

**Supplemental Table. 3** RMSE<sub>EOF</sub> values of the pairwise model comparison as shown in Fig. 11.

Model Name	North Pacific		Tropical Indo-Pacific		North Atlantic		Tropical Atlantic		Southern Ocean		Global Summary	
	High-pass	Low-pass	High-pass	Low-pass	High-pass	Low-pass	High-pass	Low-pass	High-pass	Low-pass	High-pass	Low-pass
<b>CMIP3</b>												
BCCR-BCM2.0	41.3	60.7	34.7	47.8	29.7	66.3	27.2	32.4	41.2	65.7	34.8	54.6
CGCM3.1 (T47)	26.1	39.4	52.3	30.8	23.9	52.2	29.7	31.8	34.9	55.5	33.4	42.0
CGCM3.1 (T63)	29.5	49.1	53.5	32.8	27.3	51.5	28.8	27.3	41.8	56.3	36.2	43.4
CNRM-CM3	31.2	48.6	74.6	33.7	29.6	60.4	27.1	26.2	50.1	74.2	42.5	48.6
CSIRO-Mk3.0	31.2	59.4	34.1	41.5	62.4	65.1	30.9	46.2	40.8	71.0	39.9	56.6
CSIRO-Mk3.5	28.0	48.6	37.1	33.9	40.8	67.3	25.3	29.3	46.0	67.0	35.4	49.2
GFDL-CM2.0	34.4	56.6	35.7	36.7	44.6	68.0	26.8	54.8	35.5	61.0	35.4	55.4
GFDL-CM2.1	22.7	51.0	56.8	41.9	28.6	55.3	25.9	28.6	26.5	62.6	32.1	47.9
GISS-AOM	28.1	59.8	77.7	63.1	29.1	62.6	38.5	40.9	54.5	72.1	45.6	59.7
GISS-EH	37.6	76.9	58.9	41.8	39.5	71.5	35.8	36.2	40.6	75.8	42.5	60.4
GISS-ER	31.9	63.7	72.9	63.4	33.8	67.1	30.7	29.2	33.2	73.9	40.5	59.5
FGOALS-g1.0	41.6	54.2	129.4	29.9	29.8	57.7	35.8	30.8	35.1	63.0	54.3	47.1
INGV-SXG	24.9	48.2	35.5	32.8	32.4	67.5	29.0	33.8	48.8	60.0	34.1	48.5
INM-CM3.0	28.3	51.8	37.5	36.3	39.7	65.1	31.2	38.1	51.4	64.3	37.6	51.1
IPSL-CM4	29.2	62.3	46.3	29.6	26.2	55.9	27.7	44.0	42.2	72.4	34.3	52.8
MIROC3.2 (hires)	38.0	72.9	65.4	41.1	29.6	53.2	30.7	26.8	43.4	73.7	41.5	53.5
MIROC3.2 (medres)	28.6	45.9	46.6	39.9	28.6	61.0	24.6	30.3	34.0	65.6	32.5	48.5
ECHAM5/MPI-OM	28.6	46.0	58.6	30.3	43.9	73.7	28.4	39.6	49.3	76.9	41.8	53.3
MRI-CGCM2.3.2	26.2	44.8	31.7	35.1	29.7	54.2	28.4	35.8	42.0	63.9	31.6	46.8
CCSM3	27.7	51.3	39.5	50.1	35.7	58.4	29.8	37.7	37.3	64.4	34.0	52.4
PCM	28.1	55.3	44.6	47.1	39.7	69.5	39.9	49.8	44.2	74.2	39.3	59.2
UKMO-HadCM3	42.2	52.3	34.8	35.9	46.9	64.2	34.8	49.3	48.5	72.0	41.5	54.8
UKMO-HadGEM1	39.9	63.8	56.0	42.1	33.4	57.3	36.6	46.1	38.9	71.9	41.0	56.2
<b>CMIP5</b>												
ACCESS1.0	26.9	64.3	35.7	53.2	33.0	59.5	30.3	29.6	30.1	71.7	31.2	55.7
BCC-CSM1.1	31.3	54.3	40.7	49.4	44.6	71.1	29.9	31.8	26.3	56.8	34.6	52.7
CCSM4	23.5	45.6	51.0	37.7	23.9	49.9	27.1	28.6	44.4	54.6	34.0	43.3
CNRM-CM5	27.3	51.1	35.3	40.4	25.7	50.9	26.7	37.1	30.5	64.8	29.1	48.9
CanESM2	23.0	39.1	48.6	28.6	36.1	57.1	27.0	29.2	32.1	59.7	33.4	42.7
GFDL-CM3	21.9	54.6	41.8	35.4	31.4	59.1	25.0	25.8	25.8	54.8	29.2	45.9
GFDL-ESM2G	34.8	45.7	38.5	35.6	30.1	50.2	26.8	29.9	31.2	69.6	32.3	46.2
GFDL-ESM2M	25.8	45.3	47.0	40.3	33.1	66.7	29.2	36.9	27.8	66.3	32.6	51.1
GISS-E2-H	25.7	58.4	33.6	56.5	25.5	61.7	32.0	29.3	38.9	72.5	31.2	55.7
GISS-E2-R	28.8	55.2	32.9	43.5	23.2	61.7	33.8	36.3	26.9	64.3	29.2	52.2
HadCM3	45.2	59.7	34.9	33.6	46.9	57.3	35.5	42.0	45.9	65.5	41.7	51.6
HadGEM2-CC	32.4	54.3	39.3	34.9	31.1	50.1	35.4	39.4	33.4	61.9	34.3	48.1
HadGEM2-ES	33.4	56.9	47.2	32.9	31.1	52.6	39.2	40.7	35.1	67.3	37.2	50.1
INM-CM4	34.8	52.9	43.9	44.1	48.9	63.6	47.9	50.2	61.5	73.0	47.4	56.8
IPSL-CM5A-LR	24.7	49.4	39.1	30.1	23.4	50.2	29.6	25.1	37.3	62.6	30.8	43.5
IPSL-CM5A-MR	24.2	43.1	34.6	28.3	25.0	56.2	27.9	33.9	27.9	68.5	27.9	46.0
IPSL-CM5B-LR	31.0	63.7	38.7	43.8	24.2	62.8	35.3	40.5	41.9	74.2	34.2	57.0
MIROC5	25.7	58.2	39.7	31.4	25.7	54.1	23.0	33.4	32.3	63.0	29.3	48.0
MPI-ESM-LR	39.5	61.5	39.2	31.1	45.8	72.3	33.9	32.2	54.7	81.3	42.6	55.7
MPI-ESM-P	35.3	52.6	34.9	34.5	43.3	65.9	32.1	36.8	53.4	76.1	39.8	53.2
MRI-CGCM3	27.0	59.9	41.8	42.3	47.3	59.2	34.9	42.6	32.2	68.2	36.6	54.5
NorESM1-M	24.6	49.0	41.7	31.7	23.9	61.1	32.0	26.0	40.1	65.0	32.5	46.5
NorESM1-ME	25.9	49.7	40.5	39.8	27.0	61.6	32.4	31.8	43.4	58.3	33.8	48.2