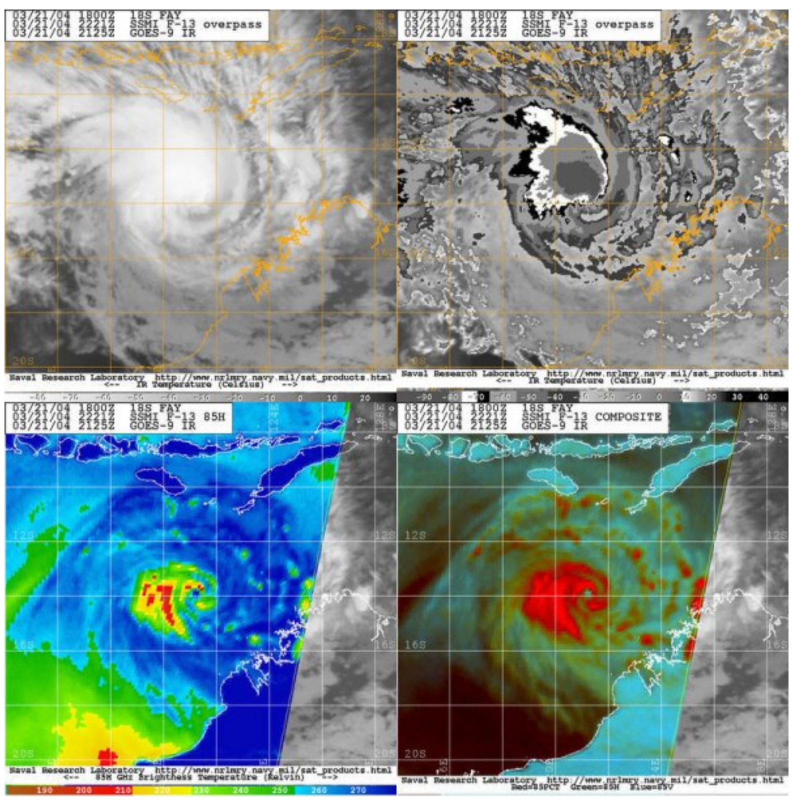


Figure 2-18S-2. 212221Z March 2004 SSM/I Multi-Sensor Imagery of TC 18S (Fay), at this time, the microwave imagery reveals a very small pinhole eye while the Enhanced Infrared imagery reveals the llcc is embedded on the south side of the deep convection. The peak intensity at this time was 120kts.

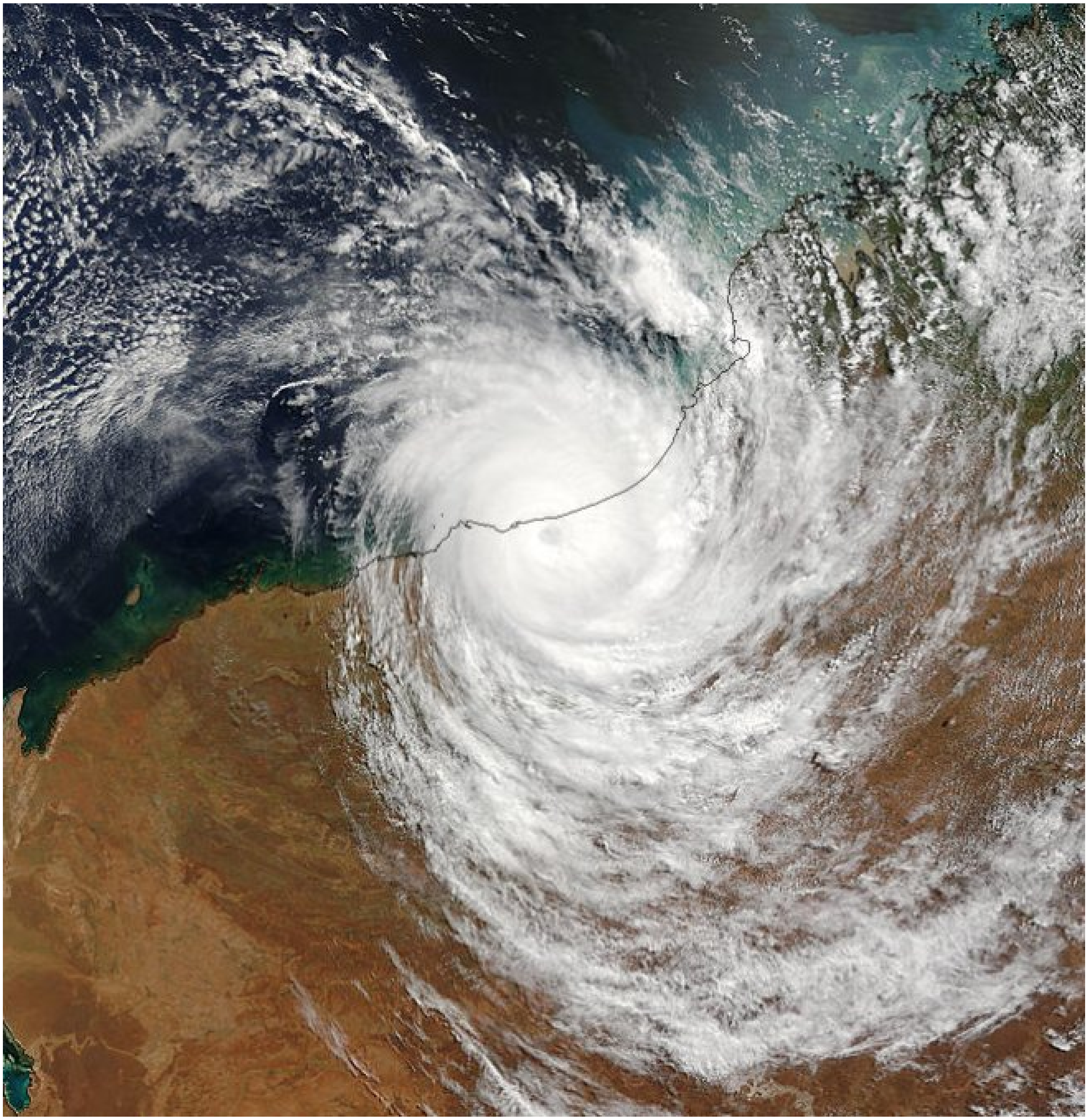
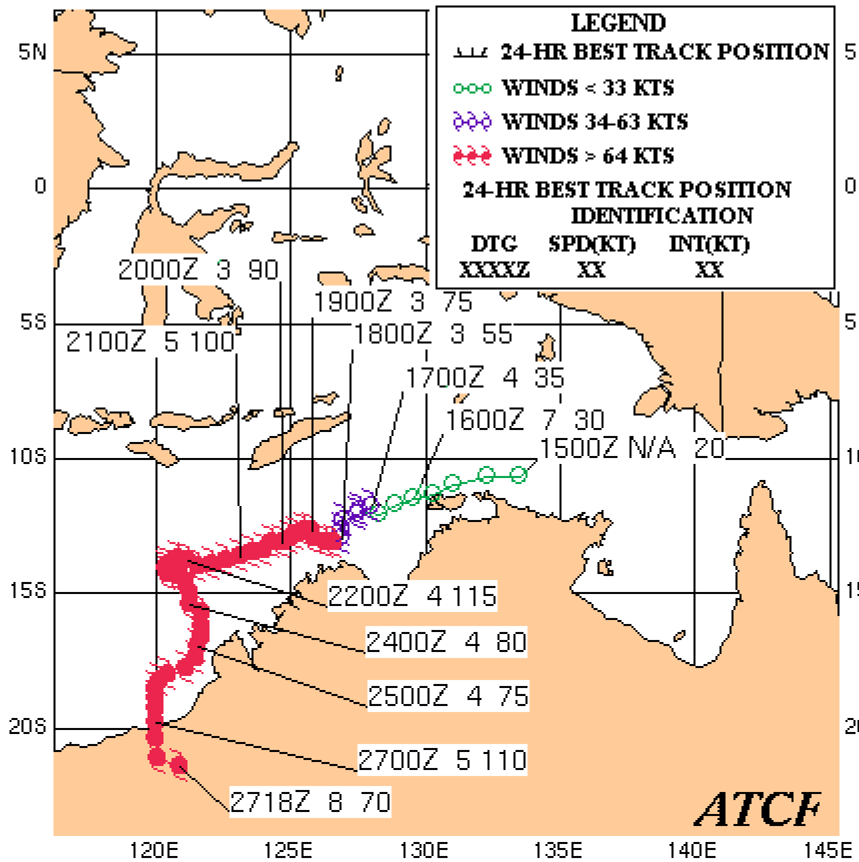
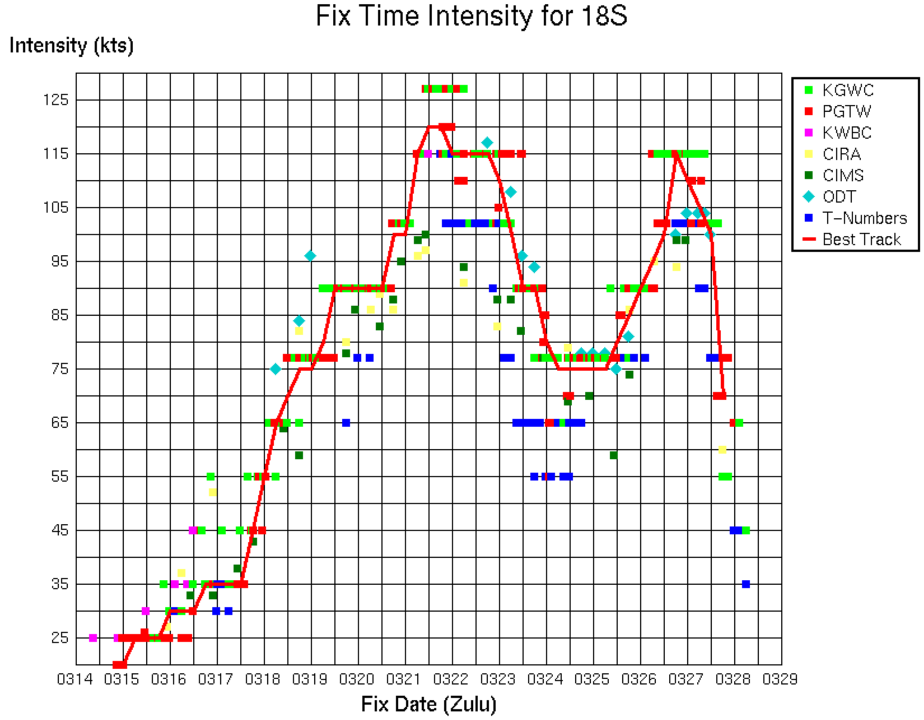


Figure 2-18S-3. 270220Z March 2004 MODIS true-color image of TC 18S (Fay), just after making landfall over Australia with an intensity of 115 knots.

TROPICAL CYCLONE 18S (FAY)
15-27 MAR 2004





Tropical Cyclone (TC) 19S (Grace)

First Poor : 1530Z 18 Mar 04

First Fair : 0600Z 19 Mar 04

First TCFA : N/A

First Warning : 1800Z 21 Mar 04

Last Warning : 1800Z 22 Mar 04, Dissipated over water

Max Intensity : 35 kts, gusts to 45 kts

Landfall : None

Total Warnings : 3

Remarks :

1) Tropical cyclone (TC) 19P was first noted as a tropical disturbance off the east coast of Australia, near Cairns as multiple low level circulation centers. Consolidation and development of this cyclone was slow with the first warning being issued over 72 hours after being detected. After the initial warning, the low level center remained partially exposed throughout the short life cycle and the cyclone only barely attained tropical storm intensity.

2) Damage reports indicated several roads were flooded or destroyed by landslides caused by the heavy rains during the formative stage of the cyclone's track. No casualties were reported.

Statistics for JTWC on TC19P

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04032012		15.3S	147.7E	25																
04032018		14.9S	148.9E	25																
04032100		15.8S	150.2E	25																
04032106		17.0S	152.0E	25																
04032112		18.3S	153.6E	30																
04032118	1	19.7S	154.9E	35	5	90	174						0	15	25					
04032206	2	20.7S	156.5E	30	41	39							0	10						
04032218	3	21.5S	158.3E	25	12								0							

04032300		22.1S	159.6E	25																
			AVERAGE		20	64	174						0	13	25					
			BIAS										0	13	25					
			# CASES		3	2	1						3	2	1					

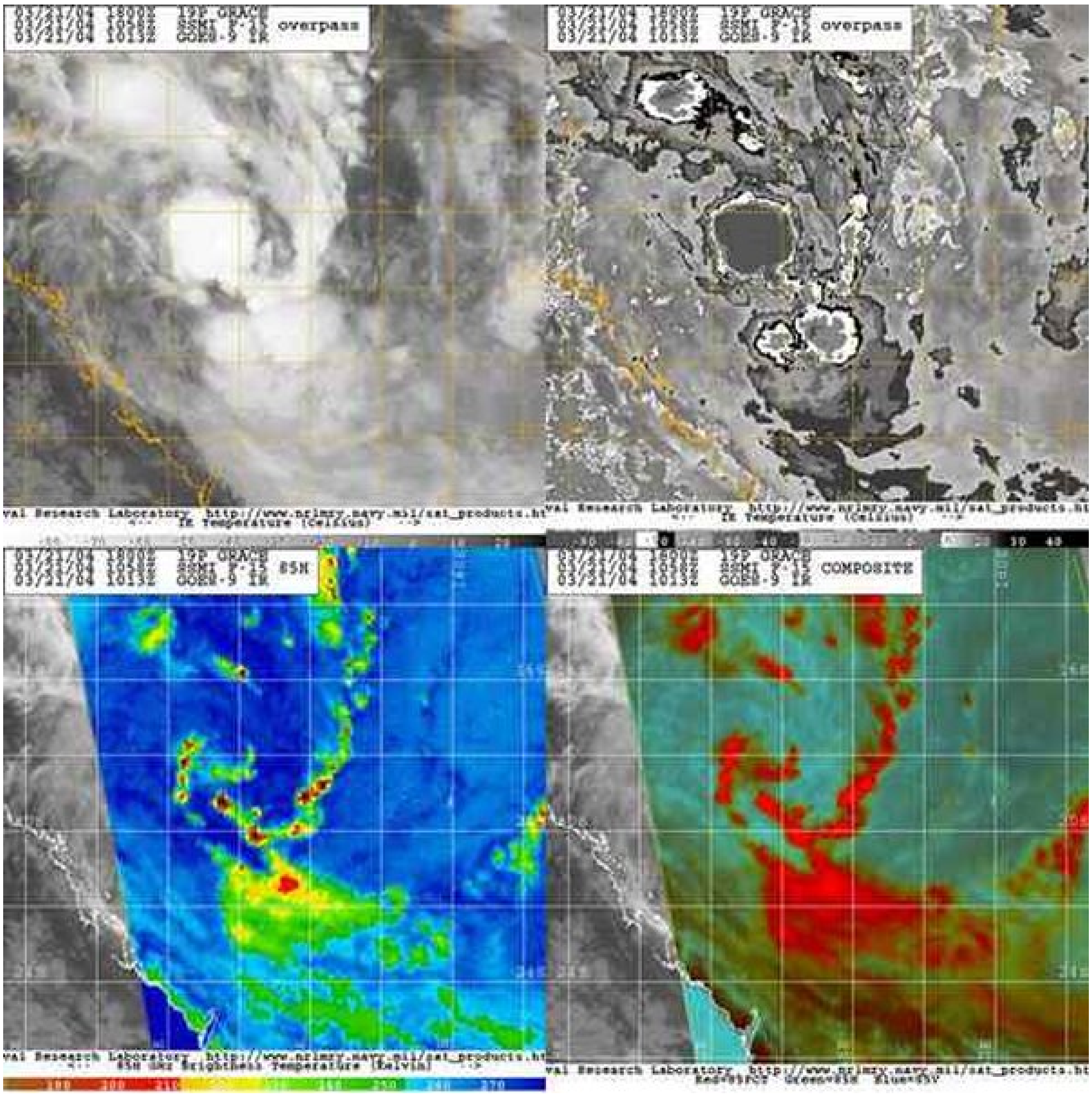
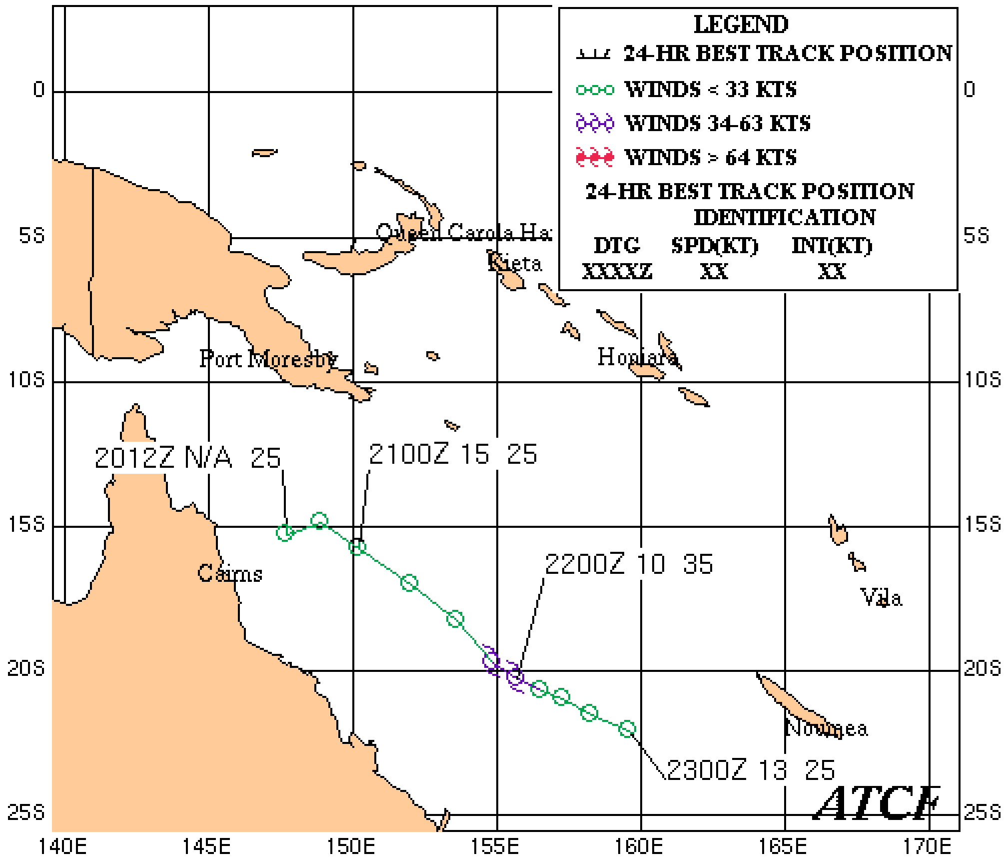
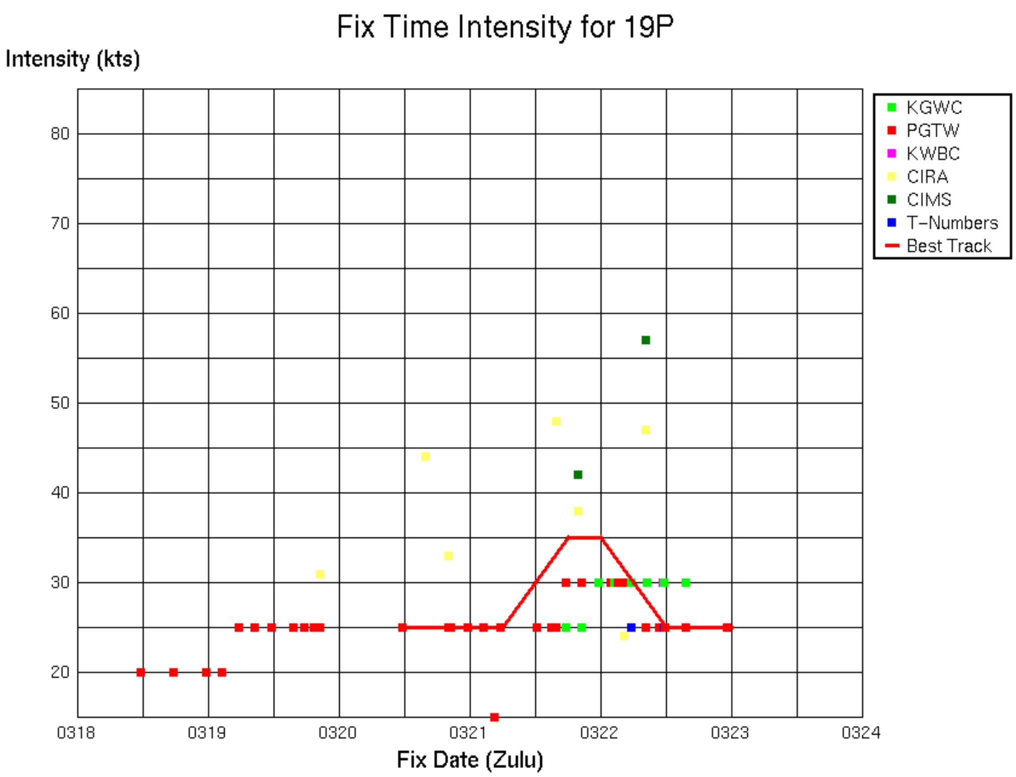


Figure 2-19P-1. 211058Z March 2004 SSM/I Multi-sensor imagery of TC 19P (Grace), reveals a partially exposed low-level circulation center off the eastern coast of Australia with an intensity of 35kts.

TROPICAL CYCLONE 19P (GRACE)
20-23 MAR 2004





Tropical Cyclone (TC) 20S (Oscar)

First Poor : N/A

First Fair : 0130Z 21 Mar 04

First TCFA : 0530Z 23 Mar 04

First Warning : 1200Z 23 Mar 04

Last Warning : 0000Z 28 Mar 04, Dissipated over water

Max Intensity : 115 kts, gusts to 140 kts

Landfall : None

Total Warnings : 10

Remarks:

1) Tropical cyclone (TC) 20S formed in the southeast Indian Ocean approximately 380 nm east of the Cocos Islands on 21 Mar. The disturbance initially tracked south-southeastward before turning westward and intensifying to warning criteria on 23 Mar. Late on 24 Mar, a migratory shortwave trough allowed the cyclone to turn southwestward. The system's rate of intensification rapidly increased after it's southwest turn. Due to enhanced outflow associated with the migratory trough, the cyclone intensified at a rate of two T numbers in twenty-four hours. The system continued to track southwestward for thirty-six hours after the rapid intensification before encountering increased vertical wind shear associated with the mid-latitude westerlies which caused the cyclone to rapidly dissipate on 28 Mar.

2) No damage reports were received for this system.

