**The influence of orbital forcing on 10Be deposition in Greenland over the glacial period**

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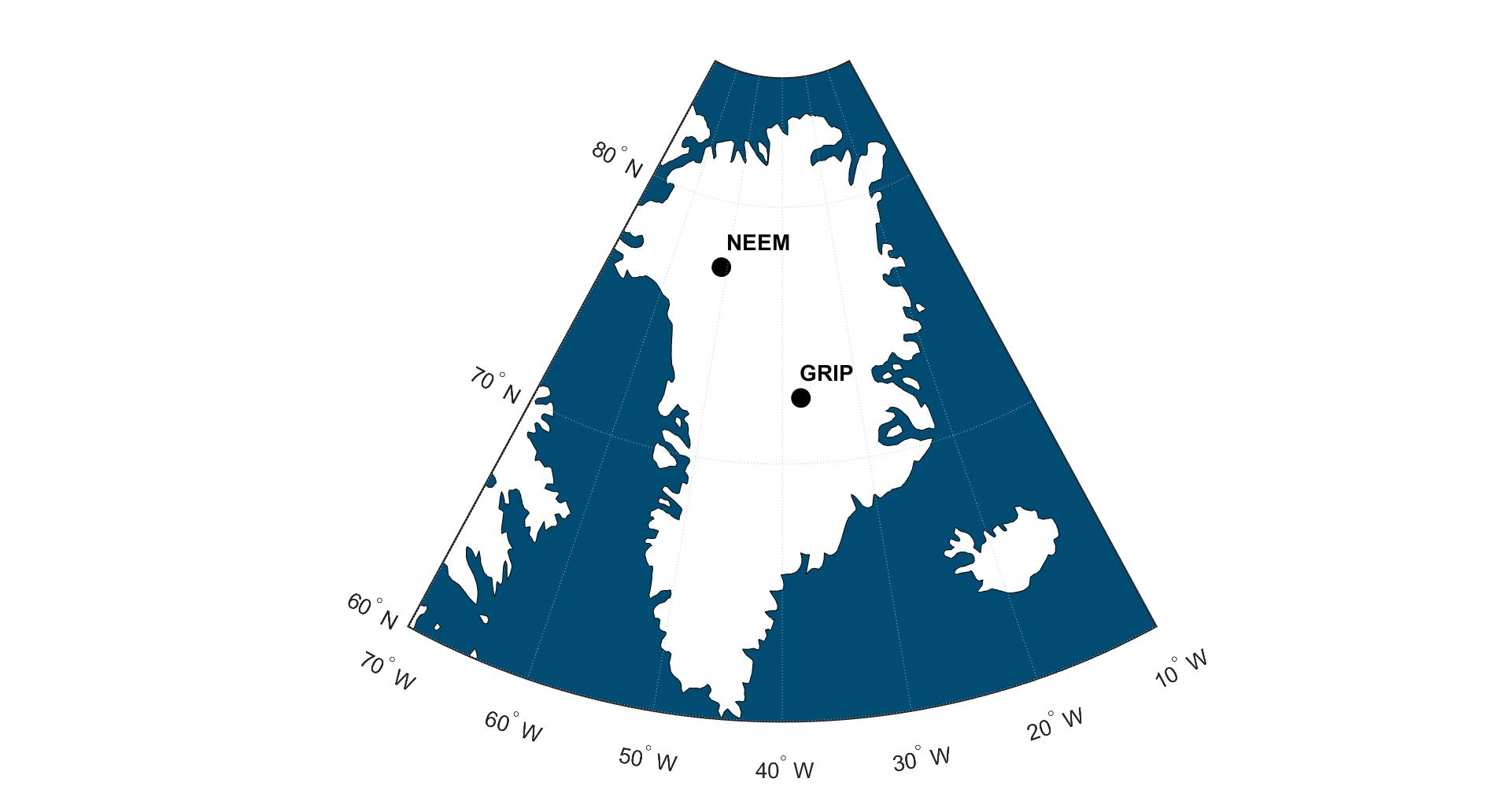
**File content**

Figures S1-S10

图表, 折线图

描述已自动生成

**Fig. S1.** Variations of the three components of Milankovitch orbital forcing cycles in the glacial period; eccentricity (a) (how round or elliptic the Earth’s orbit is with cycles of 413, 125 and 95 kyr that loosely combine into a 100 ka cycle); obliquity (b) (the axial tilt which changes between 22.1° and 24.5° with a cycle of about 41 ka) and precession (c) (change in direction of the Earth’s axis with a cycle of about 19-23 ka).

