

## SI Guide:

### Supplementary Data S1 (.xls)

This file contains the following tabs:

README

- |                         |                                    |
|-------------------------|------------------------------------|
| 1 - Meta Data Ice Cores |                                    |
| 2 - NEEM-2011-S1 Be-10  | 10Be results NEEM-2011-S1 (Fig. 1) |
| 3 - NGRIP Be-10         | 10Be results NGRIP (Fig. 1)        |
| 4 - WDC Be-10           | 10Be results WDC (Fig. 1)          |
| 5 - TUNU2013 Be-10      | 10Be results TUNU2013 (Fig. 1)     |

### Supplementary Data S2 (.pdf)

This file contains the following three tables:

Historical documentary evidence of volcanism in 79, 536-37, 626-627, 939 CE

Historical documentary evidence of volcanic dust veils, pre-536 CE

Monte Carlo equal means test of association between NEEM volcanic events and historical validation points

### Supplementary Data S3 (.xls)

This file contains the following tabs:

README

- |                                 |   |
|---------------------------------|---|
| 1 - NEEM2011S1_layer_count      | High-resolution data used for annual layer counting |
| 2 - NEEMSC_layer_count          | High-resolution data used for annual layer counting |
| 3 - NEEM_CFA_layer_count        | High-resolution data used for annual layer counting |
| 4 - NEEM_2011_S1_annual_nssS    | Sulfur record NEEM-2011-S1                          |
| 5 - NEEMSC_annual_nssS and S    | Sulfur records NEEM                                 |
| 6 - NEEM_annual_combined        | Sulfur record NEEM-2011-S1/NEEM (Fig. 2)            |
| 7 - NEEM2011S1_monthly_nssS     | Sulfur record (monthly) NEEM-2011-S1 (Fig. 5)       |
| 8 - NEEM_5cm_discreteBAS        | Sulfur record (5 cm) NEEM (Fig. 5)                  |
| 9 - Tunu2013_Volcanic_Tiepoints | Volcanic synchronization results for TUNU2013       |
| 10 - Tunu2013_annual_nssS       | Sulfur record TUNU2013 (Fig. 5)                     |
| 11 - NGRIP_Volcanic_Tiepoints   | Volcanic synchronization results for NGRIP          |
| 12 - NGRIP_5cm_discrete         | Sulfur record (5 cm) NGRIP                          |

### Supplementary Data S4 (.xls)

This file contains the following tabs:

README

- |                             |  |
|-----------------------------|--|
| 1 - WDC06A_layer_count      | High-resolution data used for annual layer counting          |
| 2 - WDC06A_annual_nssS      | Sulfur record WDC (Fig. 2)                                   |
| 3 - WDC06A_monthly_nssS     | Sulfur record (monthly) WDC (Fig. 5)                         |
| 4 - B40_Volcanic_Tie_Points | Volcanic synchronization results for B40                     |
| 5 - B40_annual_nssS         | Sulfur record B40 (Fig. 5)                                   |
| 6 - AVS2k_database_annual   | Sulfur records for 21 ice cores in Antarctica                |
| 7 - AVS2k_database_events   | Volcanic sulfate deposition for five ice cores in Antarctica |
| 8 - AVS2k_composite         | Stacked volcanic sulfate deposition in Antarctica            |

**Supplementary Data S5 (.xls)**

This file contains the following tabs:

README

1 - Volcanic\_Forcing

Reconstructed volcanic forcing (Fig. 3)

2 - Volcanic\_Forcing\_Methods

Methods used for the reconstruction

3 - NEEM2011S1\_Tephra

Tephra results for NEEM-2011-S1 (Extended Data Fig. 5)