Statistics for JTWC on TC20S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04032100		12.5S	103.4E	15																
04032106		13.2S	103.8E	15																
04032112		13.8S	103.6E	25																
04032118		14.2S	103.2E	25																
04032200		14.5S	102.6E	25																
04032206		14.8S	101.9E	25																
04032212		14.8S	101.1E	25																
04032218		14.8S	100.3E	25																
04032300		14.8S	99.7E	25																

04032306		14.7S	99.1E	25																
04032312	1	14.7S	98.4E	30	5	18	52	76	110				5	0	0	-5	-10			
04032400	2	14.5S	96.9E	45	6	8	38	44	56				0	-5	-5	-10	-40			
04032412	3	14.6S	95.3E	55	0	25	44	59	71				0	0	-5	-30	-25			
04032500	4	15.3S	94.0E	65	18	8	18	80	143				-5	-15	-40	-30	0			
04032512	5	16.2S	92.9E	80	8	29	58	63	67				-10	-35	-20	15	55			
04032600	6	16.8S	92.4E	115	6	13	23	38	38				-5	10	40	70	100			
04032612	7	17.4S	92.0E	110	8	8	29	58					5	25	60	90				
04032700	8	18.1S	91.3E	85	8	36	102						5	25	40					
04032712	9	19.1S	90.4E	55	11	58							-5	10						
04032800	10	19.8S	89.1E	30	5								5							
04032806		20.4S	89.2E	35																
			AVERAGE		8	23	45	60	81				5	14	26	36	38			
			BIAS										-1	2	9	14	13			
			# CASES		10	9	8	7	6				10	9	8	7	6			

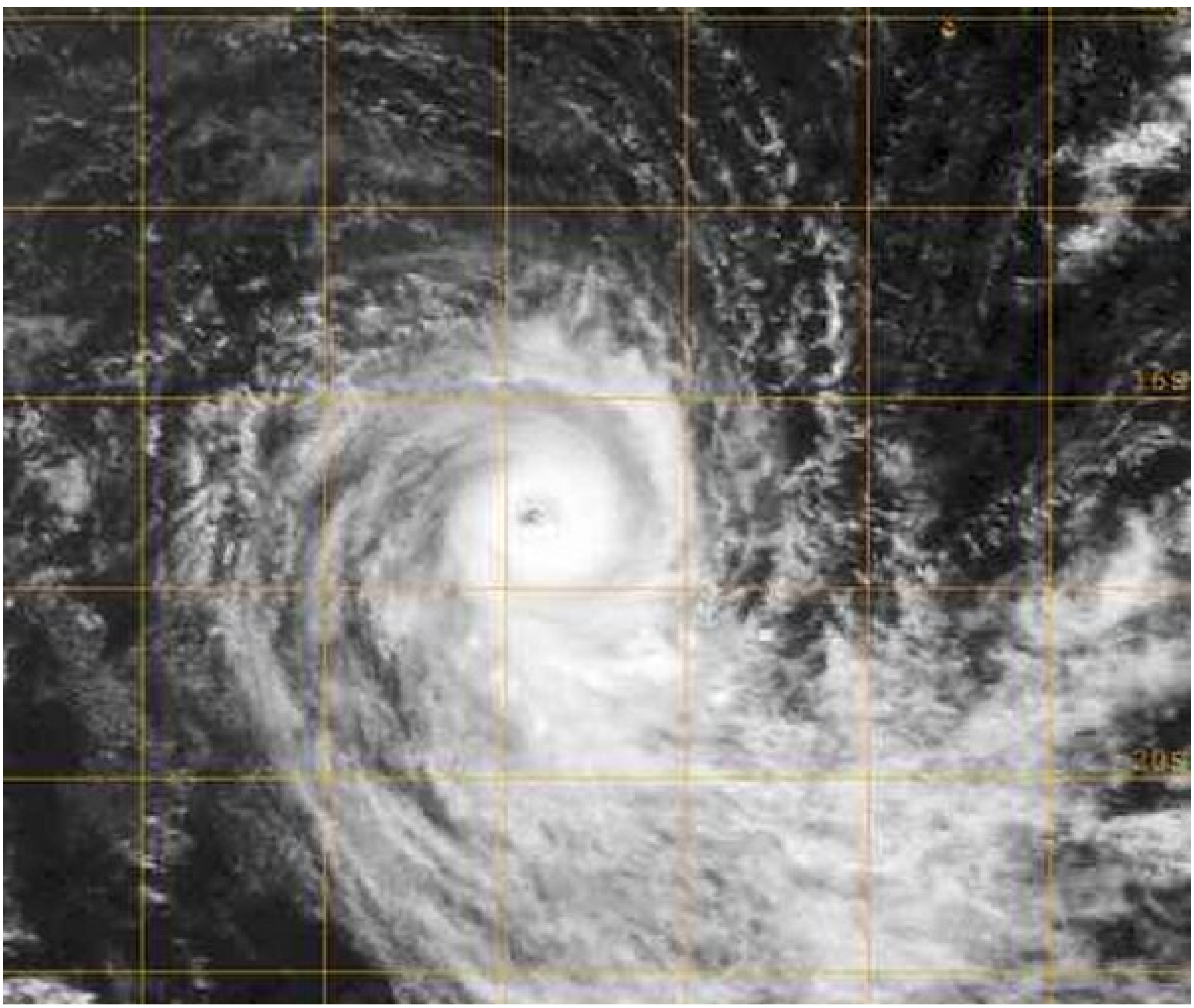


Figure 2-20S-1. 260600Z March 2004 Met-5 visiblie imagery of TC 20S (Oscar), reveals a small pinhole eye with a peak intensity of 115kts.

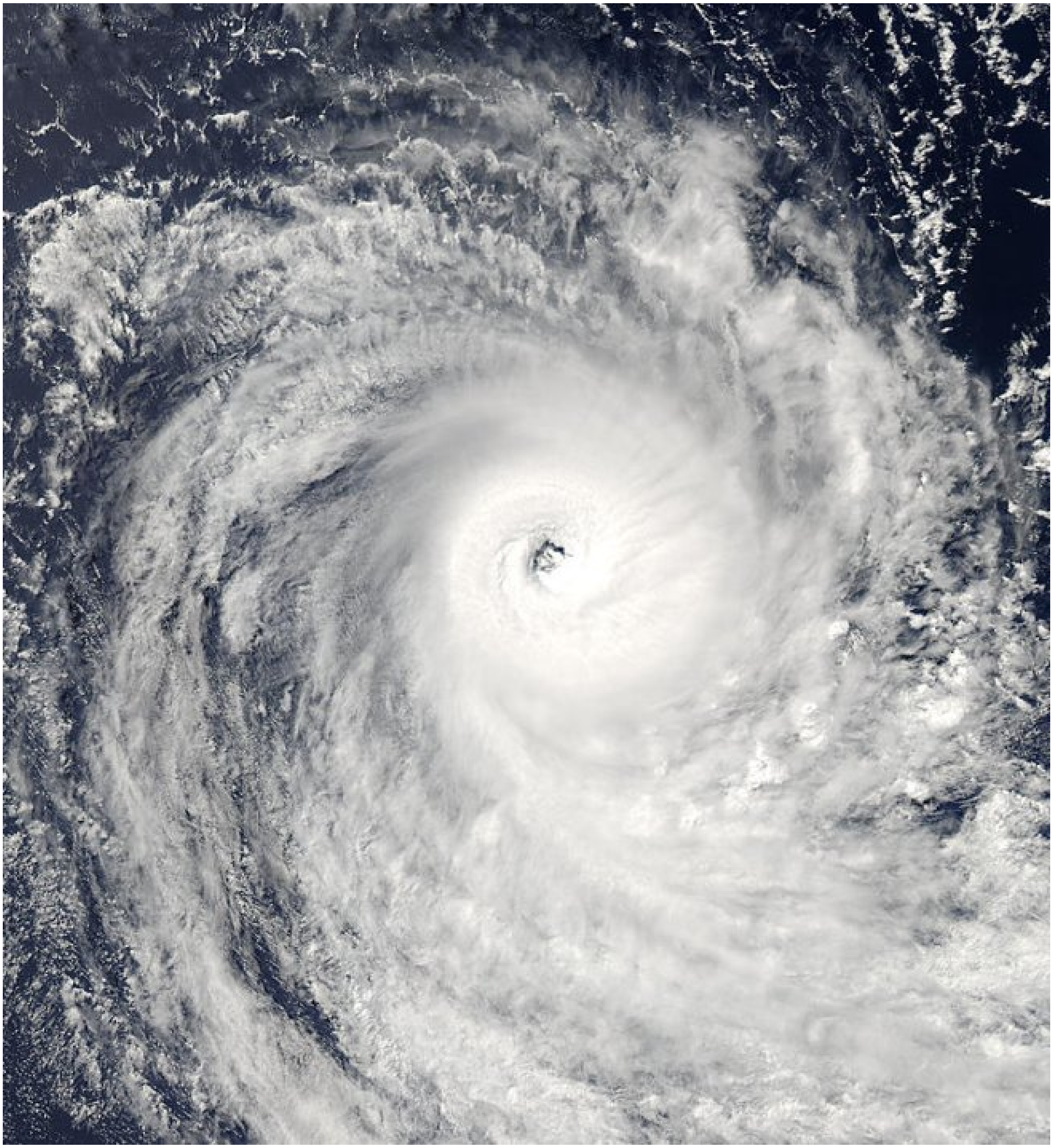
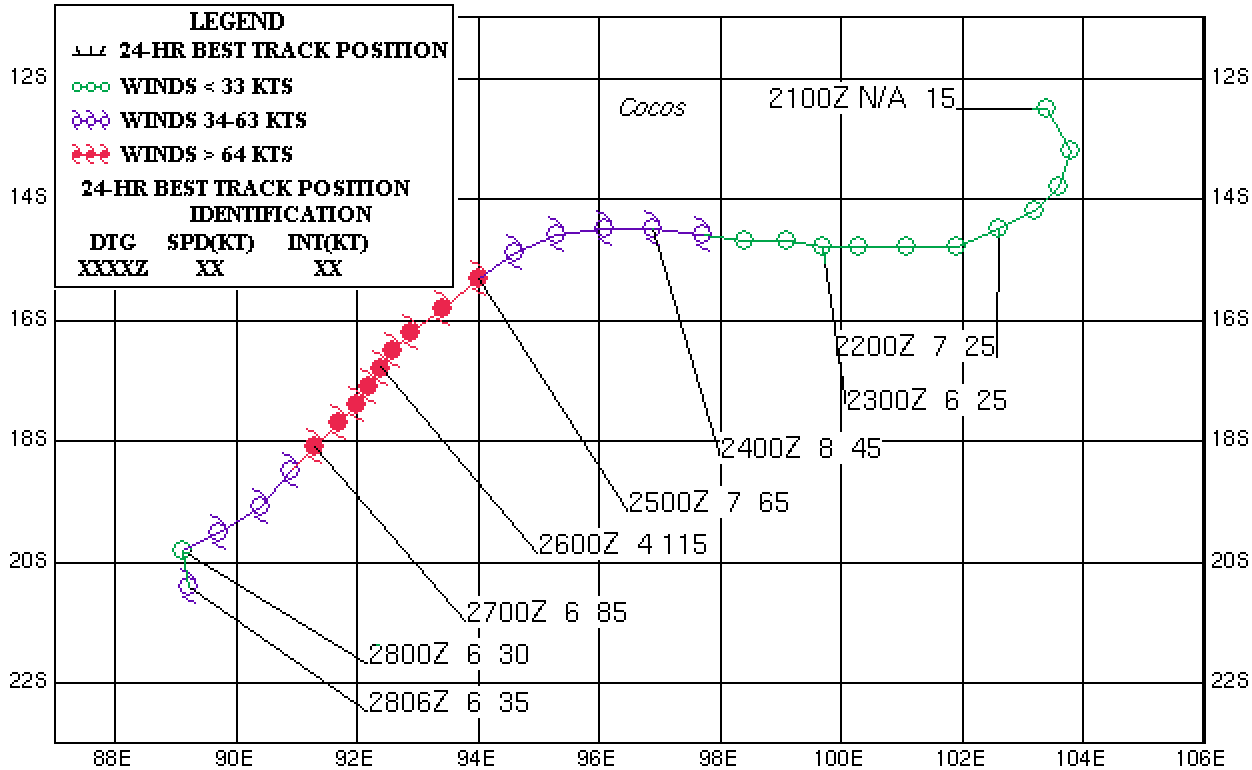
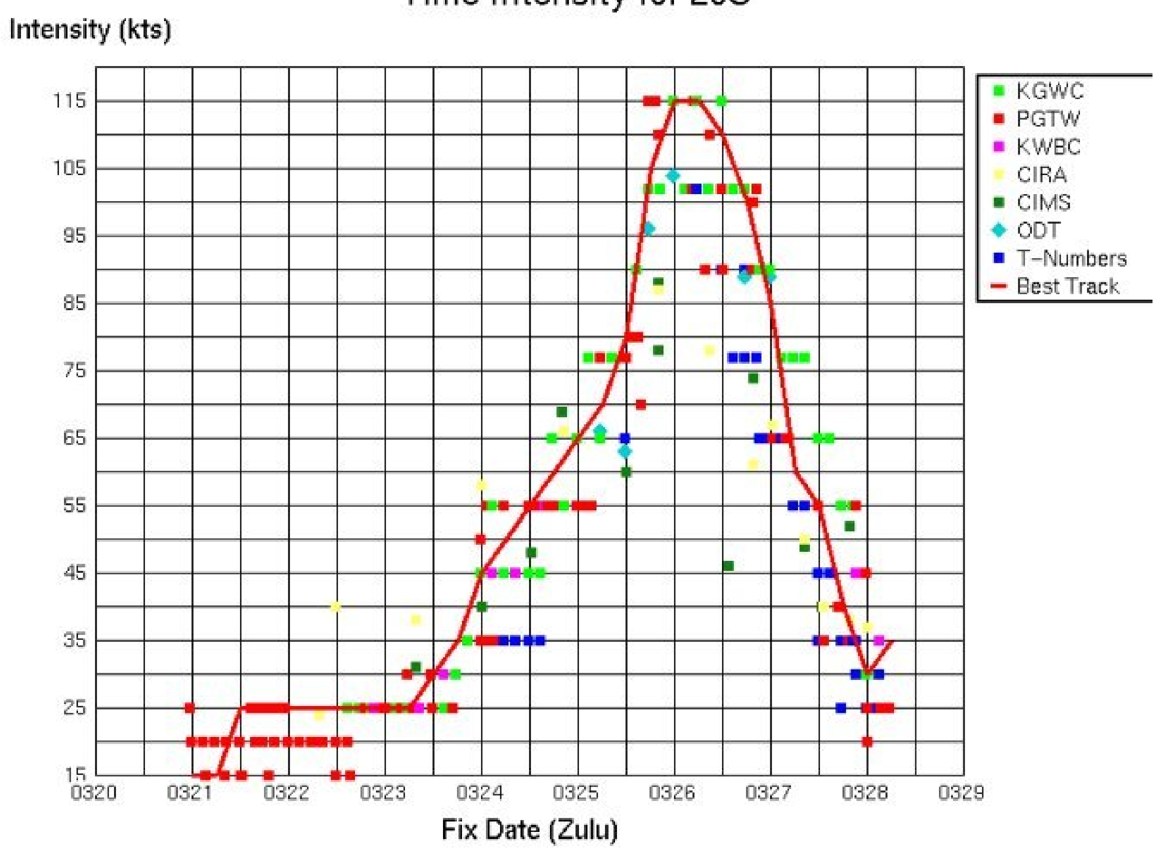


Figure 2-20S-2. 260735Z March 2004 MODIS true-color image of TC 20S (Oscar), located 400 nm southwest of the Cocos Islands with an intensity of 115 knots.

TROPICAL CYCLONE 20S (OSCAR)
23 MAR 04 - 28 MAR 04





Tropical Cyclone (TC) 21S

First Poor : N/A

First Fair : 1800Z 23 Mar 04

First TCFA : N/A

First Warning : 1800Z 23 Mar 04

Last Warning : 1200Z 24 Mar 04, Dissipated over water

Max Intensity : 25 kts, gusts to 35 kts

Landfall : None

Total Warnings : 3

Remarks:

1) Tropical cyclone (TC) 21S formed approximately 500 nm off the northeast point of Madagascar. The system was initially identified on 21 Mar as a region of deep convection over a low level circulation center (LLCC) in a region of moderate vertical shear. The initial warning for the system was issued on 23 Mar at 1800Z. The first forecast called for TC 21S to remain weak and quasistationary. The system tracked slowly in a general westward direction and never exceeded 25 kts in strength. Only two more warnings were issued with the final warning sent on 24 Mar at 1200z.

2) No damage reports were received for this system.

Statistics for JTWC on TC21S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04032306		8.4S	55.8E	20																
04032312		8.5S	55.9E	25																
04032318	1	8.6S	56.0E	25	6	31	86	72	76				5	10	15	25	40			
04032406	2	9.1S	56.0E	25	30	91	90	88	104				5	5	5	10	20			
04032412	3	9.6S	55.7E	25	58	89							-5	-5						
04032418		10.2S	55.3E	25																
04032500		10.0S	54.7E	25																
04032506		9.7S	54.2E	25																
04032512		9.4S	54.1E	25																
04032518		9.1S	54.1E	25																
04032600		9.0S	54.0E	25																

04032606		9.2S	53.8E	25																
04032612		9.5S	53.6E	25																
04032618		9.8S	53.4E	25																
04032700		9.9S	53.1E	25																
04032706		9.9S	52.8E	25																
04032712		10.1S	52.4E	25																
04032718		10.3S	52.0E	25																
04032800		10.2S	51.6E	25																
04032806		9.8S	51.5E	25																
04032812		9.2S	51.4E	25																
			AVERAGE		32	70	88	80	90				5	7	10	18	30			
			BIAS										2	3	10	18	30			
			# CASES		3	3	2	2	2				3	3	2	2	2			

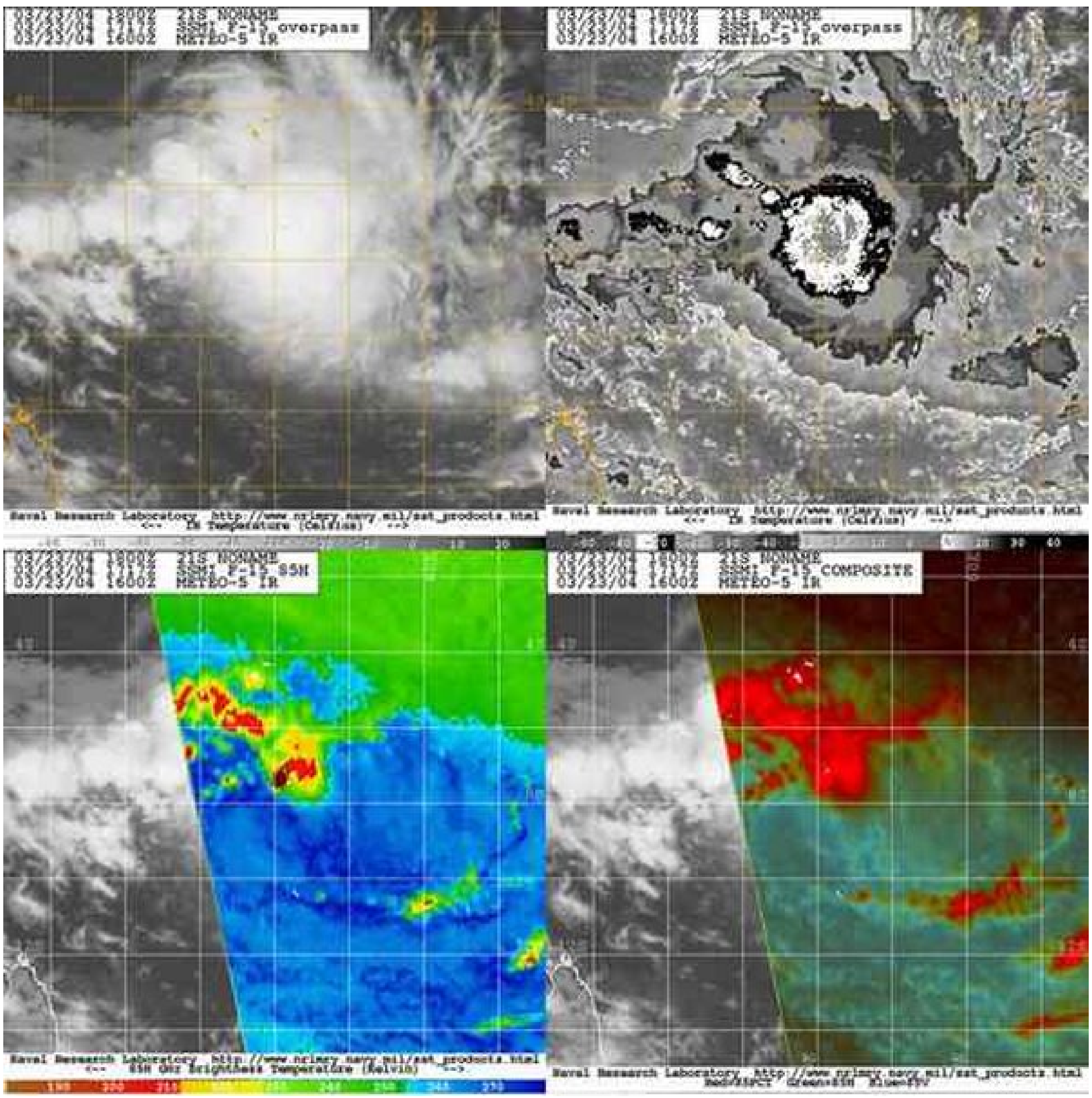
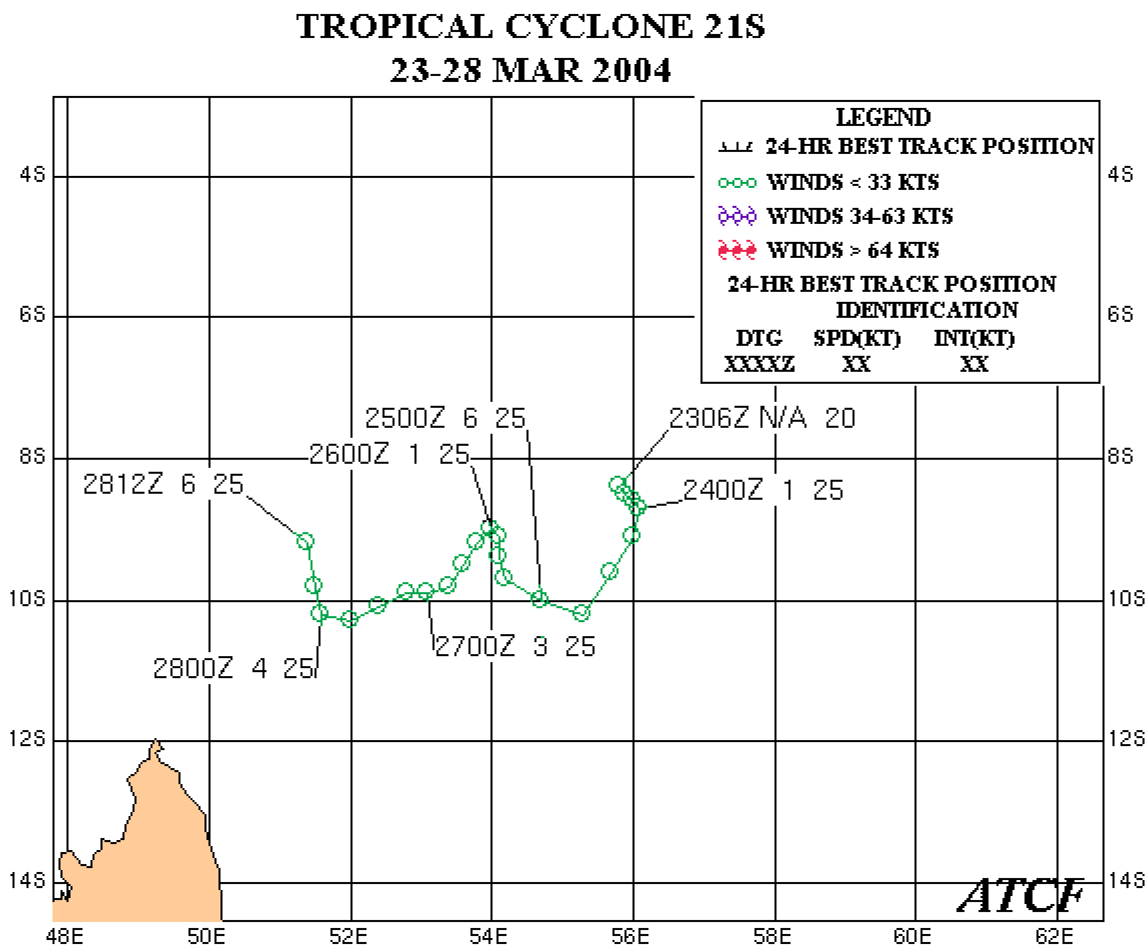
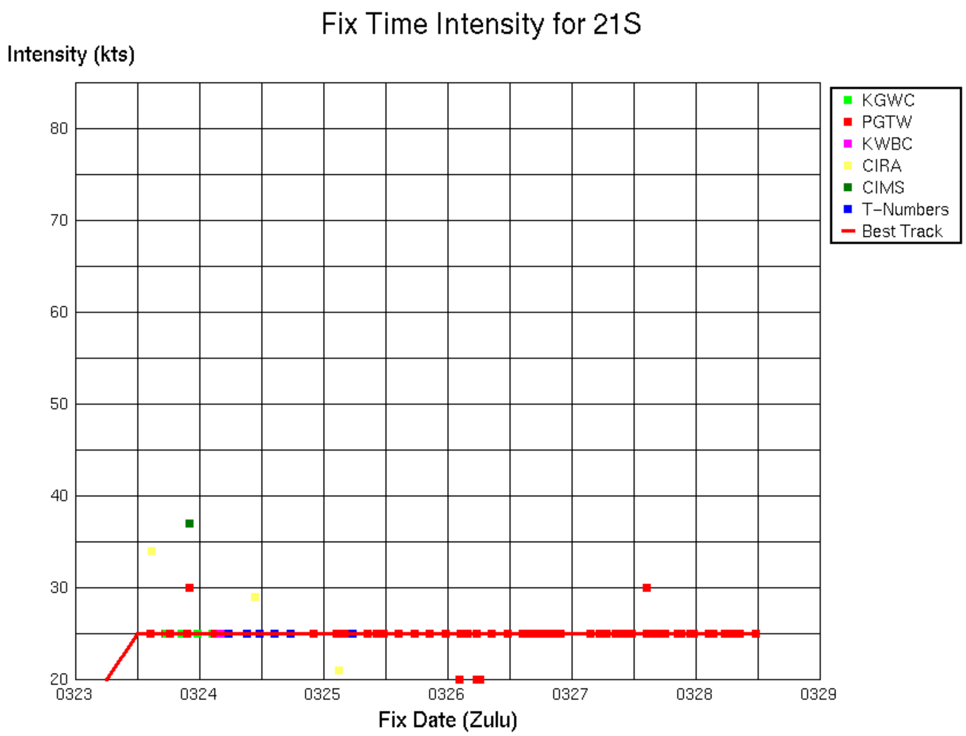


Figure 2-21S-1. 231717Z March 2004 SSM/I Multi-sensor imagery of TC 21S, reveals that the systems Low-level circulation center is partially exposed to the southwest of the associated deep cnvctn with a peak intensity of 30kts.