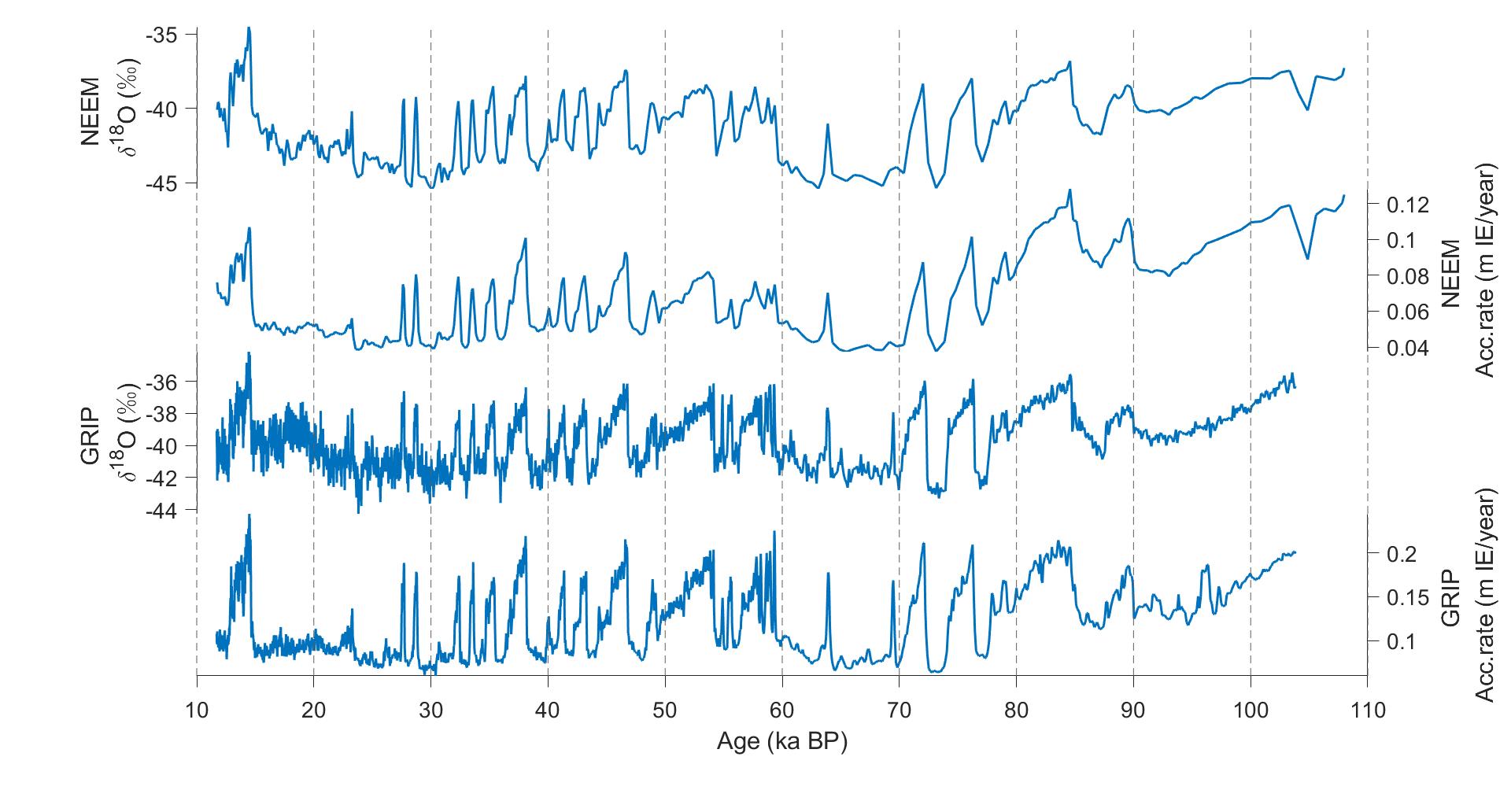


**Fig. S2** Locations of the NEEM (The North Greenland Eemian Ice Drilling) and GRIP (The Greenland Ice Core Project) ice core drilling sites in Greenland.

