Supplementary Information to:

Disparate energy sources for slow and fast Dansgaard-Oeschger cycles

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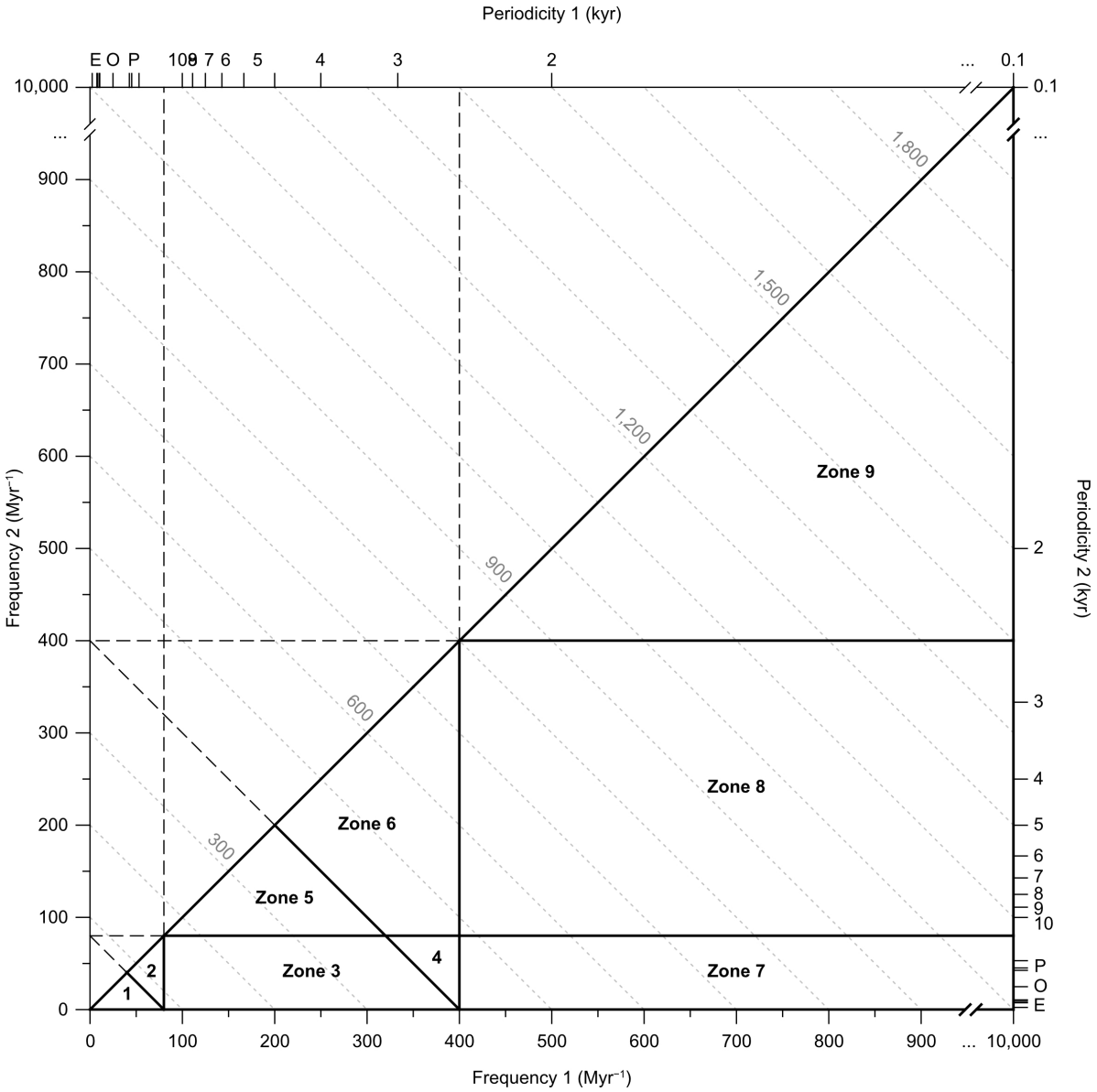
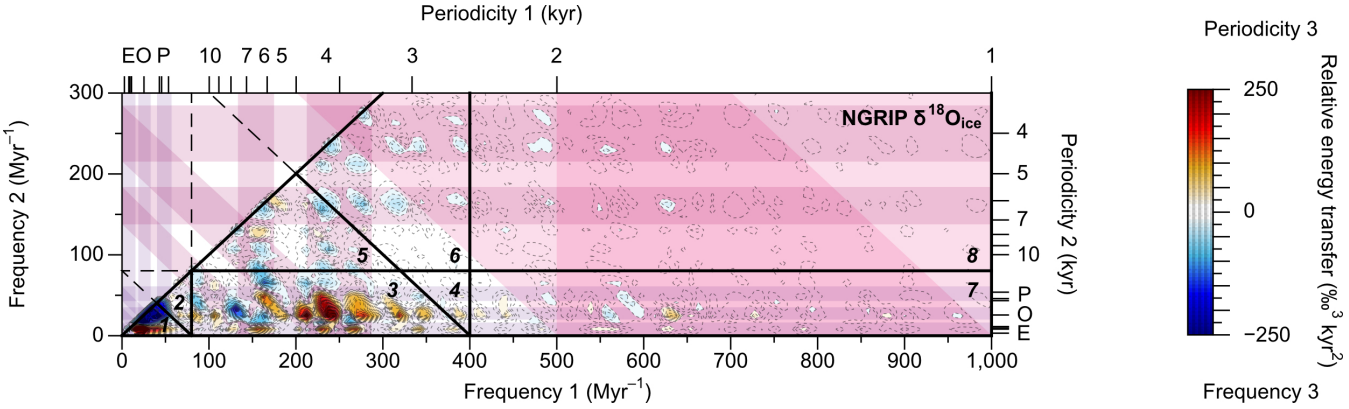
This supplement contains three Supplementary Figures (Supp. Figs. S1 to S3), and one Supplementary Table (Supp. Table S1).