TROPICAL CYCLONE 21S
23-28 MAR 2004
LEGEND
24-HR BEST TRACK POSITION
WINDS < 33 KTS
WINDS 34-63 KTS
WINDS > 64 KTS
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
2500Z 6 25
2306Z N/A 20
2600Z 1 25
2812Z 6 25
2400Z 1 25
2700Z 3 25
2800Z 4 25
4S
6S
8S
10S
12S
14S
48E
50E
52E
54E
56E
58E
60E
62E
ATCF


Fix Time Intensity for 21S
Intensity (kts)
80
70
60
50
40
30
20
0323
0324
0325
0326
0327
0328
0329
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
T-Numbers
Best Track

Tropical Cyclone (TC) 22P

First Poor : 0600Z 06 Apr 04

First Fair : 1030Z 07 Apr 04

First TCFA : 1500Z 07 Apr 04

First Warning : 1800Z 07 Apr 04

Last Warning : 0600Z 09 Apr 04, Extra-tropical

Max Intensity : 35 kts, gusts to 45 kts

Landfall : Northeast of Lautoka, Fiji

Total Warnings : 5

Remarks:

1) Tropical cyclone (TC) 22P developed within the south Pacific convergence zone north of Fiji on 6 Apr around 0600Z and quickly developed with the first warning issued on 07 Apr at 1800Z as TC 22P tracked rapdily southeastward. TC 22P made landfall northeast of Lautoka, Fiji on 08 Apr around 0300Z and tracked rapidly across the island. The final warning was issued on 09 Apr at 0600Z as TC 22P merged with a mid-latitude trough and transitioned to an extra-tropical low.

2) Reports indicated at least 3 deaths and 9 missing persons in the districts north of Suva due to flooding caused by heavy rains.

Statistics for JTWC on TC22P

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04040706		14.5S	173.0E	25																
04040712		15.2S	174.3E	30																
04040718	1	16.1S	175.8E	30	5	63	70						0	0	5					
04040800	2	17.0S	177.3E	35	31	85	62						0	5	15					
04040806	3	18.0S	178.8E	35	8	62							0	0						
04040818	4	19.6S	179.3W	35	0								0							
			AVERAGE		11	70	66						0	2	10					
			BIAS										0	2	10					
			# CASES		4	3	2						4	3	2					

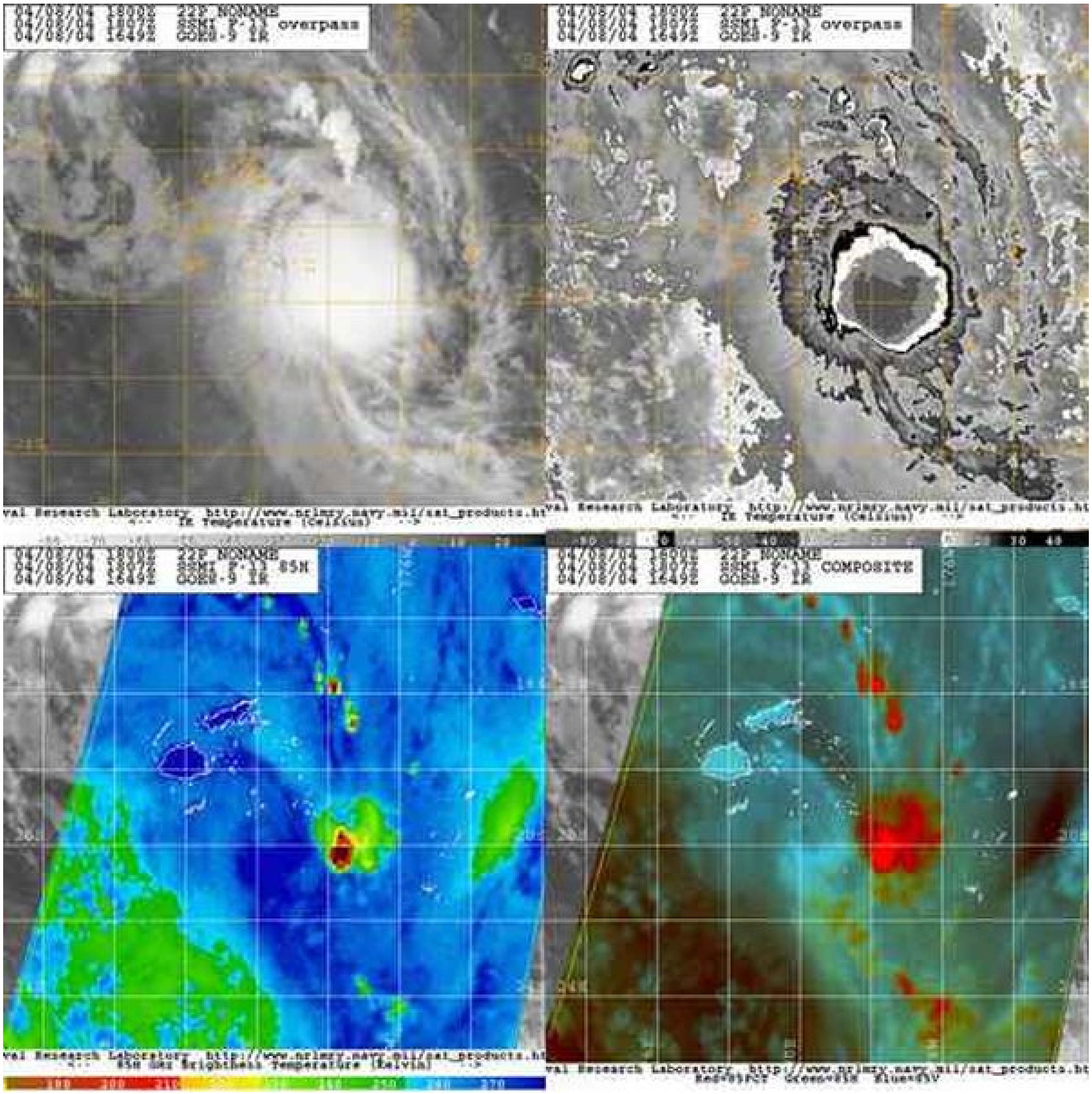
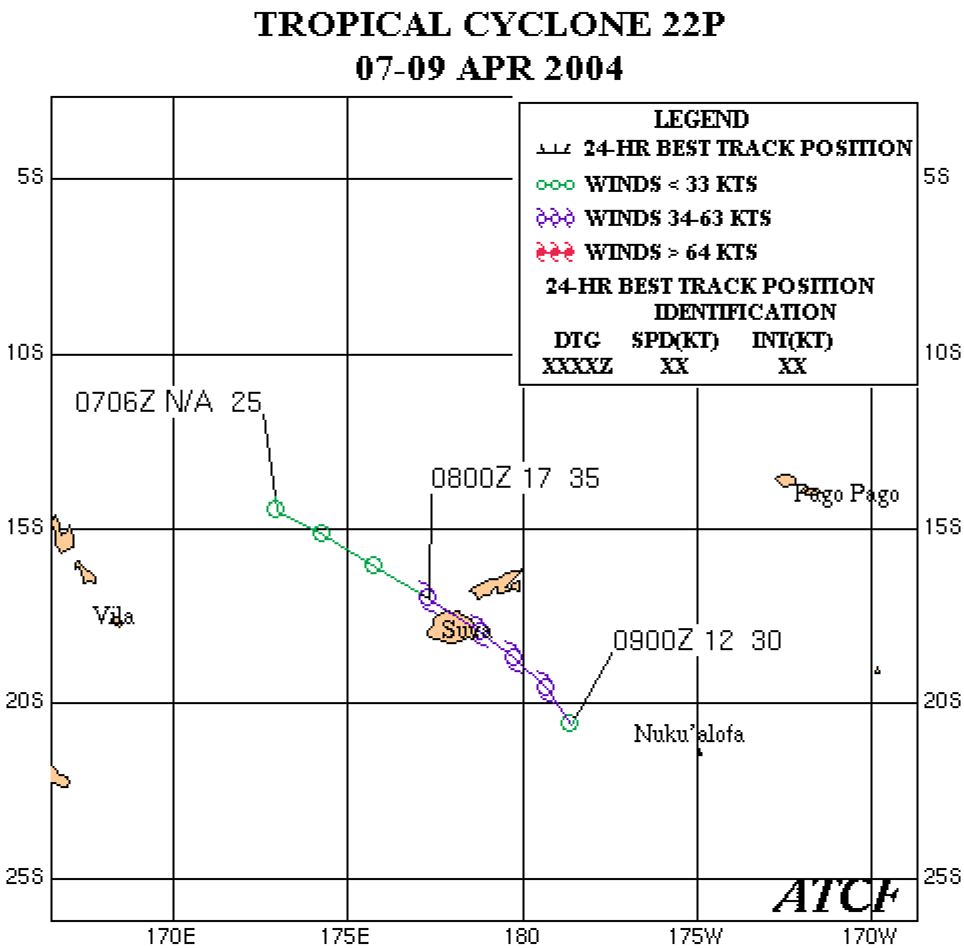
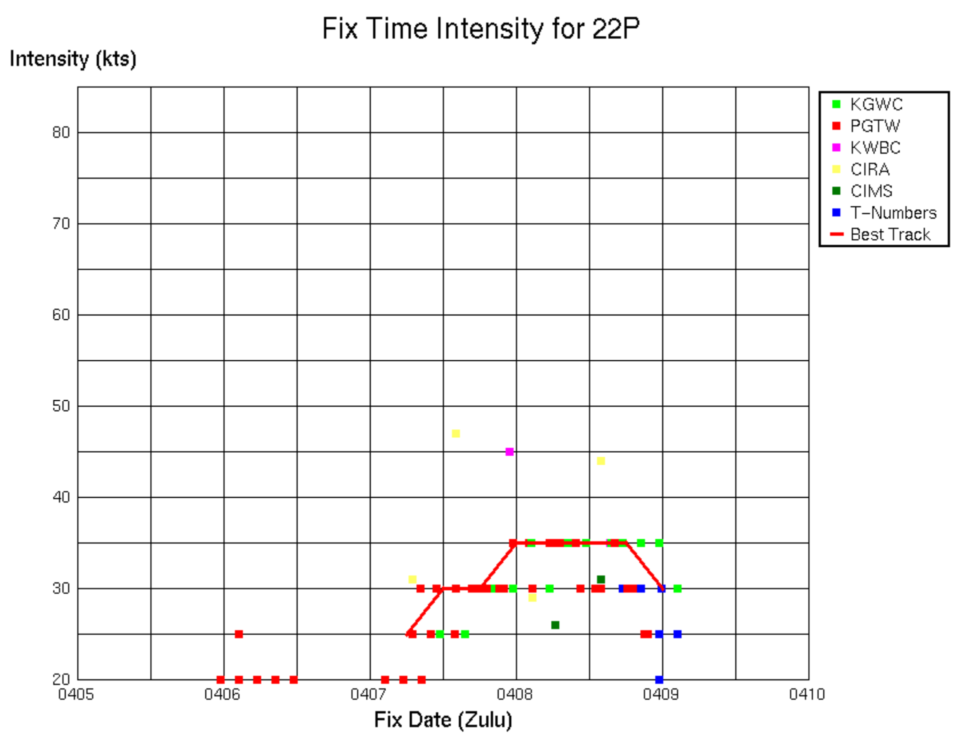


Figure 2-22P-1. 081807Z April 2004 SSm/I Multi-sensor imagery of TC 22P, the microwave images reveal that the systems Low-level circulation center (LLCC) is exposed to the west of the associated convection while the Enhanced Infrared imagery show the LLCC may be under the western edge of te deep cnvctn. At this time, the peak intensity was 35kts.


TROPICAL CYCLONE 22P
07-09 APR 2004
LEGEND
24-HR BEST TRACK POSITION
WINDS < 33 KTS
WINDS 34-63 KTS
WINDS > 64 KTS
24-HR BEST TRACK POSITION IDENTIFICATION
DTG SPD(KT) INT(KT)
XXXXZ XX XX
0706Z N/A 25
0800Z 17 35
0900Z 12 30
Pago Pago
Vila
Suva
Nuku'alofa
5S
10S
15S
20S
25S
170E
175E
180
175W
170W
ATCF


Fix Time Intensity for 22P
Intensity (kts)
80
70
60
50
40
30
20
0405
0406
0407
0408
0409
0410
Fix Date (Zulu)
KGWC
PGTW
KWBC
CIRA
CIMS
T-Numbers
Best Track

Tropical Cyclone (TC) 23S (Juba)

First Poor : 1800Z 02 May 04

First Fair : 0530Z 04 May 04

First TCFA : 1000Z 05 May 04

First Warning : 1200Z 05 May 04

Last Warning : 1800Z 14 May 04, Dissipated over water

Max Intensity : 65 kts, gusts to 80 kts

Landfall : None

Total Warnings : 10

Remarks:

1) Tropical Cyclone (TC) 23S was first detected as a tropical disturbance 725 nm east of Diego Garcia. It began moving west before looping clockwise to pass south of Diego Garcia on 10 May. After the Diego Garcia passage, the cyclone meandered southwestward while intensifying, and attained maximum intensity of 65 kts on 13 May at 1200Z. Subsequently, TC 23S tracked poleward along the western periphery of the subtropical steering ridge until approximately 14 May at 0000Z when it began to rapidly weaken due to increased vertical wind shear.

2) No damage reports were received for this cyclone.

Statistics for JTWC on TC23S

	WRN	BEST TRACK			POSITION ERRORS								WIND ERRORS							
DTG	NO.	LAT	LONG	wind	00	12	24	36	48	72	96	120	00	12	24	36	48	72	96	120
04050400		7.6S	84.1E	20																
04050406		8.1S	83.1E	25																
04050412		8.5S	82.0E	25																
04050418		8.7S	80.6E	25																
04050500		8.7S	79.2E	25																
04050506		8.6S	77.8E	30																
04050512	1	8.5S	76.4E	35	26	79	237	520	748				0	5	15	20	25			
04050518	2	8.5S	75.4E	35	16	48	221	429	586	657			0	0	10	15	20	30		
04050600	3	8.5S	74.7E	35	45	103	318	493	610	705			0	10	10	15	25	30		

04050606	4	8.0S	74.2E	35	5	199	428	579	638				0	10	10	15	25			
04050612	5	7.4S	74.8E	30	18	104							0	-5						
04051218	6	11.7S	68.1E	40	5	30	85	94	59				-5	-25	-20	-5	10			
04051306	7	12.8S	67.6E	65	5	12	34	176					-5	0	25	35				
04051318	8	14.1S	67.5E	65	0	38	174						0	15	25					
04051406	9	15.1S	67.0E	45	57	217							10	10						
04051418	10	14.4S	65.9E	30	23								0							
04051500		14.8S	65.5E	25																
			AVERAGE		21	92	214	382	528	681			2	9	16	18	21	30		
			BIAS										0	2	11	16	21	30		
			# CASES		10	9	7	6	5	2			10	9	7	6	5	2		

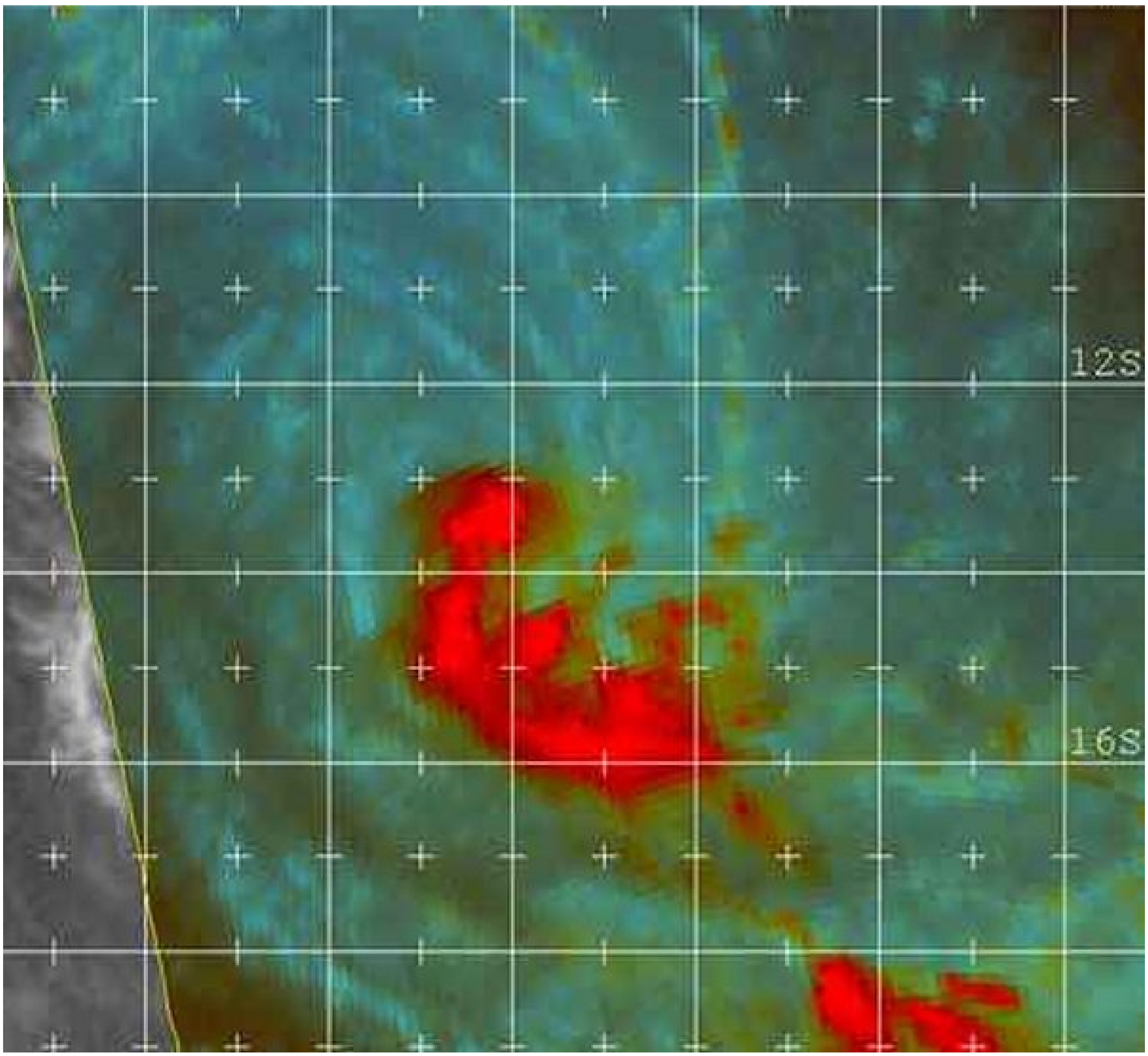
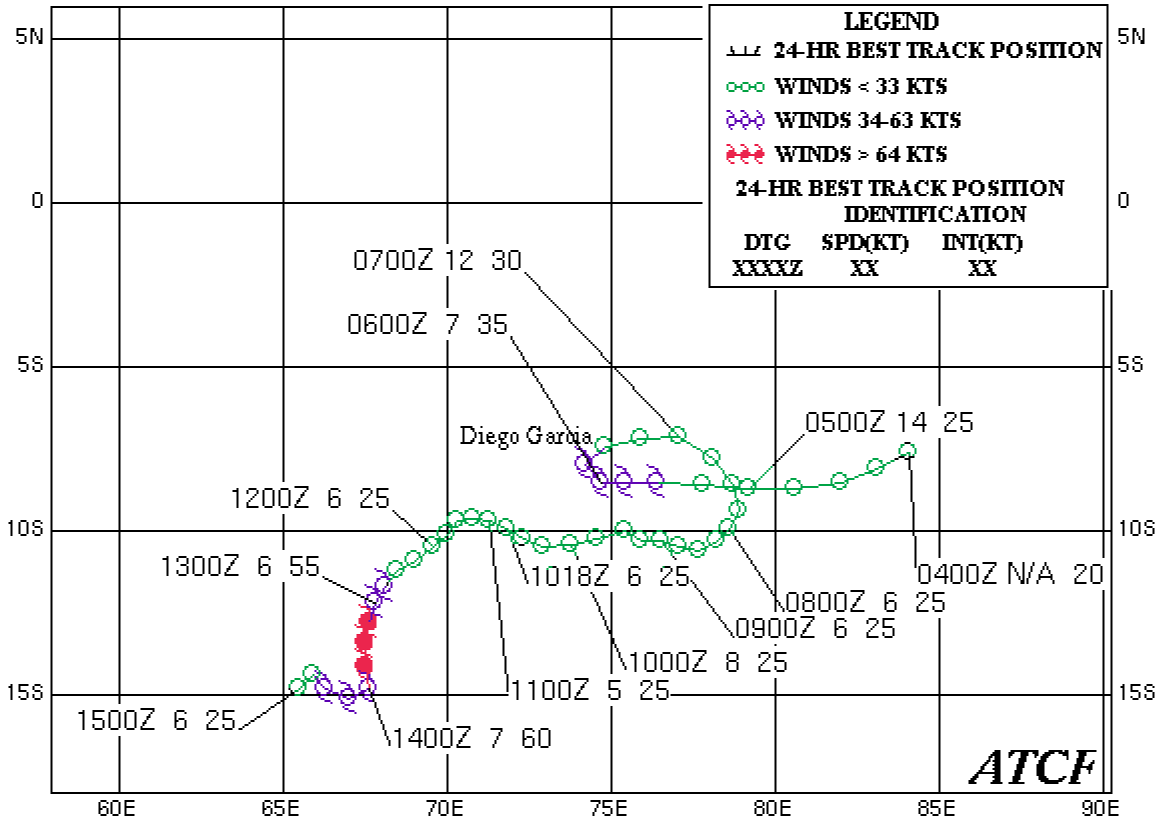
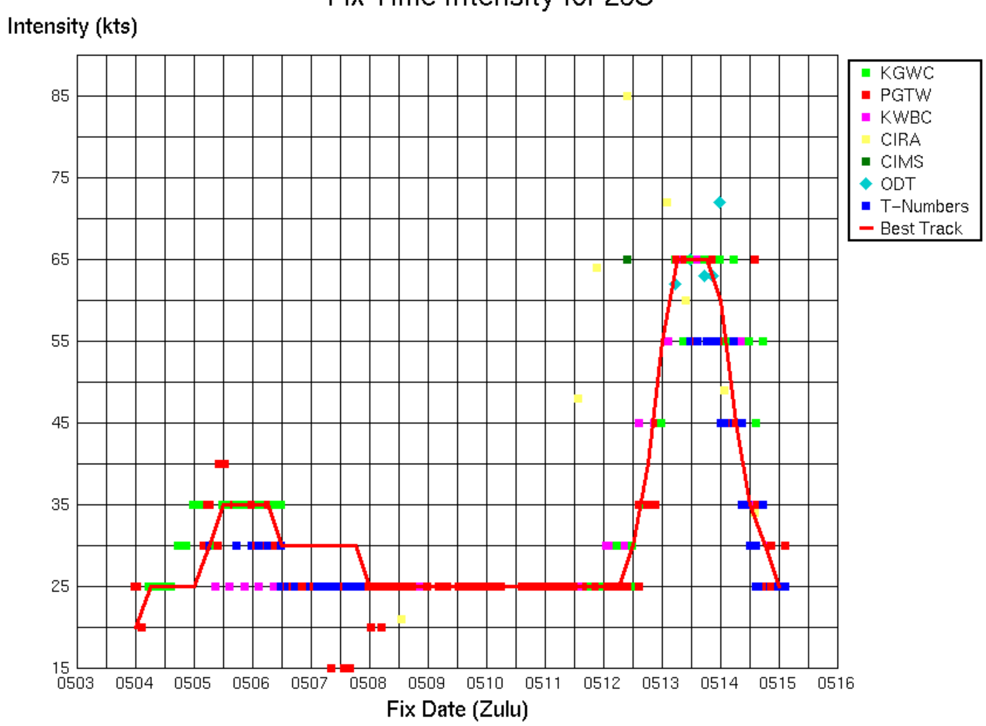


Figure 2-23S-1. 131355Z May 2004 Color 85 SSM/I image of TC 23S (Juba), at this time, the Low-level circulation was beginning to seperate from the associated convection. The peak intensity at this time was 65kts.