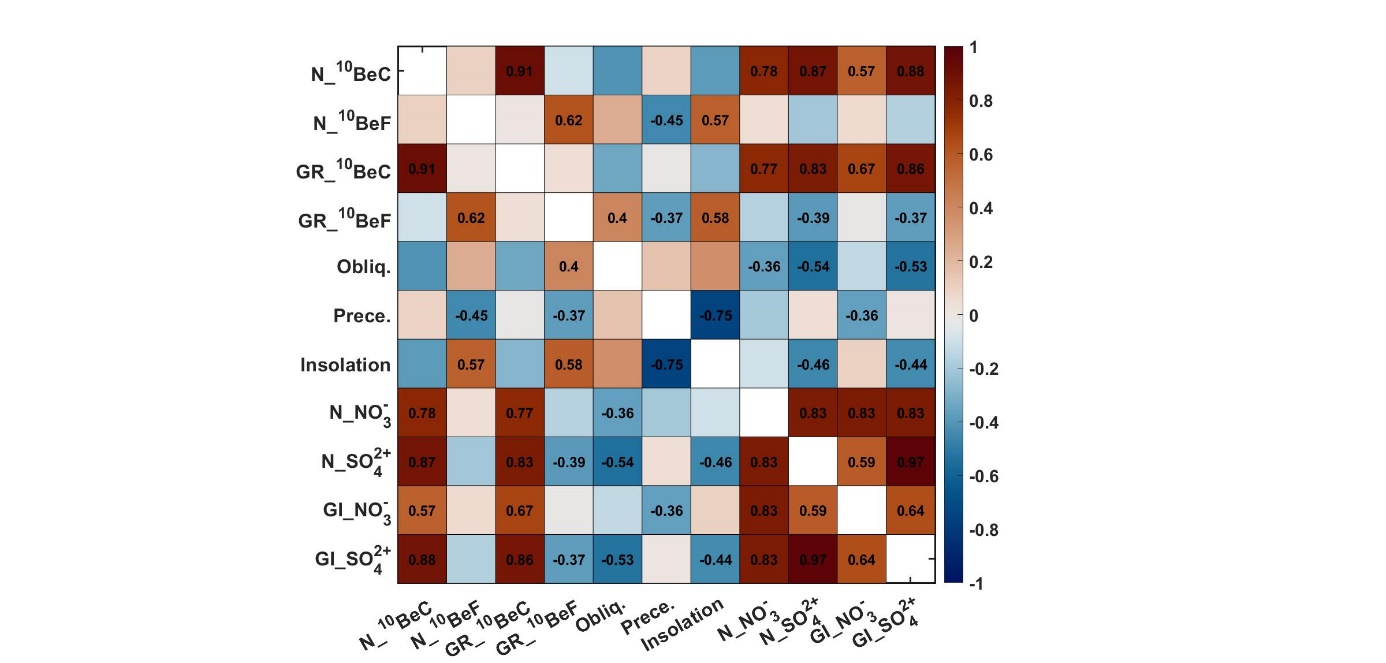
图表, 直方图

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**Fig. S3** Display of 10Be concentrations and fluxes from NEEM (a) and GRIP (b) ice cores, the PISO1500 10Beprod inferred from the independent geomagnetic record PISO-1500 from Channell et al. (2009), marine 10Be/9Be stack from Simon et al. (2016) and the 10Beprod by averaging PISO1500 10Beprod and marine 10Be/9Be stack. The PISO-1500 corrected 10Be production (denoted as PISO1500 10Beprod) was performed using the production model from Poluianov et al. (2016) with the local interstellar spectra by Herbst et al. (2017). All data are normalized over the period 11.7-100 ka BP.