TROPICAL CYCLONE 23S (JUBA)
04-15 MAY 2004



Fix Time Intensity for 23S



3. TROPICAL CYCLONE FIX DATA

3.1 2004 SEASON

Tables 3-1 to 3-3 list the number of tropical cyclone center "fixes", or locations, made using satellite (visible, infrared, and microwave), scatterometer, radar, and synoptic data. Fixes made by the DOD tropical cyclone reconnaissance network sites are included in the tables as well as those fixes received from other sources (e.g., Japanese Meteorological Agency, Australian Bureau of Meteorology, and U.S. National Weather Service National Environmental Satellite Data and Information Service). Table 3-4 lists the total fixes by basin.

TABLE 3-1 SOUTH PACIFIC & SOUTH INDIAN OCEAN FIX SUMMARY FOR 2004

Tropical Cyclone		Satellite	Scatt	Radar	Synoptic	Total
TC 01S	Abaimba	179	3	0	0	182
TC 02S	Beni	379	10	0	0	389
TC 03S	Cela	569	7	0	0	576
TC 04S	Jana	207	9	0	0	216
TC 05P	Debbie	179	1	0	0	180
TC 06S	Darius	267	5	0	0	272
TC 07P	Heta	357	2	0	0	359
TC 08S	Ken	142	4	0	0	146
TC 09S	Elita	305	4	0	0	309
TC 10S	Frank	382	9	1	0	391
TC 11S	Linda	143	3	0	0	146
TC 12P	Fritz	160	0	0	0	160
TC 13P	Ivy	292	7	0	0	299
TC 14S	Monty	143	3	0	0	146
TC 15P	Evan	63	1	0	0	64
TC 16S	Gafilo	310	6	0	0	316
TC 17S	Nicky-Helm	177	2	0	0	179
TC 18S	Fay	417	5	1	0	423
TC 19P	Grace	54	0	0	0	54
TC 20S	Oscar	196	3	0	0	199
TC 21S	-	71	3	0	0	74
TC 22P	-	70	1	0	0	71
TC 23S	Juba	234	6	0	0	240
-	Totals	5296	94	1	5	5391
Percentage of Total		98.2	1.7	0.019	0.0	100

TABLE 3-2 WESTERN NORTH PACIFIC OCEAN FIX SUMMARY FOR 2004						
Tropical Cyclone		**Satellite**	**Scatt**	**Radar**	**Synoptic**	**Total**
TD 01W	-	199	5	0	0	204
TS 02W	-	219	5	0	0	224
STY 03W	Sudal	483	6	2	0	491
STY 04W	Nida	296	2	0	0	298
TY 05W	-	109	1	0	0	110
TS 06W	Omais	234	1	0	0	235
TY 07W	Conson	288	4	48	0	340
TY 08W	Chanthu	178	0	0	0	178
STY 09W	Dianmu	320	8	95	0	423
TY 10W	Mindulle	413	6	19	0	438
TY 11W	Ting-Ting	310	8	0	0	318
TS 12W	Kompasu	152	2	12	0	166
TY 13W	Namtheun	375	3	0	0	378
TY 14W	Meranti	213	2	0	0	215
TD 15W	Malou	77	1	0	0	78
TY 16W	Rainanim	202	4	27	0	233
TD 17W	Malakas	97	0	0	0	97
TY 18W	Megi	191	0	31	0	222
STY 19W	Chaba	469	5	95	0	569
TY 20W	Aere	285	1	33	0	319
TS 21W	-	74	0	0	0	74
TY 22W	Songda	453	4	118	0	575
TS 23W	Sarika	226	2	0	0	228
TS 24W	Haima	96	0	23	0	119
TY 25W	Meari	397	7	110	0	514
STY 26W	Ma-On	202	3	20	0	225
TY 27W	Tokage	355	7	92	0	454
TY 28W	Nock-Ten	528	8	56	0	592
TY 29W	Muifa	439	2	0	0	441
TY 30W	Nanmadol	336	7	0	0	343
TS 31W	Talas	377	6	17	0	400
TS 32W	Noru	156	7	0	0	163
-	Totals	8749	117	798	0	9664
Percentage of Total		90.53	1.21	8.26	0.00	100

TABLE 3-3

NORTHERN INDIAN OCEAN FIX SUMMARY FOR 2004

Tropical Cyclone		Satellite	Scatt	Radar	Synoptic	Total
TC 01A	-	151	1	0	0	152
TC 02B	-	125	1	0	0	126
TC 03A	-	182	3	0	0	185
TC 04A	-	180	0	0	0	180
TC 05A	Agni	206	5	0	0	211
-	Totals	844	10	0	0	854
Percentage of Total		98.83	1.17	0	0	100

TABLE 3-4

FIXES BY OCEANIC BASIN FOR 2004

Oceanic Basin	**Total Fixes**
Northwest Pacific	9664
Southern Hemisphere	5391
Northern Indian Ocean	854
Total	15909

4. SUMMARY OF FORECAST VERIFICATION

4.1 ANNUAL FORECAST VERIFICATION

Verification of warning positions and intensities at initial, 12-, 24-, 48-, and 72-hour forecast periods are made against the final best track. The (scalar) track forecast, along-track and cross-track errors (illustrated in Figure 4-1) were calculated for each verifying JTWC forecast. These data, in addition to a detailed summary for each tropical cyclone, are included as Chapter 4. This section summarizes verification data this year and contrasts it with annual verification statistics from previous years.

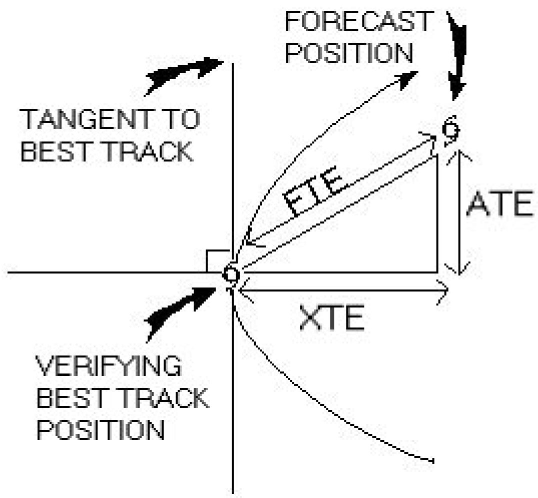


Figure 4-1. Definition of cross-track error (XTE), along-track error (ATE), and forecast track error (FTE). In this example, the forecast position is ahead of and to the right of the verifying best track position. Therefore, the XTE is positive (to the right of the best track) and the ATE is positive (ahead or faster than the best track). Adapted from Tsui and Miller, 1988.

4.1.1 WESTERN NORTH PACIFIC OCEAN

Table 4-1 includes mean track, along-track and cross-track errors from 1959, when JTWC was founded, until the present. Figure 4-2 shows mean track errors and a 5-year running mean of track errors at 24-, 48- and 72-hours since 1974.

Table 4-1 MEAN FORECAST TRACK ERRORS (NM) FOR WESTERN NORTH PACIFIC TROPICAL CYCLONES FOR 1959-2004												
	24-HOUR				**48-HOUR**				**72-HOUR**			
YEAR (Notes)	TY (1)	TC (3)	CROSS TRACK (2)	ALONG TRACK (2)	TY (1)	TC (3)	CROSS TRACK (2)	ALONG TRACK (2)	TY (1)	TC (3)	CROSS TRACK (2)	ALONG TRACK (2)
1959	117*				267*							
1960	177*				354*							
1961	136				274							
1962	144				287				476			
1963	127				246				374			
1964	133				284				429			
1965	151				303				418			
1966	136				280				432			
1967	125				276				414			
1968	105				229				337			
1969	111				237				349			
1970	98	104			181	190			272	279		
1971	99	111	64		203	212	118		308	317	177	
1972	116	117	72		245	245	146		382	381	210	
1973	102	108	74		193	197	134		245	253	162	
1974	114	120	78		218	226	157		357	348	245	
1975	129	138	84		279	288	181		442	450	290	
1976	117	117	71		232	230	132		336	338	202	
1977	140	148	83		266	283	157		390	407	228	
1978	120	127	71	87	241	271	151	194	459	410	218	296
1979	113	124	76	81	219	226	138	146	319	316	182	214
1980	116	126	76	86	221	243	147	165	362	389	230	266
1981	117	124	77	80	215	221	131	146	342	334	219	206
1982	114	113	70	74	229	238	142	162	337	342	211	223
1983	110	117	73	76	247	260	164	169	384	407	263	259
1984	110	117	64	84	228	232	131	163	361	363	216	238
1985	112	117	68	80	228	231	138	153	355	367	227	230
1986	117	126	70	85	261	261	151	183	403	394	227	276
1987	101	107	64	71	211	204	127	134	318	303	186	198
1988	107	114	58	85	222	216	103	170	327	315	159	244
1989	107	120	69	83	214	231	127	162	325	350	177	265
1990	98	103	60	72	191	203	110	148	299	310	168	225
1991	93	96	53	69	187	185	97	137	298	287	146	229
1992	97	107	59	77	194	205	116	143	295	305	172	210
1993	102	112	63	79	205	212	117	151	320	321	173	226
1994**	96	105	56	76	172	186	105	131	244	258	152	176
1995	105	123	67	89	200	215	117	159	311	325	167	240
1996	85	105	56	76	157	178	89	134	252	272	137	203
1997	86	93	55	76	159	164	87	134	251	245	120	202

1998	127	124	58	98	263	239	127	178	392	370	201	274
1999	88	106	59	74	150	176	102	119	225	234	139	155
2000	75	81	45	57	136	142	80	98	205	209	118	144
2001	67	73	42	50	115	122	75	79	176	180	111	121
2002	47	66	45	39	87	115	78	70	131	163	109	100
2003	59	73	41	52	119	128	68	94	186	186	89	147
2004	52	70	41	48	94	122	69	84	180	173	95	121
Averages (1978 - 2004)	97	106	60	74	192	201	114	141	299	301	170	211

1. Track errors were calculated for typhoons when intensities were at least 65kts at warning times

2. Cross-track and along-track errors were adopted by the JTWC in 1986. Right angle errors (used prior to 1986) were recomputed as cross-track errors after-the fact to extend the data base. See Figure 3-1 for the definitions of cross-track and along-track.

3. Mean forecast errors for all warned systems in Northwest Pacific.

*Forecast positions north of 35 degrees North latitude were not verified.

**1994 statistics were recalculated to resolve earlier Along and Cross-Track discrepancies.

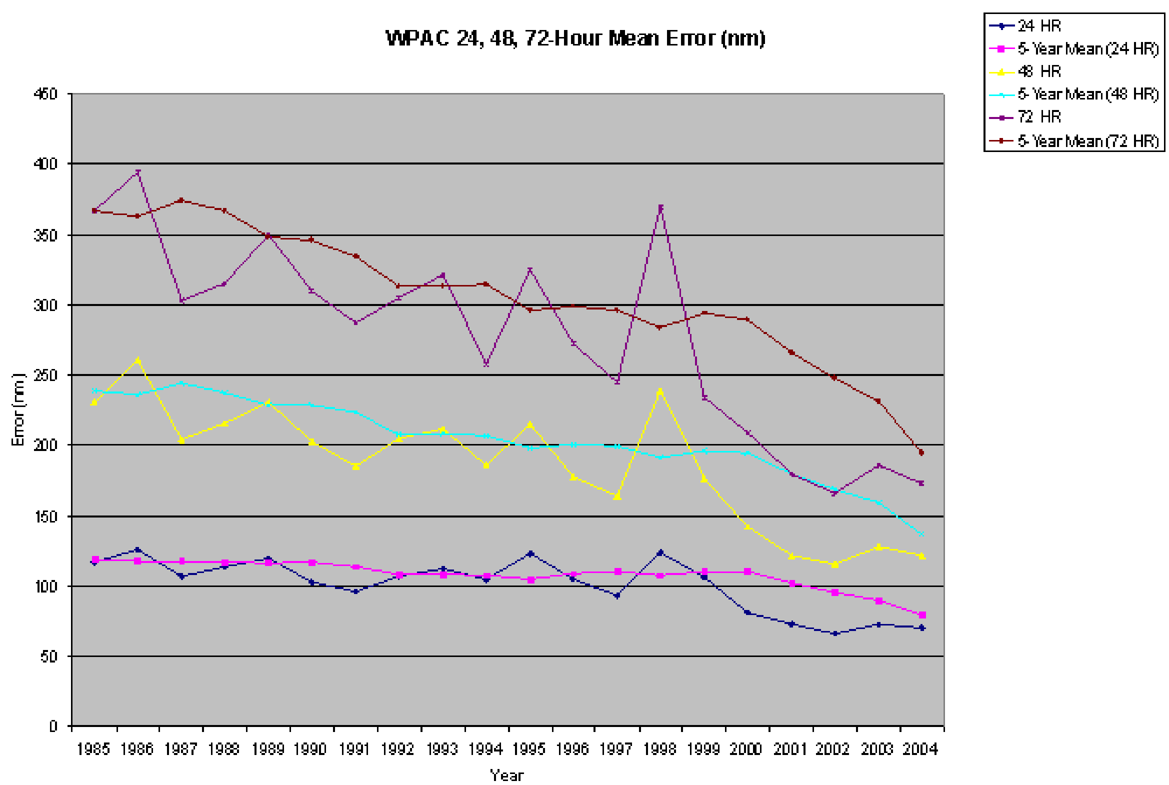


Figure 4-2a. Mean track forecast error (nm) and 5-year running mean for 24, 48 and 72 hours for Western North Pacific Ocean tropical cyclones from 1985-2004.

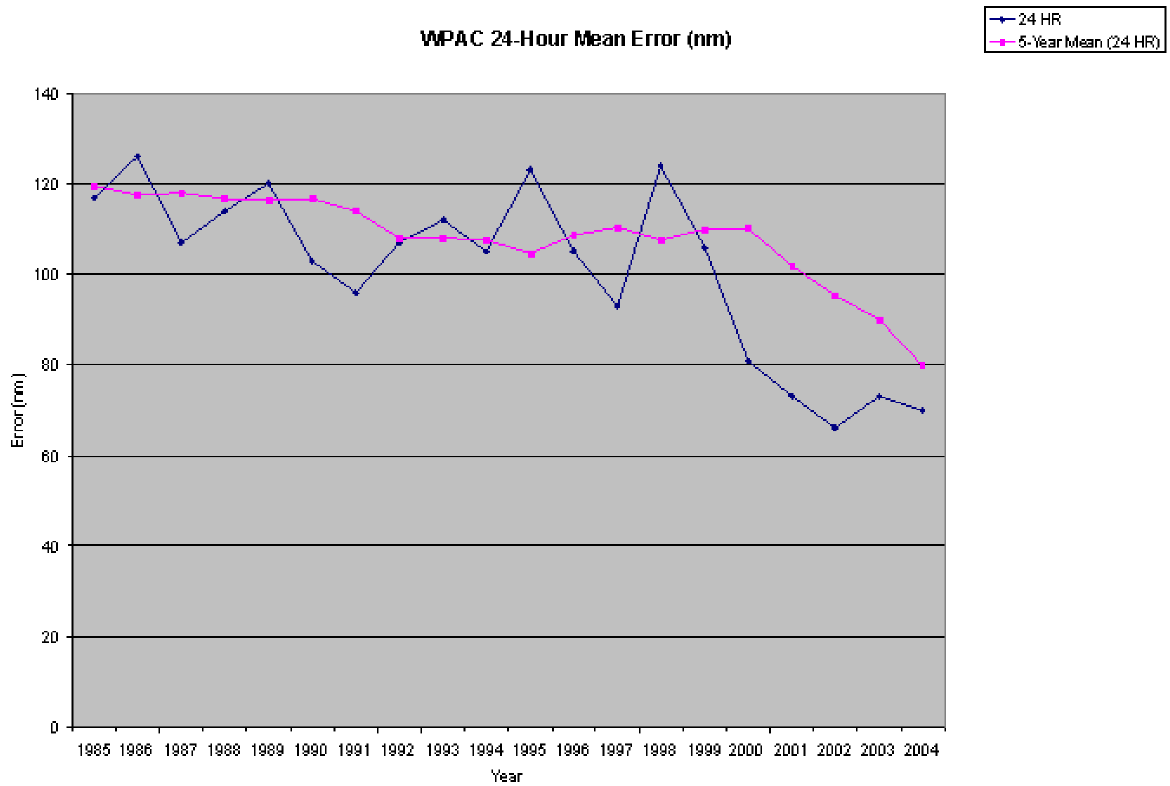


Figure 4-2b. Mean track forecast error (nm) and 5-year running mean for 24 hours for western North Pacific Ocean tropical cyclones from 1992-2004.

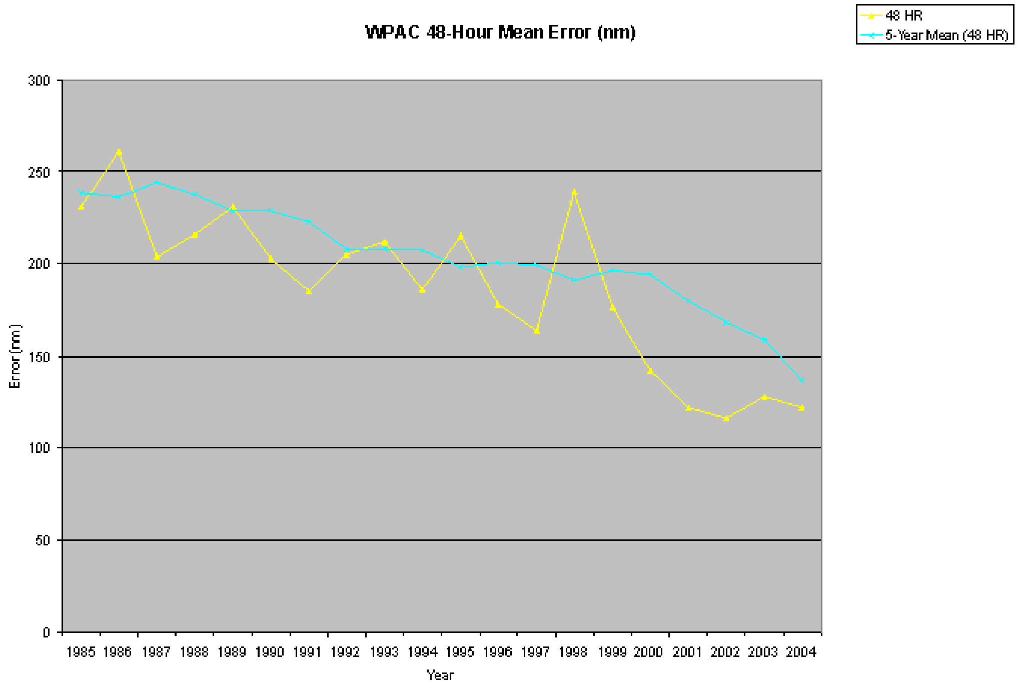


Figure 4-2c. Mean track forecast error (nm) and 5-year running mean for 48 hours for western North Pacific Ocean tropical cyclones from 1985-2004.

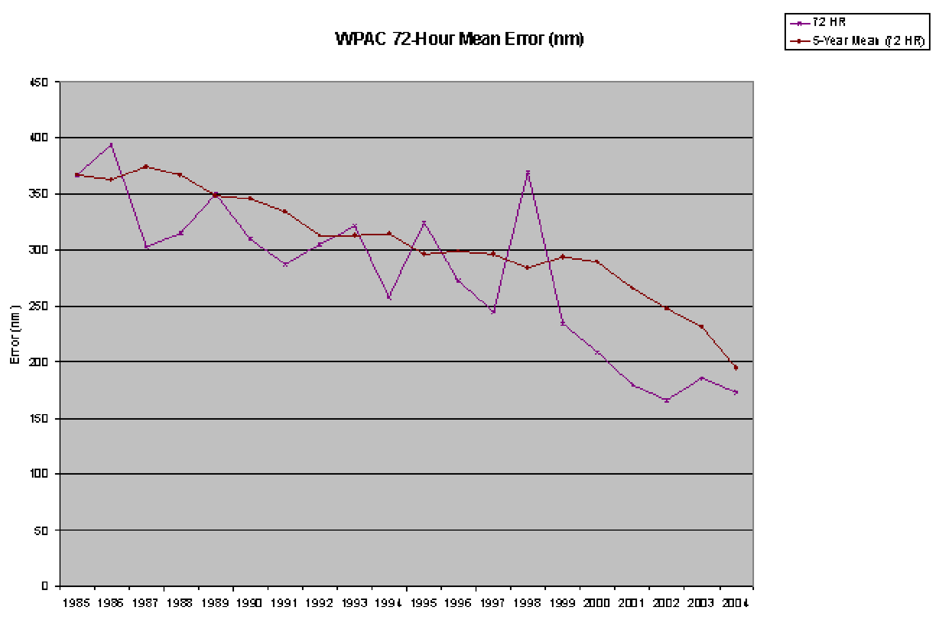


Figure 4-2d. Mean track forecast error (nm) and 5-year running mean for 72 hours for western North Pacific Ocean tropical cyclones from 1985-2004.

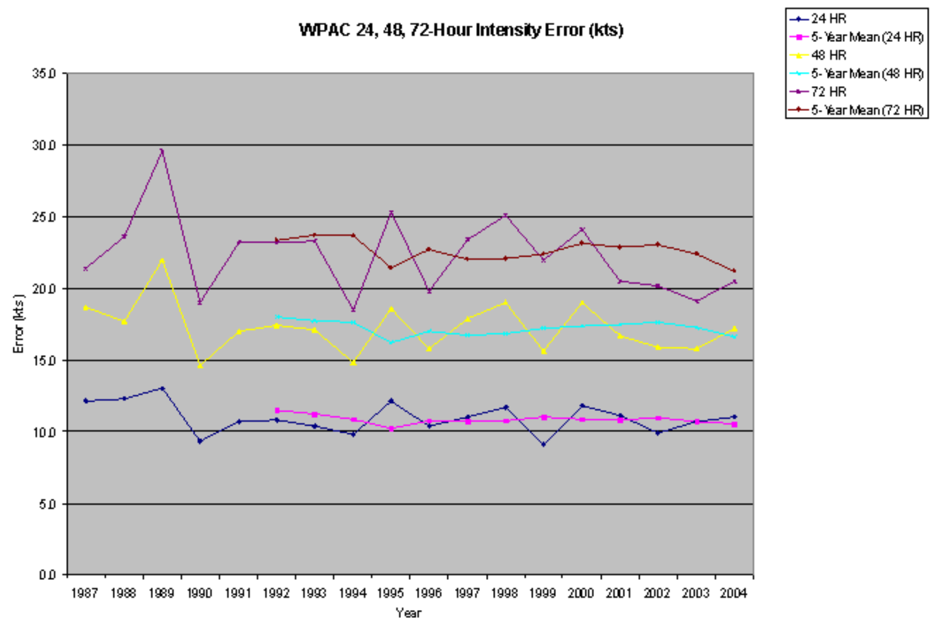


Figure 4-3a. Mean intensity forecast error (nm) and 5-year running mean for 24, 48, and 72 hours for western North Pacific Ocean tropical cyclones from 1987-2004.

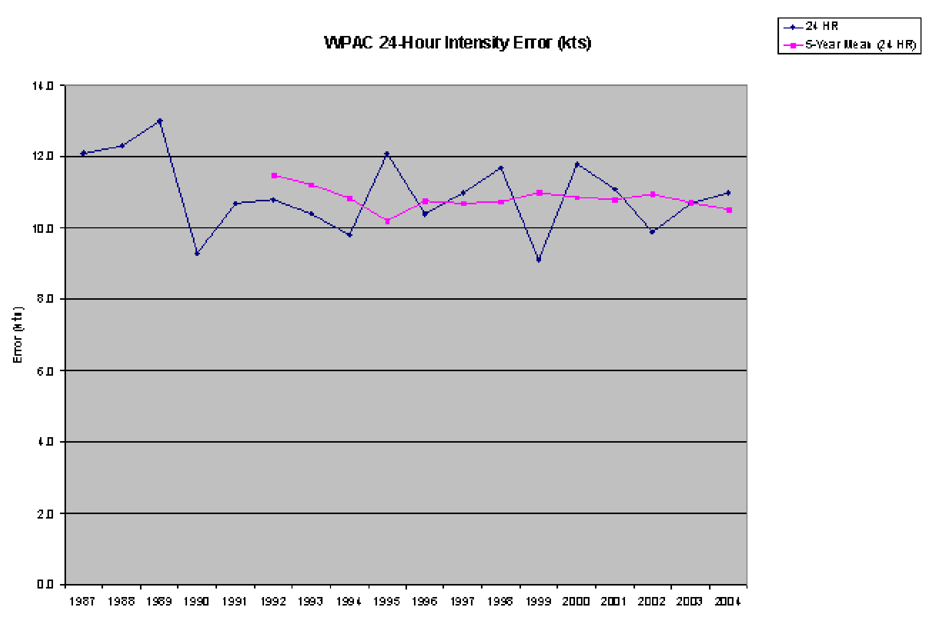


Figure 4-3b. Mean intensity forecast error (nm) and 5-year running mean for 24 hours for western North Pacific Ocean tropical cyclones from 1987-2004.

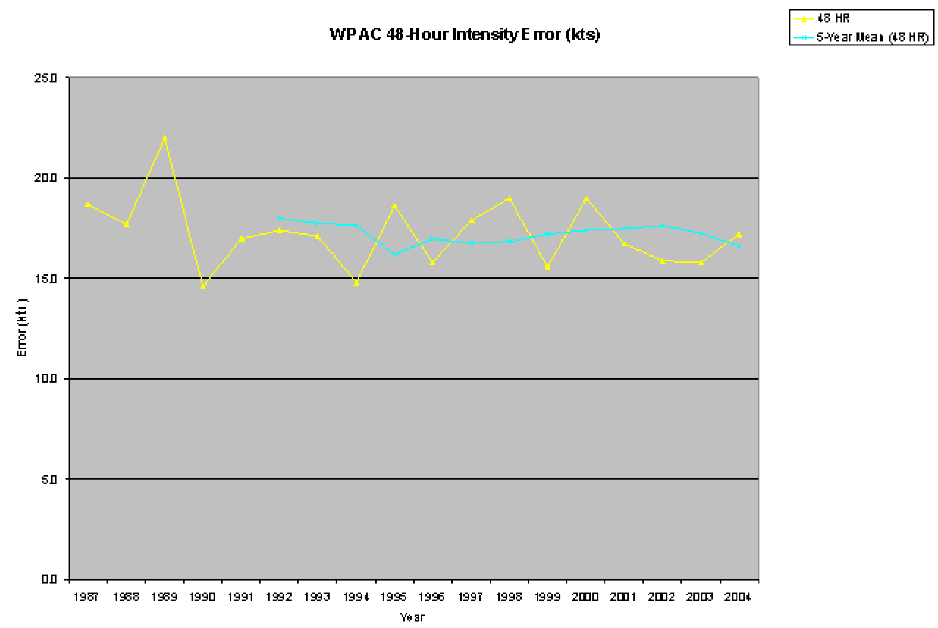


Figure 4-3c. Mean intensity forecast error (nm) and 5-year running mean for 48 hours for western North Pacific Ocean tropical cyclones from 1987-2004.

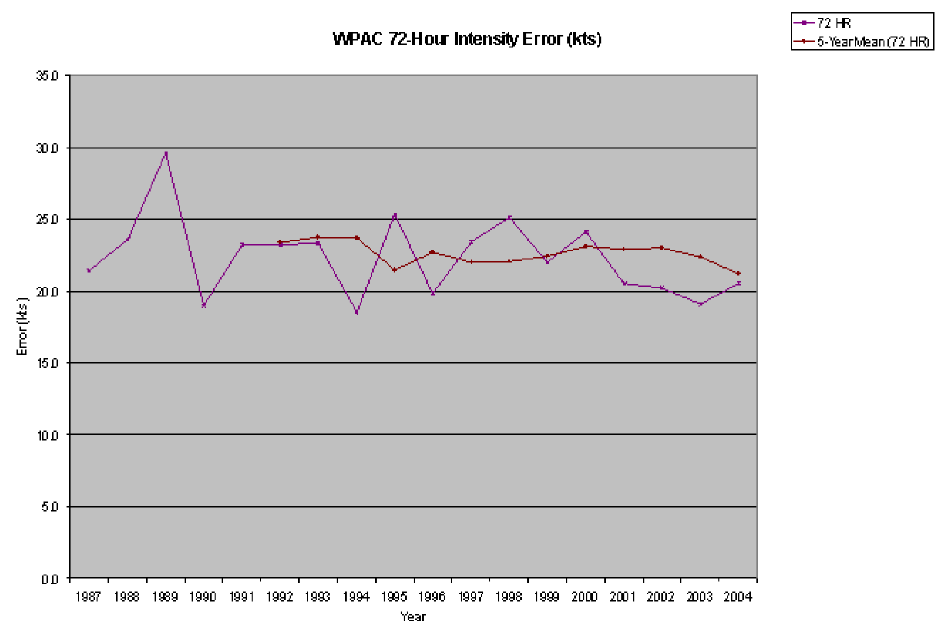


Figure 4-3d. Mean intensity forecast error (nm) and 5-year running mean for 72 hours for western North Pacific Ocean tropical cyclones from 1987-2004.

4.1.2 NORTH INDIAN OCEAN

Table 4-2 JTWC FORECAST ERRORS (NM) FOR THE NORTH INDIAN OCEAN 1985-2004

	24-Hour				48-Hour				72-Hour			
	Number	Track	Along	Cross	Number	Track	Along	Cross	Number	Track	Along	Cross
1985	30	122	102	53	8	242	119	194	0			
1986	16	134	118	53	7	168	131	80	5	269	189	180
1987	54	144	97	100	25	205	125	140	21	305	219	188
1988	30	120	89	63	18	219	112	176	12	409	227	303
1989	33	88	62	50	17	146	94	86	12	216	164	11
1990	36	101	85	43	24	146	117	67	17	185	130	104
1991	43	129	107	54	27	235	200	89	14	450	356	178
1992	149	128	73	86	100	244	141	166	62	398	276	218
1993	28	125	87	79	20	198	171	74	12	231	176	116
1994	44	97	80	44	28	153	124	63	13	213	177	92
1995	47	138	119	58	32	262	247	77	20	342	304	109
1996	123	134	94	80	85	238	181	127	58	311	172	237
1997	42	119	87	49	29	201	168	92	17	228	195	110
1998	55	106	84	51	34	198	135	106	17	262	188	144
1999	41	79	59	38	22	184	130	116	10	374	309	177
2000	24	61	47	26	16	85	69	37	1	401	399	38
2001	41	61	40	37	31	115	71	71	22	166	44	154
2002	30	84	41	63	18	137	92	83	10	185	92	133
2003	37	108	66	69	31	196	115	132	7	354	210	252
2004	46	81	53	52	36	140	95	85	9	173	144	86
(1985-2004)												
Avg	47	108	81	56	30	185	132	102	17	285*	209*	147*

*19 year average (1985 not available)

Table 4-2 includes mean track, along-track and cross-track errors for a 16-year period. Figure 4-6 shows mean track errors and a 5-year running mean of track errors at 24- and 48-hours since 1985, and at 72-hours since 1986.

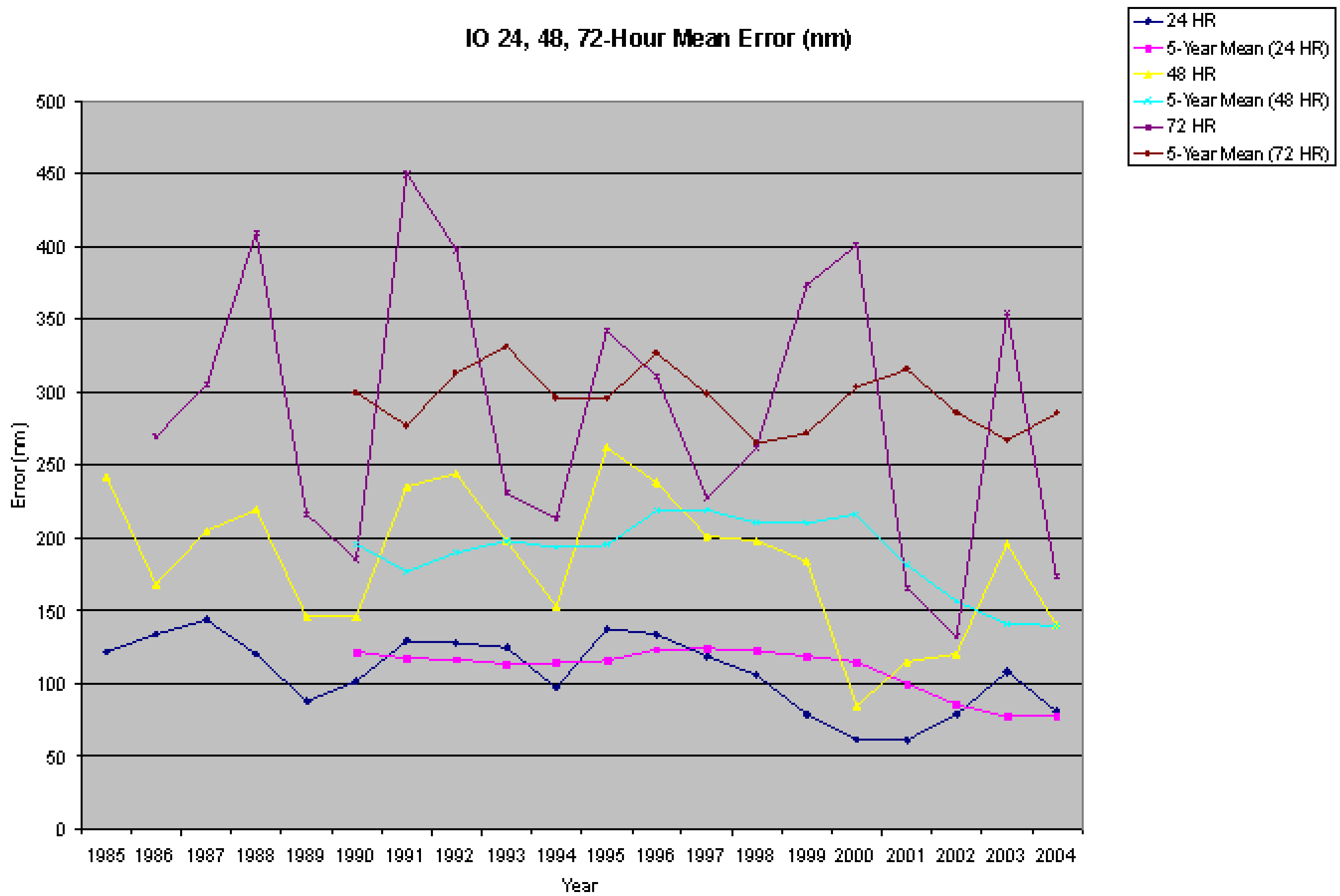


Figure 4-4a. Mean track forecast error (nm) and 5-year running mean for 24, 48 and 72 hours for North Indian Ocean tropical cyclones from 1985-2004.

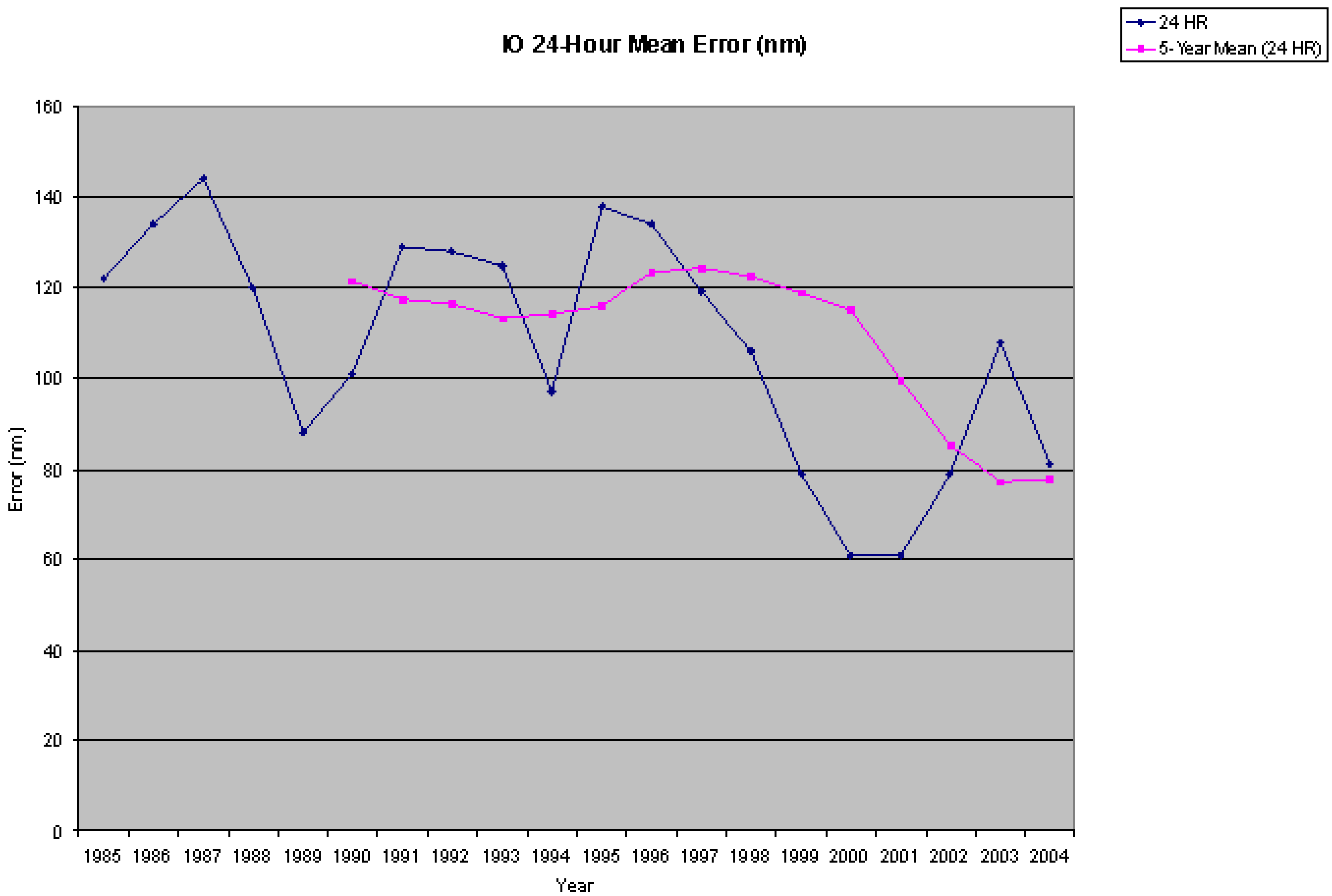


Figure 4-4b. Mean track forecast error (nm) and 5-year running mean for 24 hours for North Indian Ocean tropical cyclones from 1985-2004.

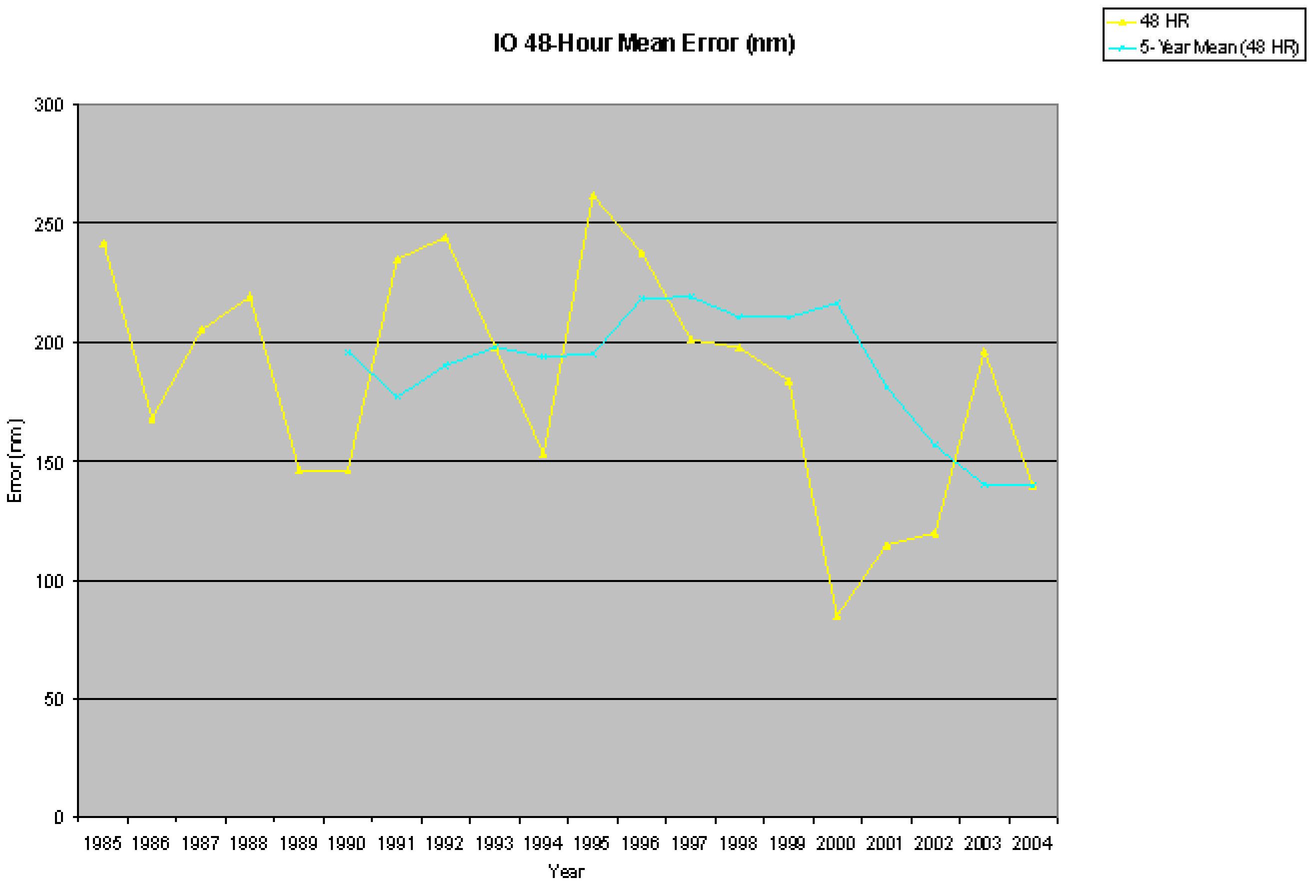


Figure 4-4c. Mean track forecast error (nm) and 5-year running mean for 48 hours for North Indian Ocean tropical cyclones from 1985-2004.

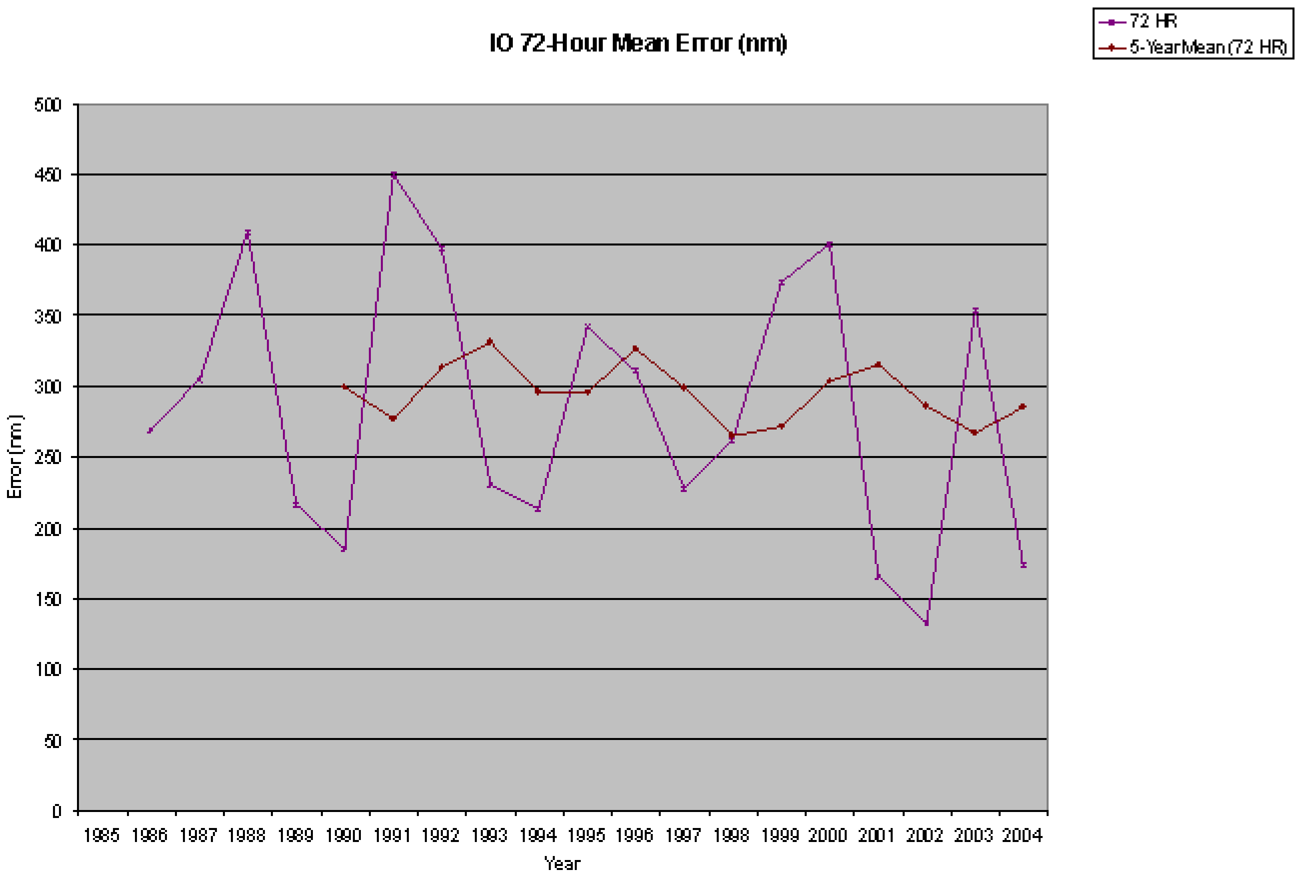


Figure 4-4d. Mean track forecast error (nm) and 5-year running mean for 72 hours for North Indian Ocean tropical cyclones from 1987-2004.