**Fig. S4** Profiles of accumulation rates and δ18O of NEEM and GRIP ice cores.



**Fig. S5.** Pearson correlation matrix for the different datasets used in this study. The numbers within grids indicate the significant values (p<0.05, student-t test adjusted by the autocorrelation following (Hu et al., 2017)). N\_10BeC=NEEM 10Be concclimate, N\_10BeF=NEEM 10Be fluxclimate, GR\_10BeC=GRIP 10Be concclimate , GR\_10BeF=GRIP10Be fluxclimate, Insolation=summer solar insolation TOA 65oN, Obliq=Obliquity, Prece=Precession, N\_=NEEM (ng g-1), N\_SO42-=NEEM SO42- (ng g-1), GI\_=GISP2 (ng g-1), GI\_SO42-=GISP2 SO42- (ng g-1).

图表, 折线图

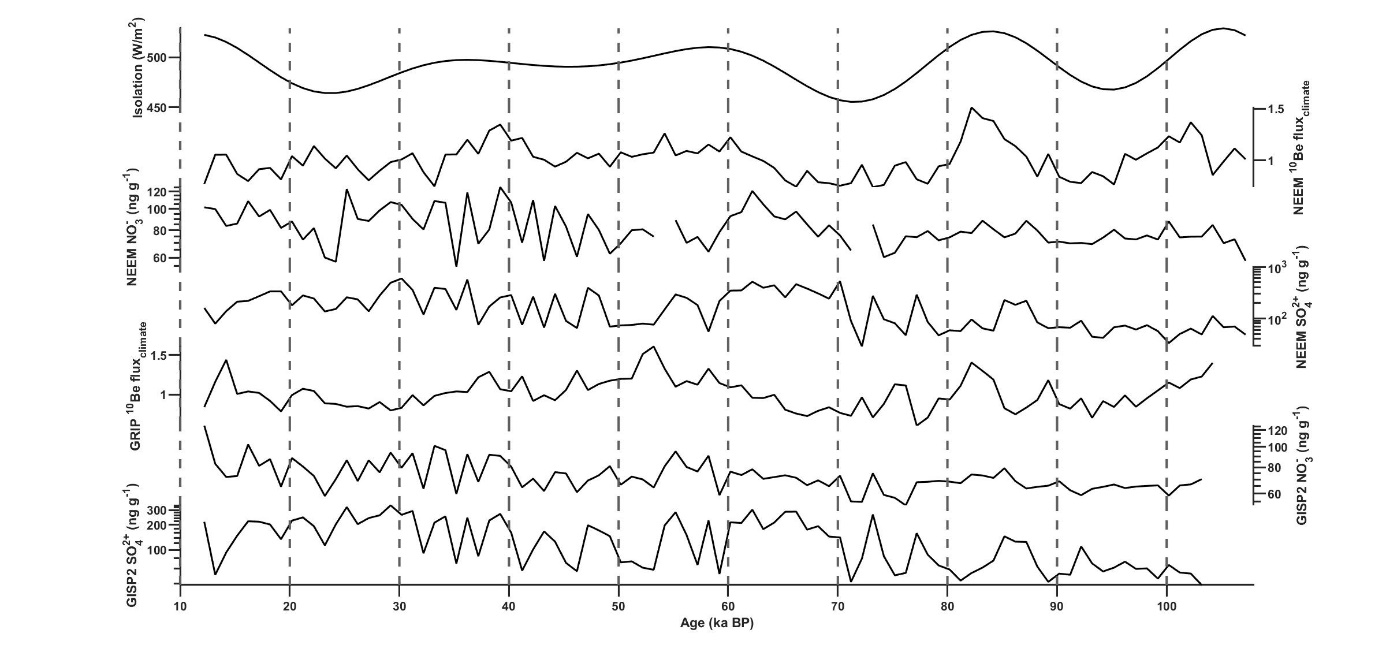
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**Fig. S6** Fourier spectra for the NEEM and GRIP 10Be fluxclimate and NEEM and GRIP δ18O. Observe the strong periodicity of about 22 ka (precession cycle) in the 10Be fluxclimate records which is less prominent in the δ18O records.