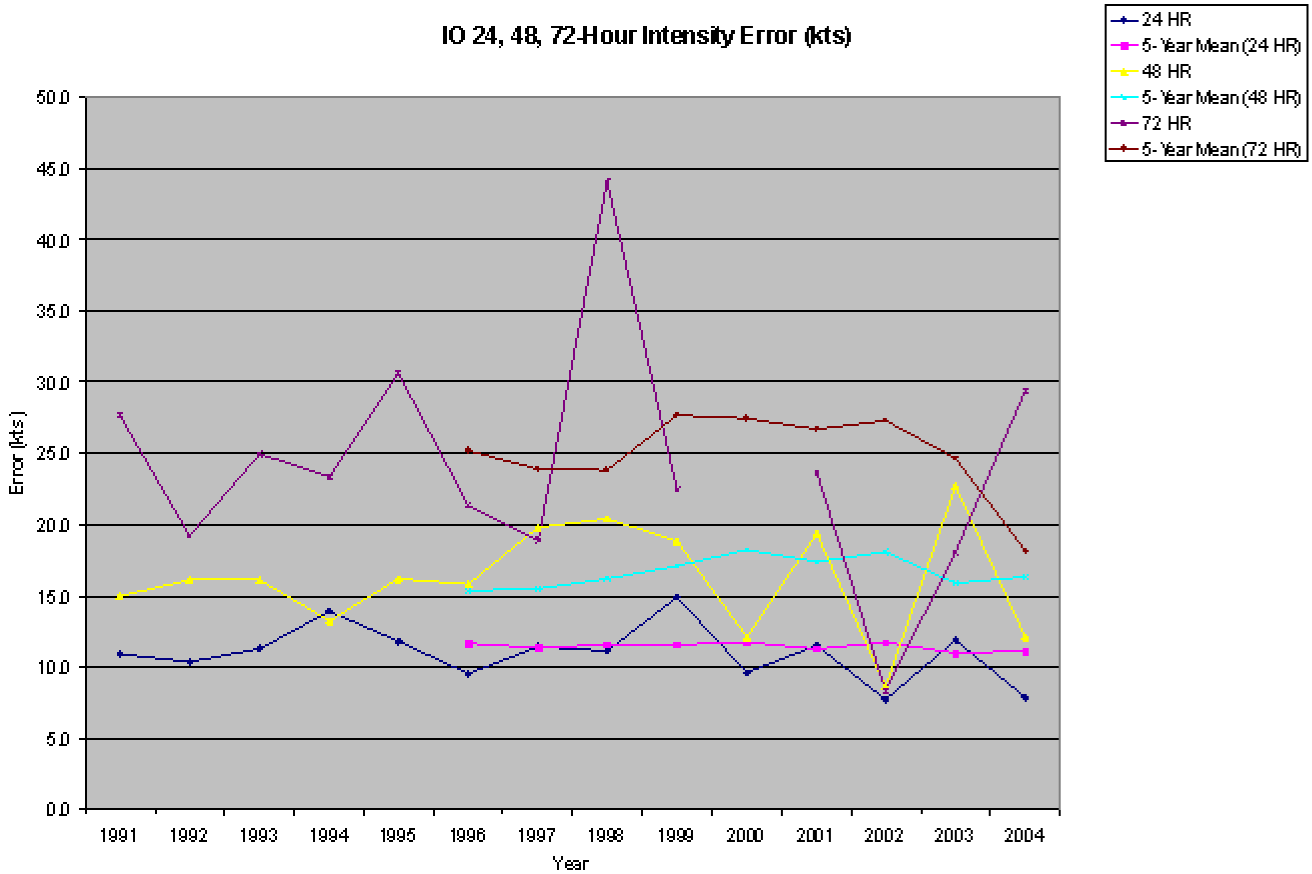


Figure 4-5a. Mean intensity forecast error (nm) and 5-year running mean for 24, 48 and 72 hours for North Indian Ocean tropical cyclones from 1995-2004.

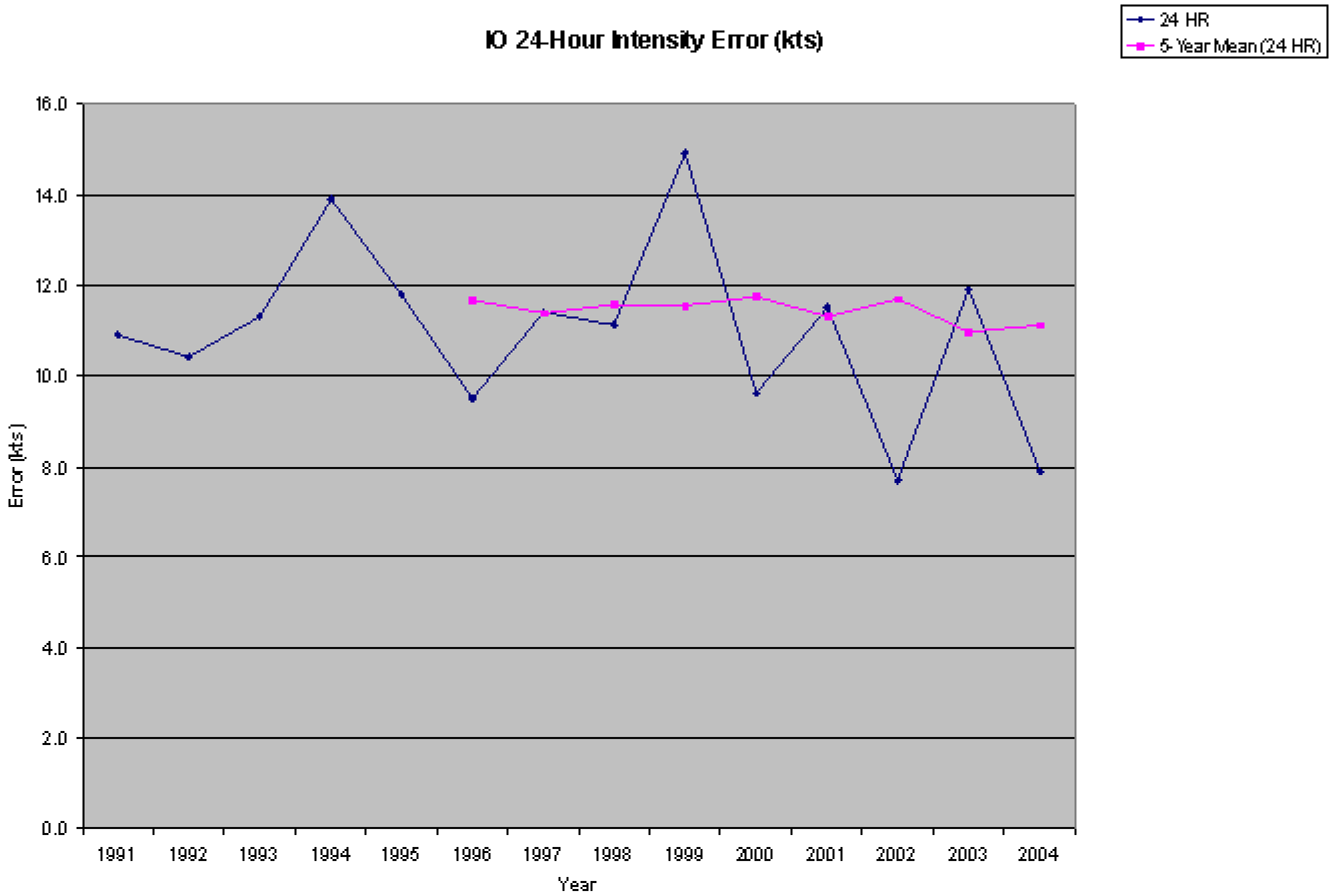


Figure 4-5b. Mean intensity forecast error (nm) and 5-year running mean for 24 hours for North Indian Ocean tropical cyclones from 1995-2004.

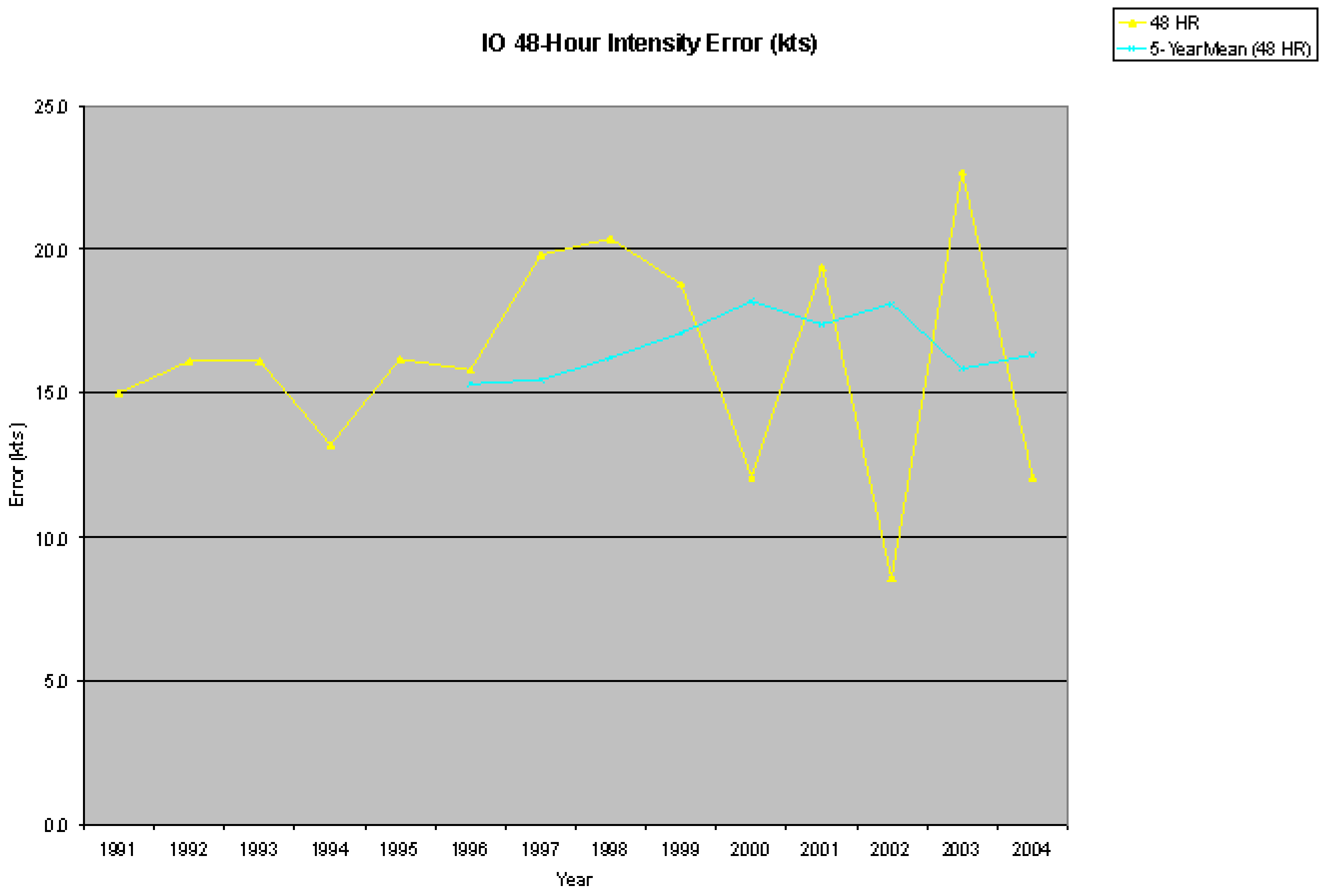


Figure 4-5c. Mean intensity forecast error (nm) and 5-year running mean for 48 hours for North Indian Ocean tropical cyclones from 1995-2004.

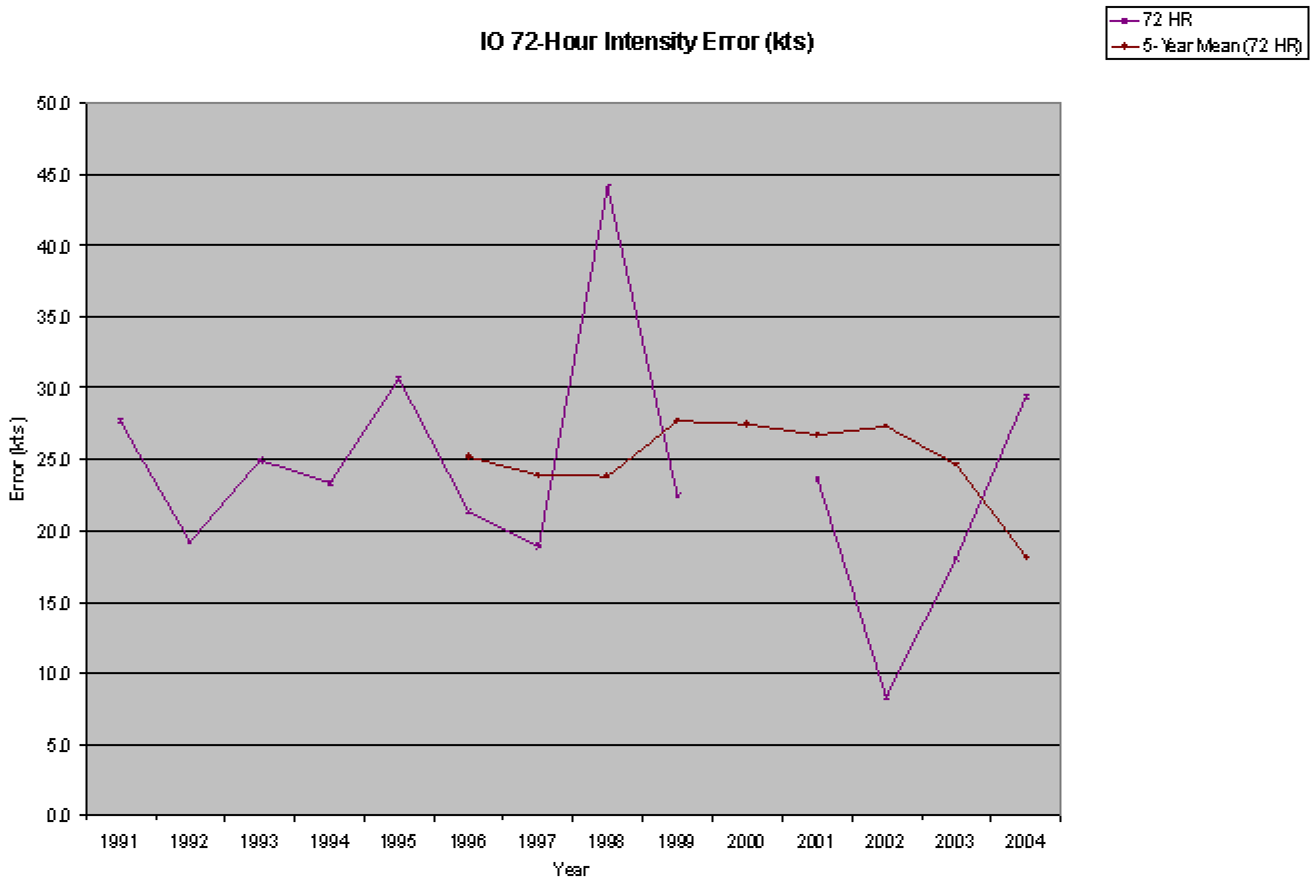


Figure 4-5d. Mean intensity forecast error (nm) and 5-year running mean for 72 hours for North Indian Ocean tropical cyclones from 1995-2004.

4.1.3 SOUTH PACIFIC AND SOUTH INDIAN OCEANS (SOUTHERN HEMISPHERE)

Table 4-3 JTWC FORECAST ERRORS (NM) FOR THE SOUTHERN HEMISPHERE 1985-2004

	24-Hour				48-Hour				72-Hour			
	Number	Track	Along	Cross	Number	Track	Along	Cross	Number	Track	Along	Cross
1985	257	134	92	79	193	236	169	132				
1986	227	129	86	77	171	262	169	164				
1987	138	145	94	90	101	280	153	138				
1988	99	146	98	83	48	290	246	144				
1989	242	124	84	73	186	240	166	136				
1990	228	143	105	74	177	263	178	152				

1991	231	115	75	69	185	220	152	129				
1992	230	124	91	64	208	240	177	129				
1993	225	102	74	57	176	199	142	114				
1994	345	115	77	68	282	224	147	134				
1995	222	108	82	55	175	198	144	108	53	291	169	190
1996	298	125	90	67	237	240	174	129	46	277	221	133
1997	499	109	82	72	442	210	163	135	150	288	248	175
1998	305	111	85	52	245	219	169	108	81	349	261	171
1999	322	113	80	64	245	226	159	132	59	286	198	164
2000	313	72	47	45	245	135	84	86	58	180	94	139
2001	147	84	61	44	113	148	105	86	11	248	132	197
2002	200	82	60	43	146	133	93	75	5	102	91	41
2003	279	74	57	37	221	127	90	68	37	123	99	54
2004	277	77	52	45	233	142	92	89	47	210	162	102
(1985-2004)												
Avg	253	113	80	64	200	215	152	121	56*	238*	168*	140*
*10-year average												

Table 4-3 includes mean track, along-track and cross-track errors for a 16-year period. Figure 4-7 shows mean track errors and a 5-year running mean of track errors at 24- and 48-hours since 1981, and at 72-hours since 1995.

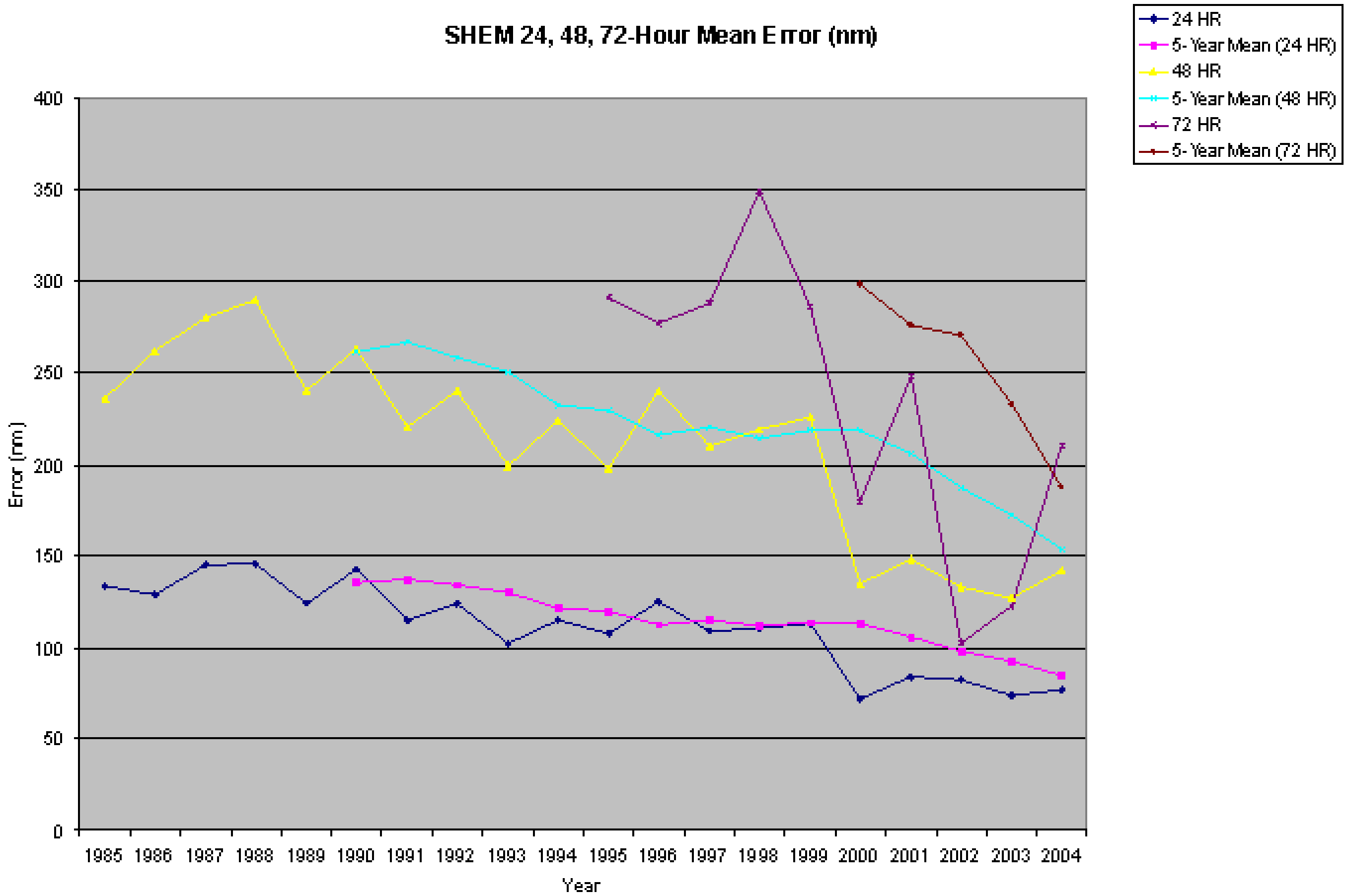


Figure 4-6a. Mean track forecast error (nm) and 5-year running mean for 24, 48 and 72 hours for Southern Hemisphere (Africa to 180 degrees) tropical cyclones from 1985-2004.

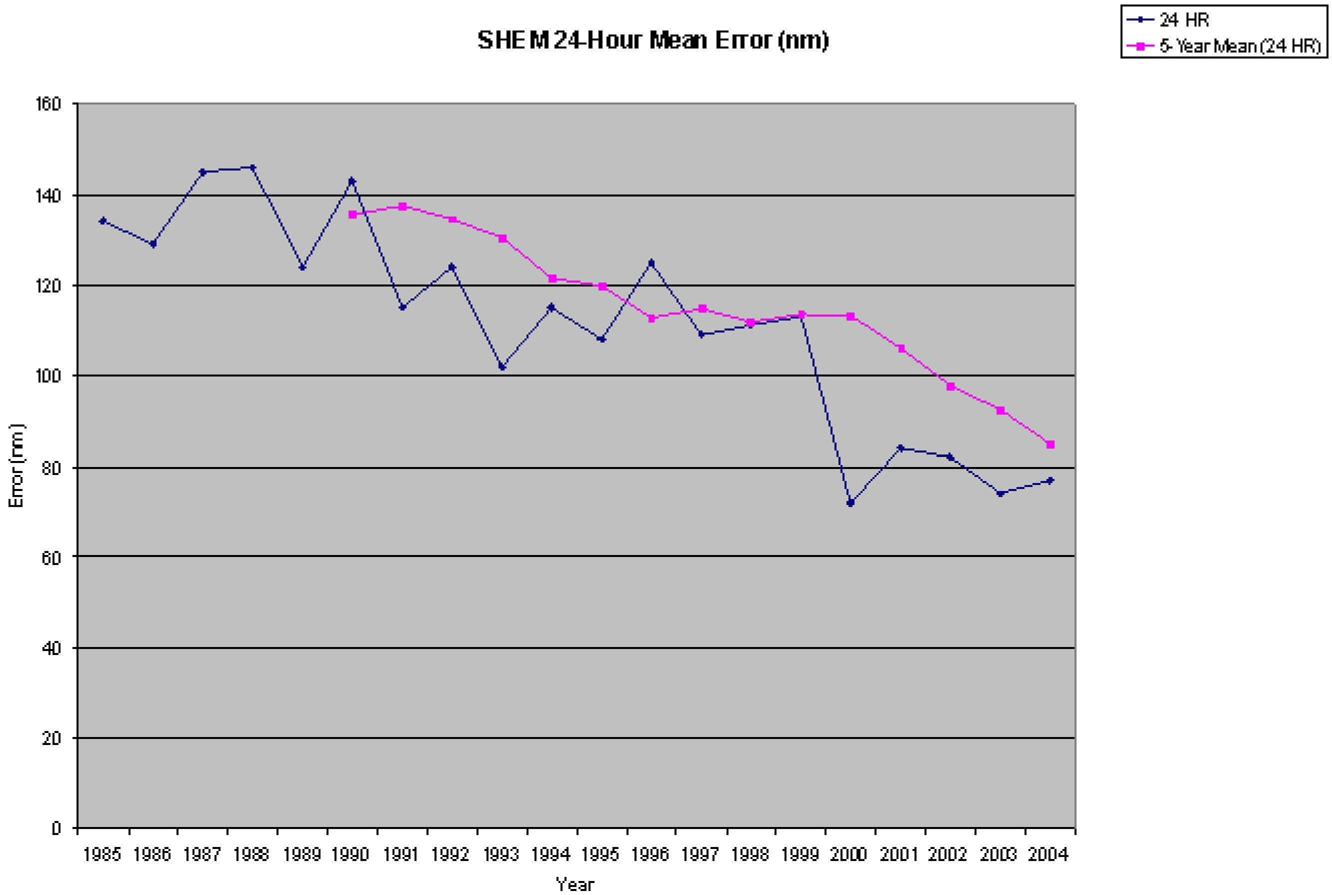


Figure 4-6b. Mean track forecast error (nm) and 5-year running mean for 24 hours for Southern Hemisphere (Africa to 180 degrees) tropical cyclones from 1985-2004.

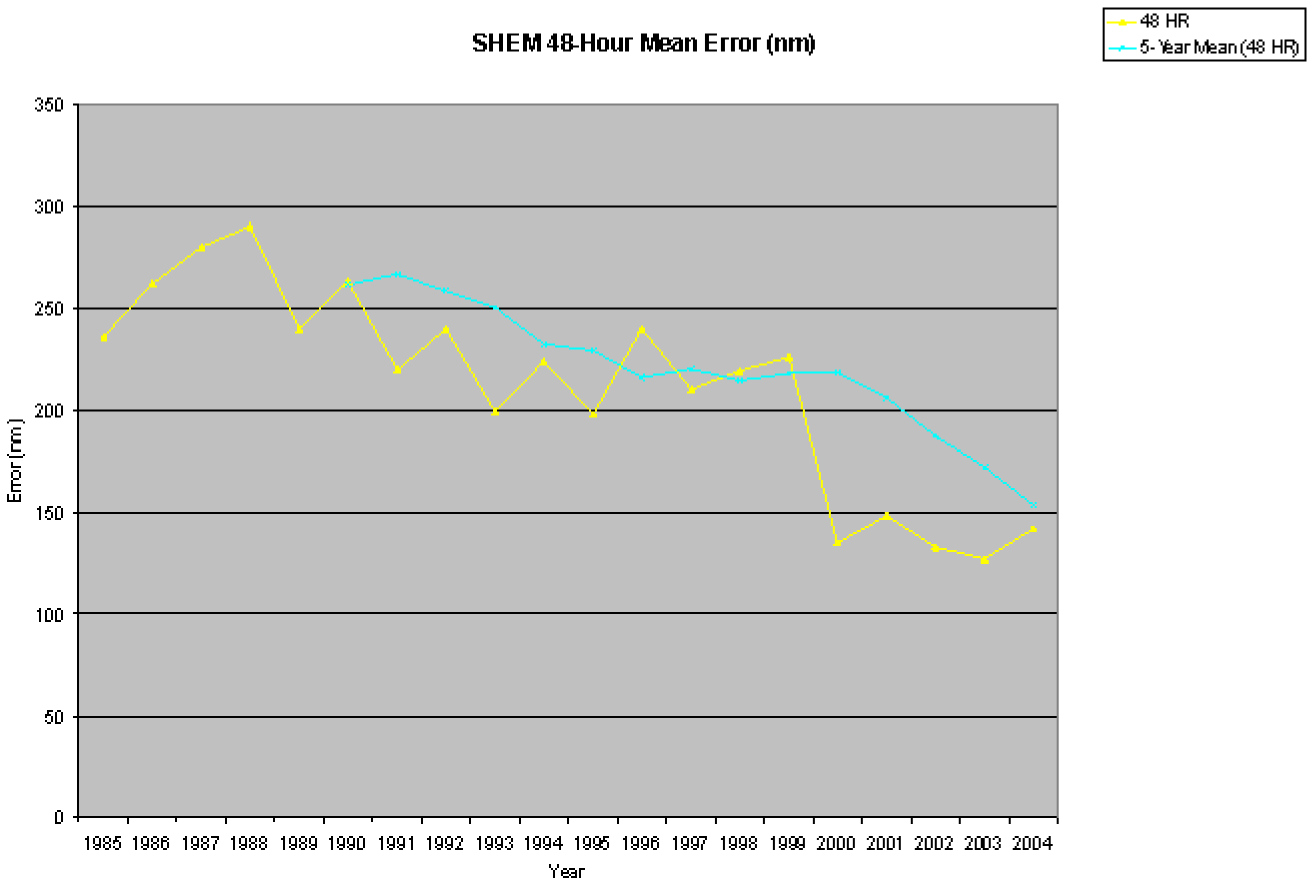


Figure 4-6c. Mean track forecast error (nm) and 5-year running mean for 48 hours for Southern Hemisphere (Africa to 180 degrees) tropical cyclones from 1985-2004.

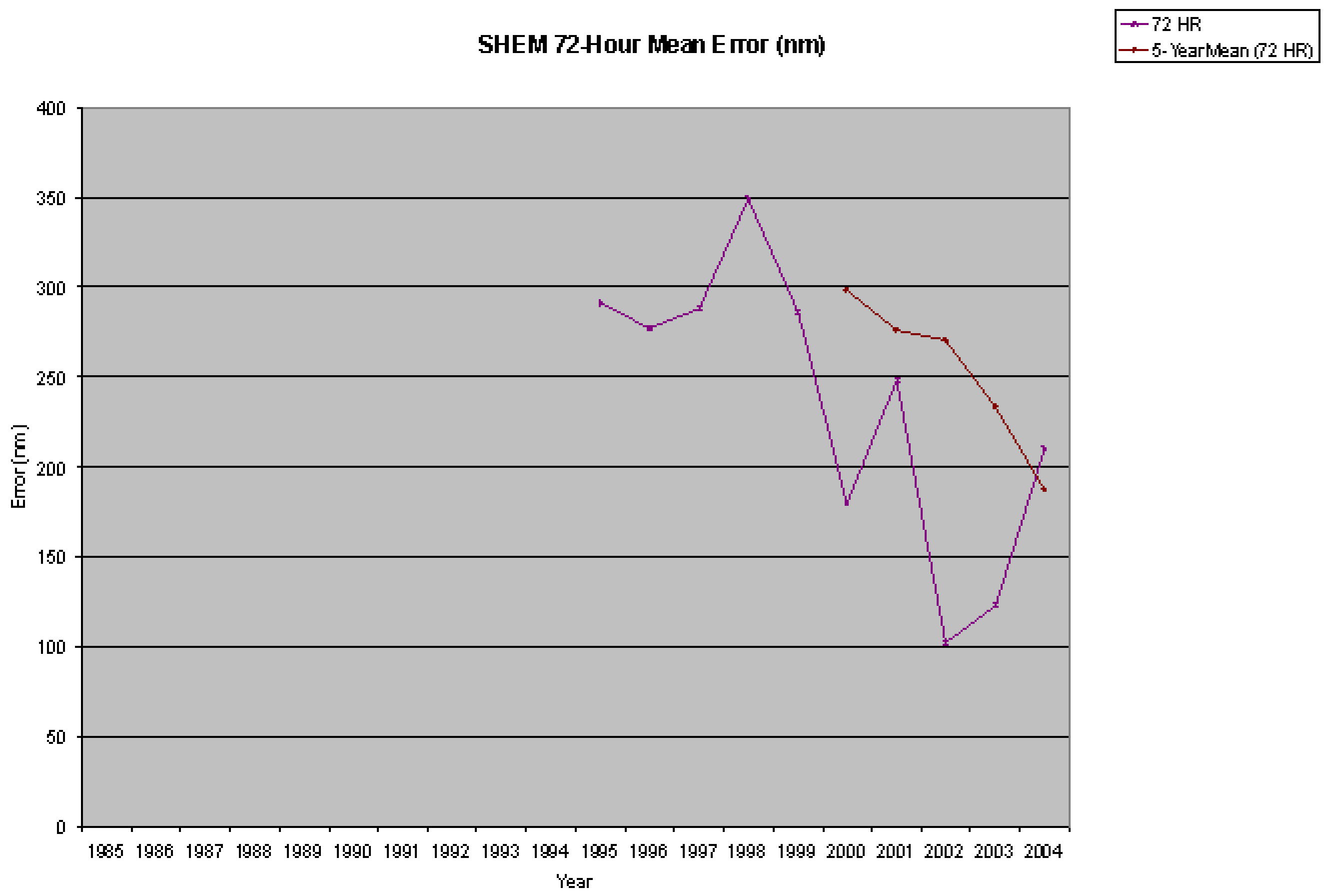


Figure 4-6d. Mean track forecast error (nm) at 72 hours for Southern Hemisphere (Africa to 180 degrees) tropical cyclones from 1995-2004.

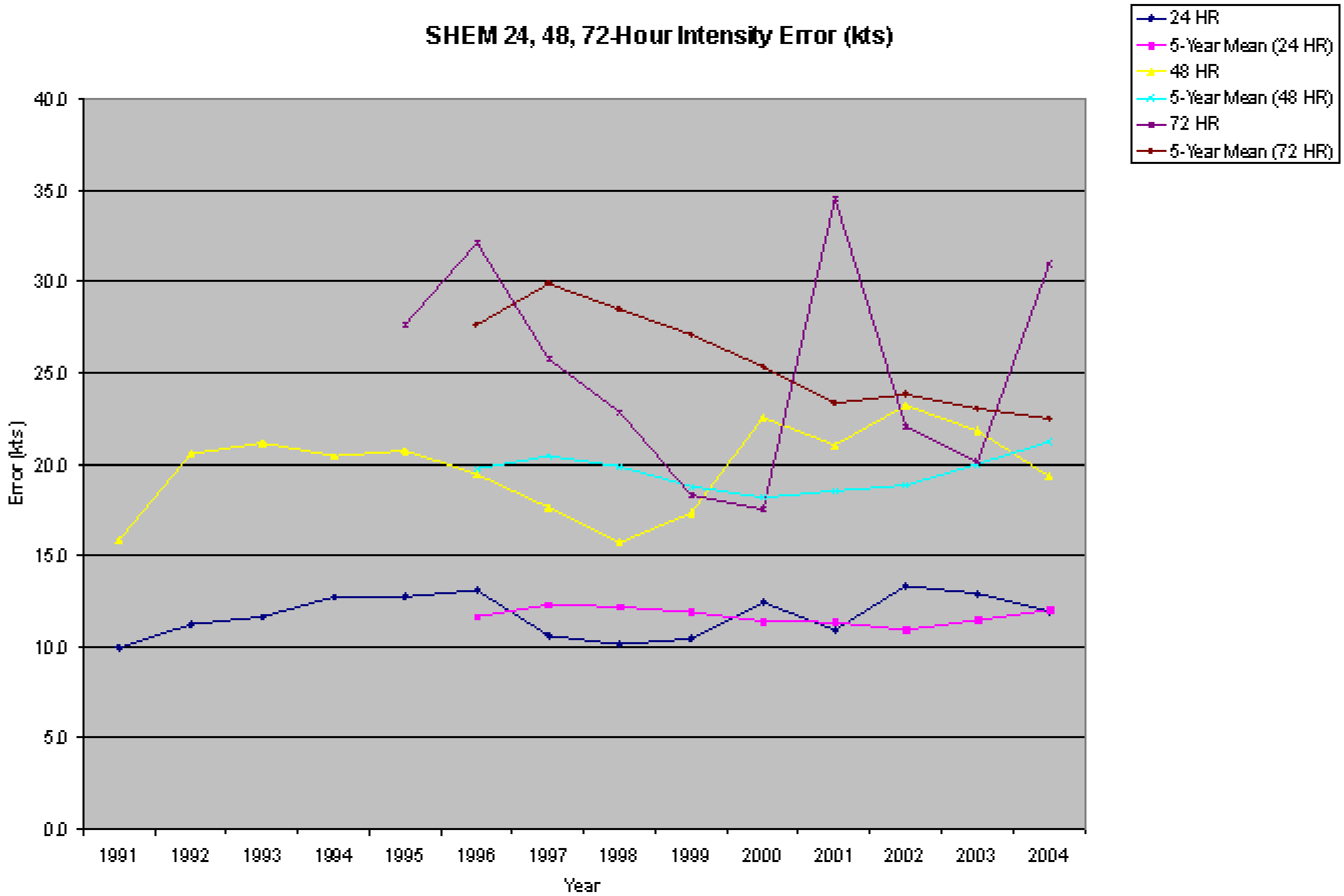


Figure 4-7a. Mean intensity forecast error (nm) and 5-year running mean for 24, 48 and 72 hours for Southern Hemisphere (Africa to 180 degrees) tropical cyclones from 1996-2004.

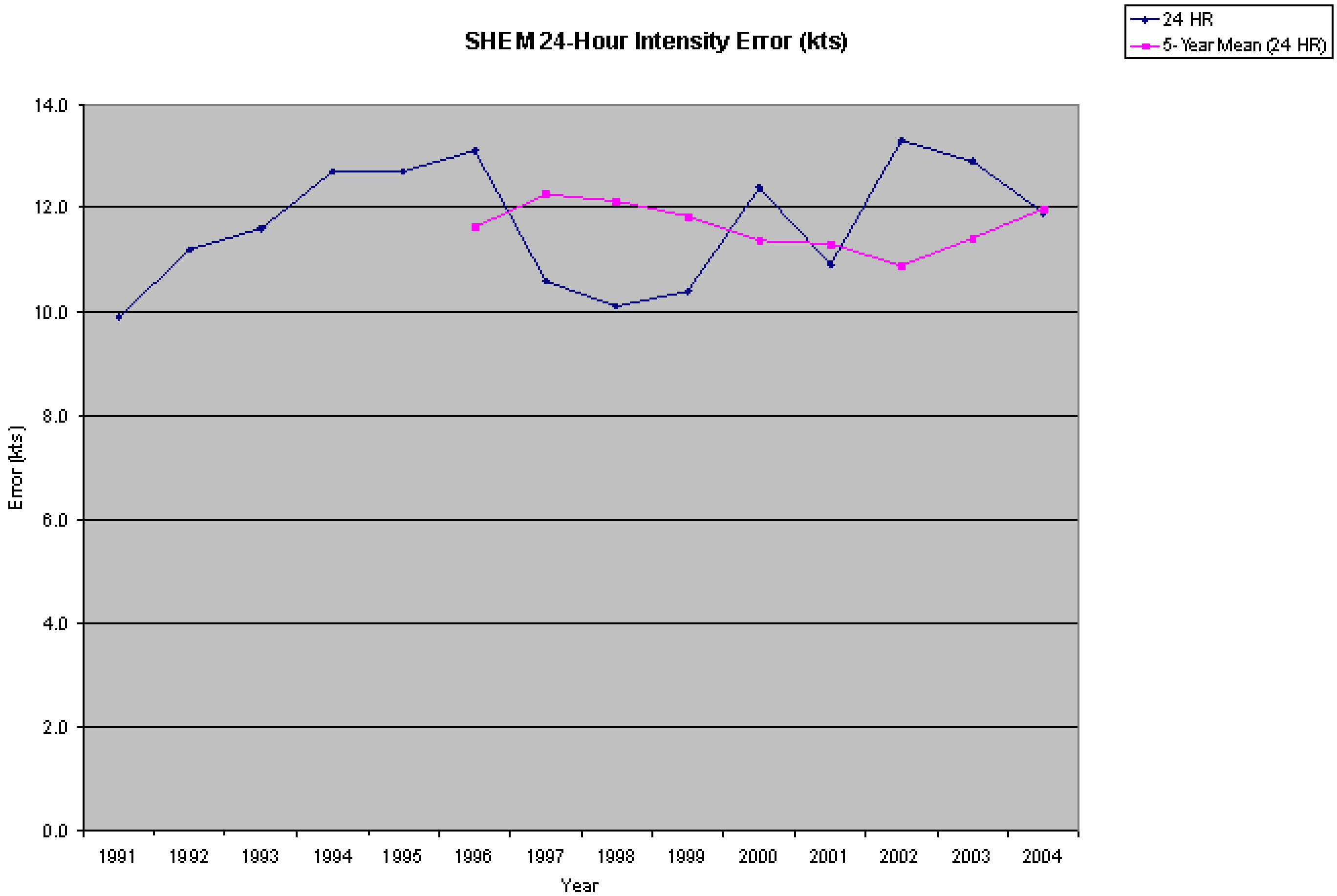


Figure 4-7b. Mean intensity forecast error (nm) and 5-year running mean for 24 hours for Southern Hemisphere (Africa to 180 degrees) tropical cyclones from 1996-2004.

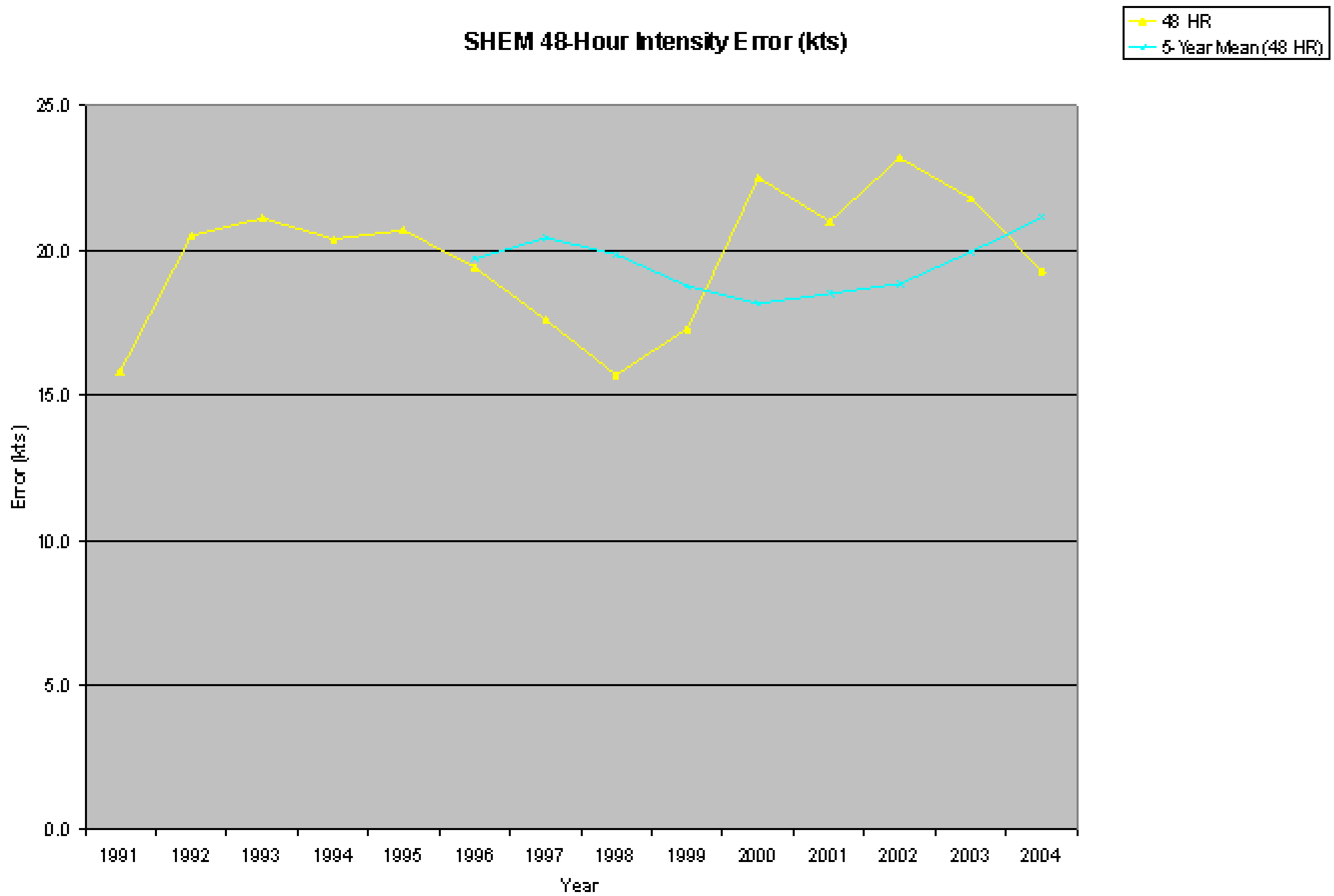


Figure 4-7c. Mean intensity forecast error (nm) and 5-year running mean for 48 hours for Southern Hemisphere (Africa to 180 degrees) tropical cyclones from 1996-2004.

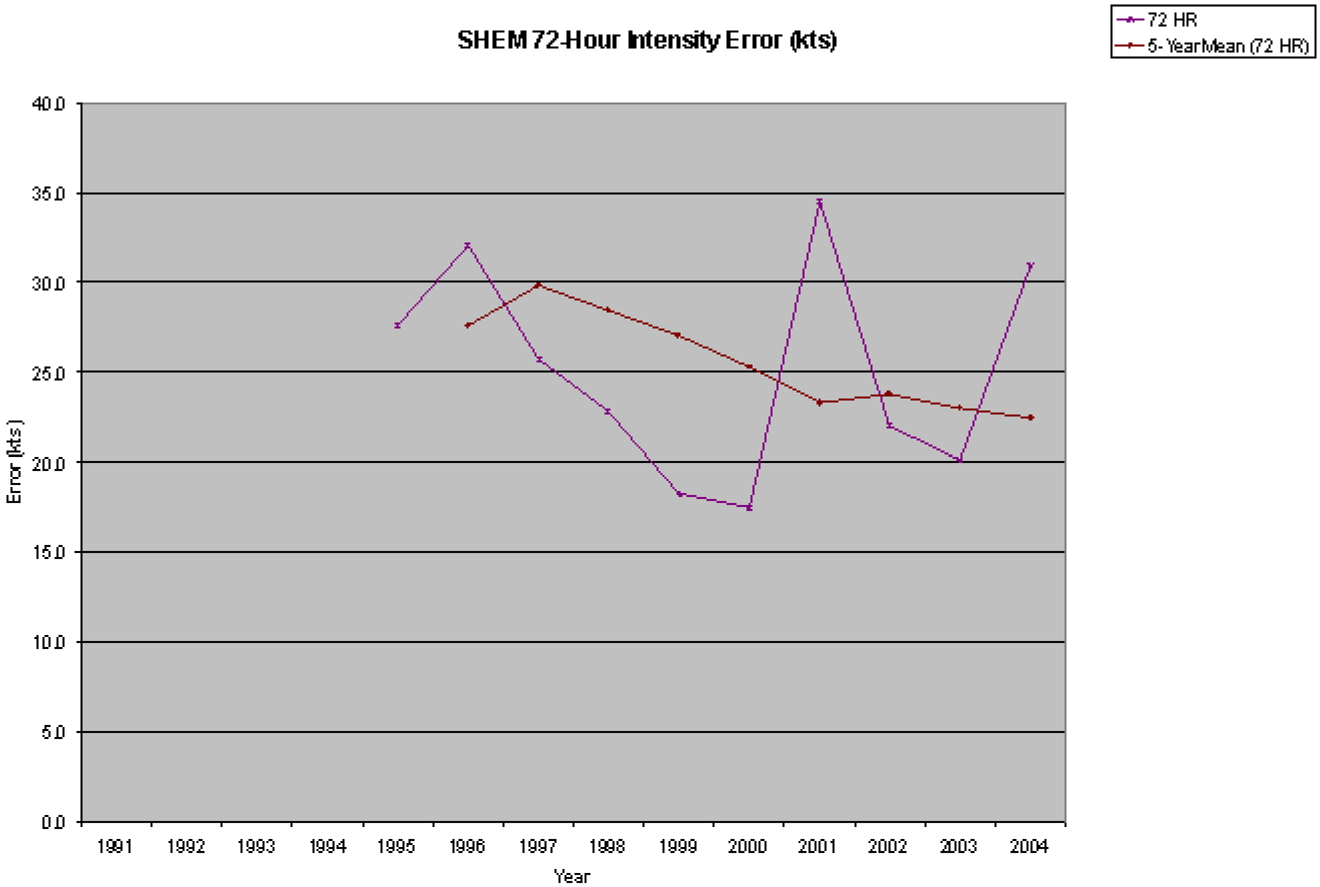


Figure 4-7d. Mean track forecast error (nm) and 5-year running mean for 72 hours for Southern Hemisphere (Africa to 180 degrees) tropical cyclones from 1996-2004.