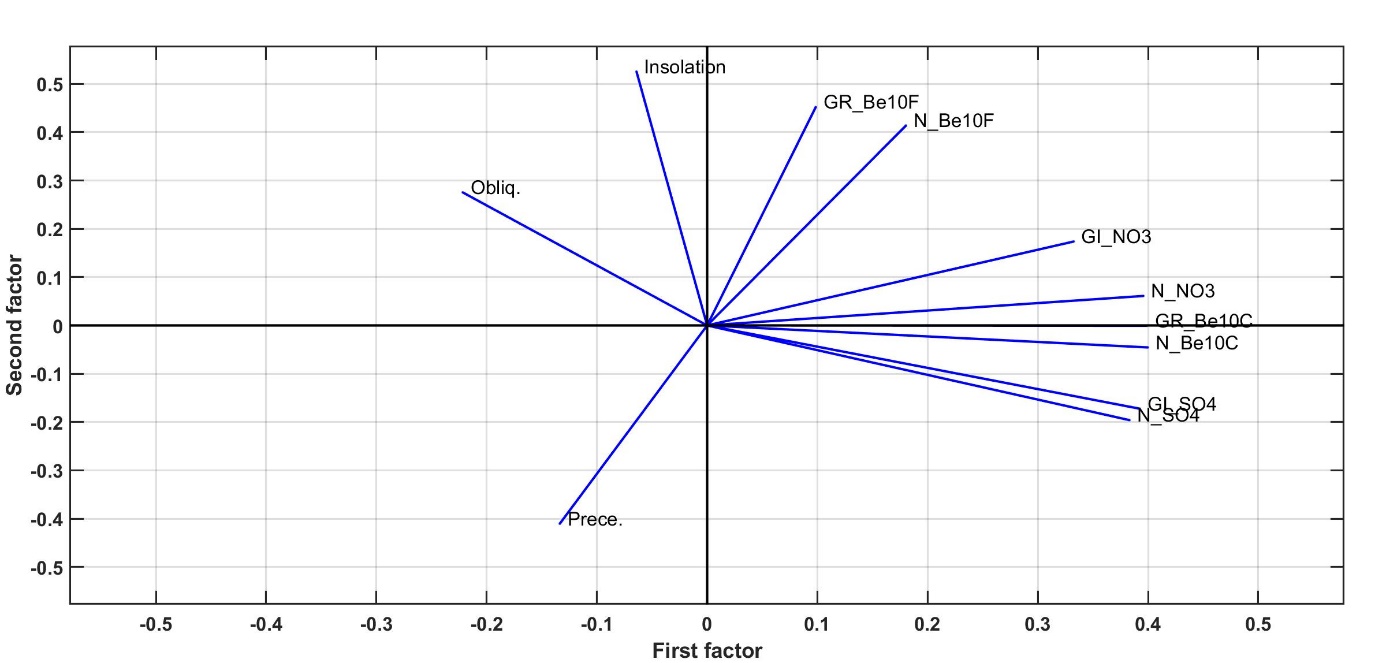
图示

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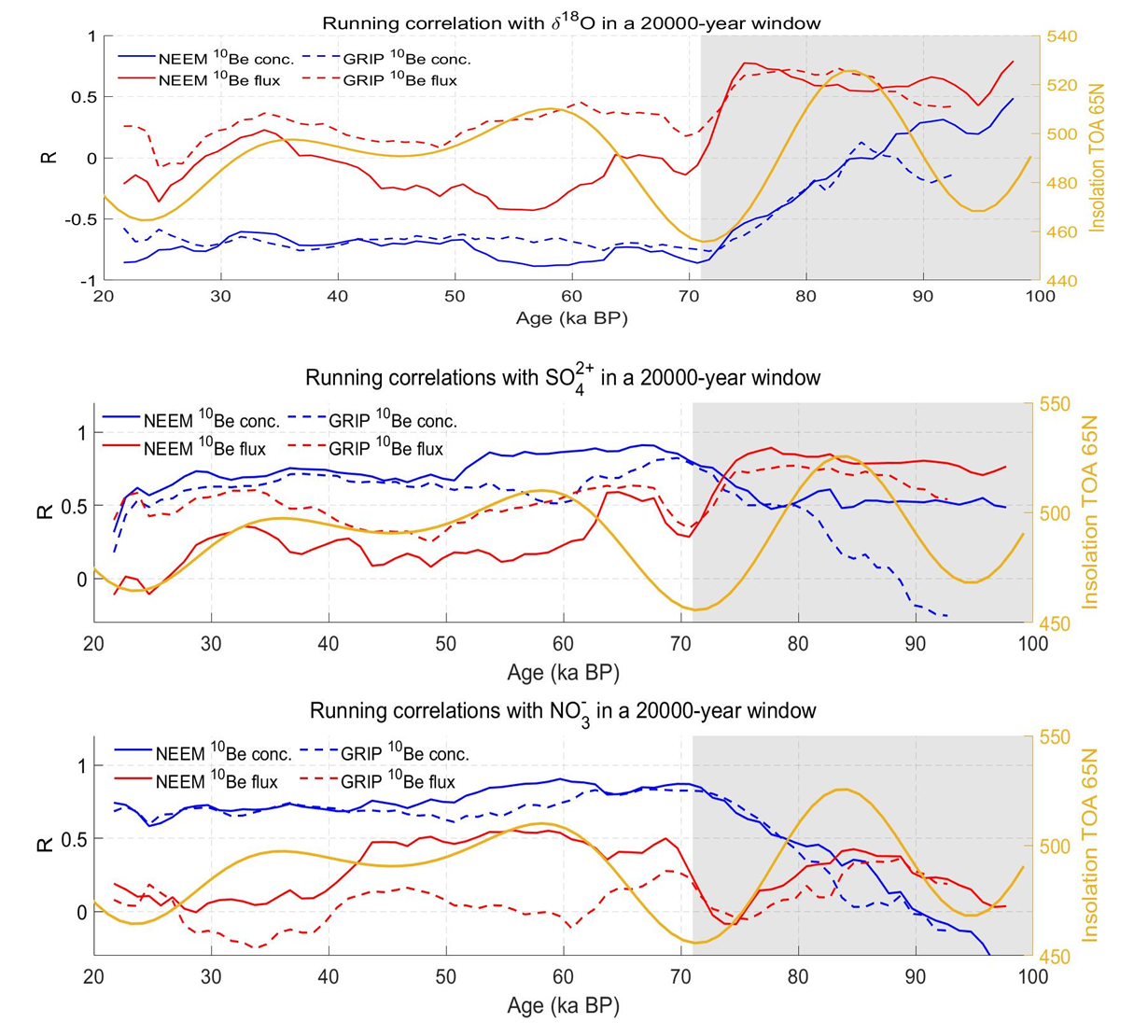
**Fig. S7** Wavelet transform analysis of the NEEM and GRIP 10Be fluxclimate data and δ18O indicating occurrence of a clear correlation band around at a periodicity of 21 ka in the 10Be fluxclimate. Period is indicated in kiloyears.



**Fig. S8** Data of the summer insolation plotted with the NEEM and GRIP 10Be fluxclimate and the NEEM NO3- (ng g-1) and NEEM SO42- (ng g-1), and the GISP2 NO3- (ng g-1) and GISP2 SO42-(ng g-1). All data are resampled at 1000 years.



**Fig. S9** Factor analysis for the different components showing the clustering of relatively high scoring loads of 10Be concclimate with chemical data along the first factor indicating a common variability effect on these parameters (aerosols loading and sources). Less significant scoring load occurs for the 10Be fluxclimate. Symbols as in Fig. S5.



**Fig. S10** Running correlations between 10Be concentration and flux and δ18O from the NEEM and GRIP ice cores with the summer insolation (W/m2) and 10Be concentration and flux of the NEEM and GRIP cores and concentration of NO3- and SO42- from the NEEM and GISP showing correlation trends between the parameters that swing simultaneously at about 65 ka. The insolation shows clear swings as it enters MIS-4 and MIS-5 gray zone that may reflect a change in the climatic conditions resulting in changes of the aerosols transport pathways and consequently changes in 10Be deposition.

**References**

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