4.2 TESTING AND RESULTS

A comparison of selected techniques is included in Table 4-4 for all western North Pacific tropical cyclones, Table 4-5 for North Indian Ocean tropical cyclones, and Table 4-6 for Southern Hemisphere tropical cyclones.

For example, in Table 4-4 for the homogeneous comparison of the 12-hour mean forecast error between JTWC and CONW, 804 cases were available. The average forecast error at 12 hours was 42 nm for CONW and 43 nm for JTWC. The difference of 1 nm is shown in the lower right. Due to computational round-off, differences are not always exact.

Table 4-4 Error Statistics for Selected Objective Techniques Western North Pacific Ocean

12-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		COWI		EGRI		GFNI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	815	43																						
	43	0																						
CONW	804	43	846	42																				
	42	-1	42	0																				
AFWI	555	41	556	39	556	54																		
	54	13	54	15	54	0																		
AVNI	723	42	724	41	539	53	724	45																
	45	3	45	4	43	-10	45	0																
COWI	689	40	699	40	511	52	661	43	699	49														
	49	9	49	9	48	-4	49	6	49	0														
EGRI	567	40	581	39	397	49	523	42	515	46	584	50												
	50	10	50	11	48	-1	48	6	48	2	50	0												
GFNI	686	41	693	40	526	53	668	43	629	47	497	48	693	51										
	50	14	53	0	55	-4	53	-29	50	-1	58	0	51	0										
JGSI	609	40	611	39	463	53	593	43	560	46	457	48	570	48	611	46								
	46	6	46	7	44	-9	44	1	43	-3	44	-4	44	-4	46	0								
JTYI	627	41	631	40	472	52	598	43	565	46	461	48	581	50	555	45	631	45						
	45	4	45	5	43	-9	44	1	43	-3	44	-4	43	-7	44	-1	45	0						
NGPI	772	42	803	42	552	53	722	45	698	49	563	49	687	50	605	45	620	45	803	50				

	49	7	50	8	47	-6	47	2	47	-2	46	-3	46	-4	44	-1	46	1	50	0				
TCLI	410	38	412	37	323	50	401	43	385	45	323	47	393	47	371	42	369	41	408	44	412	49		
	49	11	49	12	50	0	49	6	48	3	49	2	49	2	50	8	49	8	49	5	49	0		
WBAI	745	42	777	41	505	51	662	42	645	48	533	49	639	49	562	44	580	44	735	48	387	48	788	50
	50	8	50	9	47	-4	48	6	48	0	47	-2	47	-2	46	2	47	3	50	2	45	-3	50	0
24-HOUR MEAN FORECAST ERROR (NM)																								
	JTWC		CONW		AFWI		AVNI		COWI		EGRI		GFDI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	759	70																						
	70	0																						
CONW	748	69	790	68																				
	67	-2	68	0																				
AFWI	514	67	515	65	515	97																		
	96	29	97	32	97	0																		
AVNI	676	68	677	65	504	95	677	74																
	74	6	74	9	71	-24	74	0																
COWI	652	68	662	66	478	96	629	73	662	89														
	89	21	89	23	89	-7	89	16	89	0														
EGRI	546	66	560	65	381	93	505	71	500	87	563	88												
	87	21	88	23	87	-6	87	16	86	-1	88	0												
GFNI	638	65	645	63	489	95	626	72	596	86	480	86	645	85										
	84	19	85	22	84	-11	83	11	84	-2	82	-4	85	0										
JGSI	569	65	571	63	433	96	557	71	531	84	443	87	535	83	571	75								
	75	10	75	12	73	-23	75	4	73	-11	74	-13	73	-10	75	0								
JTYI	579	66	583	64	437	94	557	73	531	84	442	84	540	84	517	74	583	74						
	74	8	74	10	71	-23	71	-2	71	-13	73	-11	69	-15	72	-2	74	0						
NGPI	719	69	750	67	512	96	676	74	661	89	543	87	641	84	566	75	575	73	750	84				
	82	13	84	17	80	-16	80	6	81	-8	80	-7	77	-7	76	1	79	6	84	0				
TCLI	388	63	390	61	307	90	383	71	372	86	314	84	375	82	354	71	351	68	387	76	390	85		
	85	22	85	24	85	-5	85	14	85	-1	85	1	84	2	86	15	84	16	85	9	85	0		
WBAI	697	68	729	66	472	95	623	71	613	88	514	86	599	84	529	73	539	72	690	83	369	85	740	90
	89	21	90	24	87	-8	88	17	88	0	86	0	86	2	84	11	85	13	90	7	84	-1	90	0

36-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVNI		COWI		EGRI		GFNI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	699	93																						
	93	0																						
CONW	688	92	728	92																				
	91	-1	92	0																				
AFWI	464	91	465	88	465	141																		
	141	50	141	53	141	0																		
AVNI	619	91	620	88	455	139	620	101																
	100	9	101	13	96	-43	101	0																
COWI	605	92	615	90	437	141	583	100	615	132														
	132	40	132	42	134	-7	131	31	132	0														
EGRI	506	90	520	88	350	139	467	99	468	129	523	125												
	124	34	125	37	124	-15	125	26	124	-5	125	0												
GFNI	587	88	592	86	443	140	575	99	554	129	445	124	592	119										
	118	30	119	33	118	-22	116	17	118	-11	113	-11	119	0										
JGSI	526	89	526	86	396	140	515	97	497	125	412	127	497	117	526	103								
	103	14	103	17	101	-39	102	5	101	-24	101	-26	101	-16	103	0								
JTYI	529	90	531	88	394	139	508	101	492	126	408	120	493	117	475	101	531	105						
	105	15	105	17	100	-39	101	0	102	-24	101	-19	98	-19	101	0	105	0						
NGPI	662	92	692	91	463	141	620	101	615	132	504	124	590	113	507	110	564	167						
	101	-1	102	-15	107	-20	99	-70	93	-36	102	-6	102	-11	103	-7	107	-60						
TCLI	358	87	358	85	280	132	353	97	346	128	293	121	346	115	330	100	323	99	357	105	358	119		
	119	32	119	34	120	-12	119	22	118	-10	116	-5	119	4	119	19	117	18	119	14	119	0		
WBAI	644	91	673	90	428	140	572	97	569	131	479	123	551	119	490	101	493	102	638	113	341	119	684	129
	128	37	129	39	126	-14	126	29	128	-3	124	1	124	5	120	19	123	21	129	16	124	5	129	0

48-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AFWI		AVN1		COWI		EGRI		GFNI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	639	121																						
	121	0																						

CONW	628	119	667	118																				
	117	-2	118	0																				
AFWI	414	117	417	113	417	190																		
	190	73	190	77	190	0																		
AVNI	558	116	560	113	403	187	560	129																
	130	14	129	16	124	-63	129	0																
COWI	549	119	555	116	388	189	523	129	555	175														
	175	56	175	59	175	-14	172	43	175	0														
EGRI	460	116	476	113	318	189	424	126	426	176	477	159												
	159	43	159	46	157	-32	158	32	158	-18	159	0												
GFNI	520	114	525	112	389	189	509	127	491	171	398	160	525	154										
	153	39	154	42	151	-38	151	24	151	-20	145	-15	154	0										
JGSI	477	116	479	112	357	186	465	124	449	167	376	164	447	149	479	134								
	134	18	134	22	130	-56	132	8	134	-33	132	-32	132	-17	134	0								
JTYI	474	116	477	113	352	185	456	129	443	167	370	161	436	149	430	133	477	135						
	136	20	135	22	129	-56	132	3	134	-33	131	-30	129	-20	132	-1	135	0						
NGPI	603	119	631	117	415	189	560	129	555	175	461	159	523	153	476	134	472	135	631	143				
	142	23	143	26	136	-53	136	7	141	-34	136	-23	135	-18	132	-2	137	2	143	0				
TCLI	317	110	319	110	245	174	314	124	308	167	264	151	304	146	296	130	285	130	318	131	319	153		
	153	43	153	43	154	-20	153	29	151	-16	146	-5	152	6	152	22	148	18	152	21	153	0		
WBAI	587	117	616	116	382	189	516	125	513	174	438	159	490	155	445	134	441	134	581	144	303	153	627	170
	170	53	170	54	168	-21	167	42	169	-5	163	4	165	10	163	29	164	30	171	27	165	12	170	0
72-HOUR MEAN FORECAST ERROR (NM)																								
	JTWC		CONW		AFWI		AVNI		COWI		EGRI		GFNI		JGSI		JTYI		NGPI		TCLI		WBAI	
JTWC	529	172																						
	172	0																						
CONW	517	169	548	173																				
	171	2	173	0																				
AFWI	329	160	329	159	329	294																		
	294	134	294	135	294	0																		
AVNI	447	163	447	164	316	289	447	198																

	198	35	198	34	197	-92	198	0																
COWI	444	167	449	166	308	292	413	195	449	273														
	274	107	273	107	277	-15	267	72	273	0														
EGRI	362	161	375	157	243	268	331	180	335	269	376	226												
	224	63	226	69	219	-49	224	44	224	-45	226	0												
GFNI	415	159	415	162	304	293	395	195	385	270	309	225	415	216										
	216	57	216	54	207	-86	211	16	217	-53	199	-26	216	0										
JGSI	384	160	384	159	275	273	361	189	364	268	292	230	352	212	384	199								
	199	39	199	40	199	-74	201	12	200	-68	189	-41	200	-12	199	0								
JTYI	385	165	386	164	278	275	361	194	358	269	294	226	350	212	347	198	386	205						
	205	40	205	41	193	-82	202	8	203	-66	190	-36	201	-11	192	-6	205	0						
NGPI	493	167	512	168	328	293	446	198	448	273	366	225	414	214	381	200	381	204	512	203				
	202	35	203	35	192	-101	193	-5	203	-70	191	-34	190	-24	191	-9	195	-9	203	0				
TCLI	241	145	241	148	191	244	233	184	234	257	202	216	229	206	229	203	221	195	241	179	241	232		
	232	87	232	84	233	-11	233	49	233	-24	219	3	233	27	230	27	232	37	232	53	232	0		
WBAI	479	166	500	170	297	283	405	189	410	267	341	225	381	216	353	199	351	203	465	203	225	230	514	265
	265	99	265	95	263	-20	263	74	258	-9	249	24	263	47	254	55	255	52	265	62	244	14	265	0

96-HOUR MEAN FORECAST ERROR (NM)

	JTWC		CONW		AVNI		EGRI		GFNI		NGPI													
JTWC	348	218																						
	218	0																						
CONW	343	216	405	231																				
	221	5	231	0																				
AVNI	309	207	334	219	337	242																		
	228	21	241	22	242	0																		
EGRI	250	214	278	212	237	221	279	280																
	286	72	280	68	288	67	280	0																
GFNI	293	211	304	220	280	226	219	291	304	286														
	285	74	286	66	277	51	289	-2	286	0														
NGPI	339	214	391	226	335	239	270	281	302	283	404	280												
	261	47	272	46	263	24	260	-21	257	-26	280	0												>

120-HOUR MEAN FORECAST ERROR (NM)																								
	JTWC		CONW		AVNI		EGRI		GFNI		NGPI													
JTWC	261	296																						
	296	0																						
CONW	254	287	301	289																				
	287	0	289	0																				
AVNI	221	277	242	272	245	287																		
	277	0	280	8	287	0																		
EGRI	182	272	206	272	167	259	207	358																
	367	95	359	87	362	103	358	0																
GFNI	215	284	229	282	206	279	156	360	229	399														
	402	118	399	117	388	109	396	36	399	0														
NGPI	255	291	294	287	240	280	200	362	229	399	305	369												
	358	67	354	67	335	55	347	-15	350	-49	369	0												

Table 4-5 Error Statistics for Selected Objective Techniques

North Indian Ocean

12-HOUR MEAN FORECAST ERROR (NM)																
	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		CLIP		CONU	
JTWC	38	58														
	58	0														
NGPS	35	58	63	78												
	67	9	78	0												
EGRR	11	54	27	82	29	92										
	68	14	87	5	92	0										
AFW1	7	65	21	71	18	79	22	72								
	59	-6	75	4	74	-5	72	0								
GFDN	18	55	22	69	0	0	0	0	22	63						
	62	7	63	-6	0	0	0	0	63	0						

JAVN	0	0	1	130	1	224	0	0	0	0	1	155				
	0	0	155	25	155	-69	0	0	0	0	155	0				
CLIP	38	58	61	76	28	91	21	70	22	63	1	155	73	72		
	70	12	72	-4	74	-17	81	11	61	-2	121	-34	72	0		
CONW	17	60	24	78	11	62	8	58	7	56	0	0	27	71	27	68
	59	-1	69	-9	70	8	72	14	36	-20	0	0	68	-3	68	0

24-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		CLIP		CONU	
JTWC	36	107														
	107	0														
NGPS	32	106	57	112												
	105	-1	112	0												
EGRR	11	96	27	116	29	120										
	108	12	120	4	120	0										
AFW1	7	128	19	100	18	121	20	103								
	108	-20	98	-2	104	-17	103	0								
GFDN	15	100	18	84	0	0	0	0	19	108						
	108	8	108	24	0	0	0	0	108	0						
JAVN	0	0	1	107	1	220	0	0	0	0	1	114				
	0	0	114	7	114	-106	0	0	0	0	114	0				
CLIP	36	107	55	109	28	119	19	104	19	108	1	114	69	134		
	142	35	134	25	133	14	161	57	128	20	123	9	134	0		
CONW	16	116	22	126	11	75	7	108	5	87	0	0	25	135	25	129
	124	8	129	3	130	55	137	29	76	-11	0	0	129	-6	129	0

36-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		CLIP		CONU	
JTWC	33	154														
	154	0														
NGPS	30	154	54	148												
	145	-9	148	0												

EGRR	11	144	26	148	27	160										
	141	-3	160	12	160	0										
AFW1	7	188	18	145	16	169	18	128								
	166	-22	128	-17	129	-40	128	0								
GFDN	14	140	17	111	0	0	0	0	18	153						
	164	24	155	44	0	0	0	0	153	0						
JAVN	0	0	1	118	1	167	0	0	0	0	1	110				
	0	0	110	-8	110	-57	0	0	0	0	110	0				
CLIP	33	154	52	144	26	160	17	135	18	153	1	110	65	192		
	210	56	196	52	197	37	244	109	186	33	108	-2	192	0		
CONW	15	180	20	170	10	130	6	176	4	139	0	0	23	206	23	195
	190	10	195	25	200	70	217	41	119	-20	0	0	195	-11	195	0

48-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		CLIP		CONU	
JTWC	30	192														
	192	0														
NGPS	28	196	51	191												
	188	-8	191	0												
EGRR	11	190	24	184	25	184										
	162	-28	188	4	184	0										
AFW1	6	223	16	180	14	208	16	184								
	175	-48	184	4	185	-23	184	0								
GFDN	13	180	16	157	0	0	0	0	16	199						
	210	30	199	42	0	0	0	0	199	0						
JAVN	0	0	1	124	1	43	0	0	0	0	1	124				
	0	0	124	0	124	81	0	0	0	0	124	0				
CLIP	30	192	50	185	25	184	16	184	16	199	1	124	62	260		
	280	88	264	79	264	80	334	150	267	68	77	-47	260	0		
CONW	12	223	18	229	9	181	5	228	3	172	0	0	21	295	21	263
	234	11	263	34	249	68	308	80	185	13	0	0	263	-32	263	0

72-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		CLIP		CONU	
JTWC	6	338														
	338	0														
NGPS	5	348	43	278												
	417	69	278	0												
EGRR	0	0	14	222	16	224										
	0	0	239	17	224	0										
AFW1	2	349	13	299	7	293	13	195								
	95 -	254	195	-104	262	-31	195	0								
GFDN	2	292	14	243	0	0	0	0	14	283						
	384	92	283	40	0	0	0	0	283	0						
JAVN	0	0	1	270	1	145	0	0	0	0	1	276				
	0	0	276	6	276	131	0	0	0	0	276	0				
CLIP	6	338	42	276	16	224	13	195	14	283	1	276	54	416		
	610	272	425	149	349	125	536	341	386	103	229	-47	416	0		
CONW	6	338	13	390	2	195	4	85	2	384	0	0	16	593	16	453
	411	73	461	71	270	75	650	565	369	-15	0	0	453	-140	453	0

Table 4-6

Error Statistics for Selected Objective Techniques Southern Hemisphere

12-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		TCLP		TLAP		CLIP		CONW	
JTWC	311	45																		
	45	0																		
NGPS	283	43	563	63																
	54	11	63	0																
EGRR	162	40	253	58	302	80														
	54	14	75	17	80	0														

AFW1	124	37	167	48	167	54	179	108												
	100	63	104	56	103	49	108	0												
GFDN	100	47	211	53	3	1568	0	0	214	48										
	51	4	47	-6	66	-1502	0	0	48	0										
JAVN	230	43	418	62	162	83	107	115	195	47	523	89								
	74	31	78	16	76	-7	73	-42	67	20	89	0								
TCLP	61	38	82	50	81	53	65	107	1	30	53	75	87	79						
	78	40	79	29	81	28	81	-26	104	74	91	16	79	0						
TLAP	62	38	84	50	84	53	68	107	1	30	52	74	77	80	89	137				
	137	99	138	88	139	86	144	37	76	46	138	64	128	48	137	0				
CLIP	309	45	555	63	286	78	174	105	212	48	484	84	86	79	88	137	690	191		
	124	79	157	94	133	55	72	-33	114	66	187	103	128	49	118	-19	191	0		
CONW	8	41	12	67	7	94	5	228	3	17	15	159	3	45	3	163	17	123	17	51
	48	7	56	-11	45	-49	58	-170	35	18	52 -	107	61	16	61	-102	51	-72	51	0

24-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		TCLP		TLAP		CLIP		CONW	
JTWC	278	74																		
	74	0																		
NGPS	258	73	526	95																
	82	9	95	0																
EGRR	150	65	239	90	287	111														
	87	22	108	18	111	0														
AFW1	115	63	156	79	156	87	168	134												
	120	57	128	49	128	41	134	0												
GFDN	92	83	195	83	3	1606	0	0	198	78										
	87	4	78	-5	132	-1474	0	0	78	0										
JAVN	209	72	386	94	155	109	101	138	181	79	489	127								
	105	33	115	21	112	3	101	-37	100	21	127	0								
TCLP	58	65	76	81	76	83	58	122	1	6	50	110	81	123						
	115	50	122	41	127	44	110	-12	39	33	129	19	123	0						

TLAP	58	64	77	80	78	83	61	123	1	6	48	101	71	123	82	192				
	188	124	185	105	196	113	194	71	30	24	224	123	182	59	192	0				
CLIP	276	75	518	95	271	110	163	129	196	78	452	121	80	122	81	193	646	240		
	172	97	207	112	180	70	120	-9	160	82	226	105	183	61	172	-21	240	0		
CONW	7	79	10	99	7	140	4	260	3	18	13	236	2	37	2	635	15	234	15	82
	83	4	89	-10	80	-60	84	-176	54	36	83 -	153	78	41	78	-557	82	-152	82	0

36-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		TCLP		TLAP		CLIP		CONW	
JTWC	250	101																		
	101	0																		
NGPS	232	99	484	127																
	110	11	127	0																
EGRR	134	89	217	123	262	126														
	119	30	122	-1	126	0														
AFW1	100	86	137	112	135	119	148	165												
	146	60	157	45	157	38	165	0												
GFDN	81	111	177	114	1	230	0	0	179	109										
	121	10	109	-5	18	-212	0	0	109	0										
JAVN	186	102	347	123	138	111	89	158	160	110	444	162								
	133	31	149	26	149	38	142	-16	120	10	162	0								
TCLP	53	94	69	116	67	115	51	146	1	12	44	162	73	152						
	148	54	153	37	157	42	148	2	18	6	158	-4	152	0						
TLAP	53	89	70	111	69	116	53	139	1	12	44	160	63	149	74	244				
	239	150	237	126	248	132	235	96	55	43	300	140	216	67	244	0				
CLIP	249	101	479	127	247	125	143	159	179	109	412	153	72	152	73	245	602	332		
	232	131	295	168	249	124	170	11	220	111	323	170	236	84	218	-27	332	0		
CONW	6	122	8	146	6	182	3	267	3	29	10	262	2	73	2	646	13	338	13	120
	117	-5	131	-15	109	-73	115	-152	80	51	120 -	142	141	68	141	-505	120	-218	120	0

48-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		TCLP		TLAP		CLIP		CONW	
JTWC	220	128																		
	128	0																		
NGPS	204	124	441	156																
	137	13	156	0																
EGRR	121	114	196	152	238	160														
	150	36	155	3	160	0														
AFW1	86	117	116	140	116	144	127	212												
	183	66	203	63	197	53	212	0												
GFDN	69	135	157	147	2	288	0	0	159	142										
	149	14	142	-5	78	-210	0	0	142	0										
JAVN	164	131	315	155	125	143	79	200	144	141	408	198								
	162	31	184	29	178	35	176	-24	157	16	198	0								
TCLP	49	115	61	151	60	143	45	175	1	12	38	172	65	185						
	184	69	187	36	188	45	170	-5	24	12	209	37	185	0						
TLAP	48	110	59	138	58	136	44	164	1	12	36	169	56	180	63	289				
	289	179	284	146	284	148	267	103	110	98	357	188	290	110	289	0				
CLIP	219	128	435	156	224	160	122	205	159	142	379	191	64	185	62	291	552	450		
	277	149	390	234	325	165	225	20	274	132	447	256	280	95	266	-25	450	0		
CONW	5	148	6	164	5	276	2	472	3	55	8	319	1	67	1	901	11	572	11	148
	157	9	151	-13	134	-142	102	-370	116	61	143 -	176	84	17	84	-817	148	-424	148	0

72-HOUR MEAN FORECAST ERROR (NM)

	JTWC		NGPS		EGRR		AFW1		GFDN		JAVN		TCLP		TLAP		CLIP		CONW	
JTWC	37	123																		
	123	0																		
NGPS	37	123	357	222																
	135	12	222	0																
EGRR	17	113	152	223	194	212														
	170	57	203	-20	212	0														
AFW1	8	91	83	219	84	197	93	290												
	107	16	278	59	274	77	290	0												

GFDN	15	132	123	201	1	581	0	0	125	220										
	207	75	219	18	98	-483	0	0	220	0										
JAVN	32	130	249	214	102	192	57	274	111	223	334	260								
	206	76	240	26	234	42	230	-44	211	-12	260	0								
TCLP	10	91	48	235	47	200	34	225	1	57	28	250	50	216						
	171	80	211	-24	214	14	172	-53	86	29	232	-18	216	0						
TLAP	9	86	46	209	45	202	33	204	1	57	28	224	44	218	48	336				
	219	133	337	128	342	140	262	58	142	85	402	178	331	113	336	0				
CLIP	37	123	350	221	181	210	88	280	124	222	308	252	48	218	46	337	459	633		
	248	125	541	320	464	254	332	52	342	120	590	338	386	168	365	28	633	0		
CONW	0	0	3	142	3	473	0	0	2	67	4	412	0	0	0	0	6	1048	7	219
	0	0	190	48	214	-259	0	0	187	120	196 -	216	0	0	0	0	225	-823	219	0

96-HOUR MEAN FORECAST ERROR (NM)

	NGPS		EGRR		JAVN		TCLP		TLAP											
NGPS	274	288																		
	288	0																		
EGRR	106	283	141	260																
	243	-40	260	0																
JAVN	186	282	74	244	259	327														
	303	21	293	49	327	0														
TCLP	0	0	0	0	0	0	1	303												
	0	0	0	0	0	0	303	0												
TLAP	0	0	0	0	0	0	1	303	1	334										
	0	0	0	0	0	0	334	31	334	0										

120-HOUR MEAN FORECAST ERROR (NM)

	NGPS		EGRR		JAVN		TCLP		TLAP											
NGPS	206	347																		
	347	0																		
EGRR	69	340	90	260																

	274	-66	260	0																
JAVN	130	348	48	268	176	384														
	362	14	361	93	384	0														
TCLP	0	0	0	0	0	0	1	459												
	0	0	0	0	0	0	459	0												
TLAP	0	0	0	0	0	0	1	459	1	463										
	0	0	0	0	0	0	463	4	463	0										