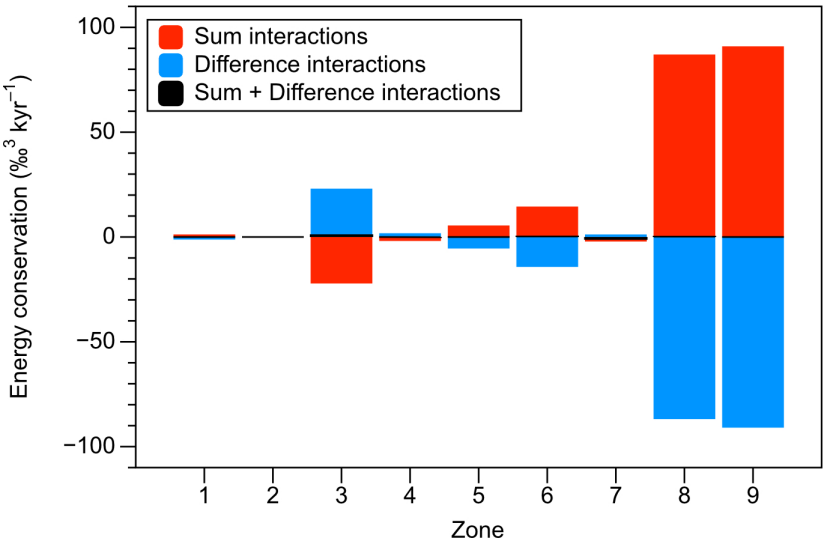
Supp. Fig. S1: Bispectral zonation scheme. Zone 1: B^{Im}(A, A, A), Zone 2: B^{Im}(A, A, $\mathrm{DO_S}$), Zone 3: B^{Im}($\mathrm{DO_S}$, A, $\mathrm{DO_S}$), Zone 4: B^{Im}($\mathrm{DO_S}$, A, $\mathrm{DO_F}$), Zone 5: B^{Im}($\mathrm{DO_S}$, $\mathrm{DO_S}$, $\mathrm{DO_S}$), Zone 6: B^{Im}($\mathrm{DO_S}$, $\mathrm{DO_S}$, $\mathrm{DO_F}$), Zone 7: B^{Im}($\mathrm{DO_F}$, A, $\mathrm{DO_F}$), Zone 8: B^{Im}($\mathrm{DO_F}$, $\mathrm{DO_S}$, $\mathrm{DO_F}$), and Zone 9: B^{Im}($\mathrm{DO_F}$, $\mathrm{DO_F}$, $\mathrm{DO_F}$). "A" stands for astronomical periodicities, "$\mathrm{DO_S}$" stands for slow DO cycles, and "$\mathrm{DO_F}$" stands for fast DO cycles. The boundary between astronomical and slow DO cycles is set at $f = 80$ $\mathrm{Myr^{-1}}$ (i.e., $p = 12.5$ kyr), and between slow DO and fast DO cycles at $f = 400$ $\mathrm{Myr^{-1}}$ (i.e., $p = 2.5$ kyr). Frequency 3 (i.e., f_3) is represented as diagonal lines in the bispectrum on the linear-linear scale, and f_3's values can be read off by summing f_1 and f_2 at any point along a diagonal.

Zone	Difference Frequency 1	Difference Frequency 2	Sum Frequency 3	Bispectral notation
Zone 1	Astronomical cycles	Astronomical cycles	Astronomical cycles	B(A, A, A)
Zone 2	Astronomical cycles	Astronomical cycles	Slow DO cycles	B(A, A, DO_S)
No zone	Astronomical cycles	Astronomical cycles	Fast DO and centennial cycles	N/A
No zone	Slow DO cycles	Astronomical cycles	Astronomical cycles	N/A
Zone 3	Slow DO cycles	Astronomical cycles	Slow DO cycles	B(DO_S, A, DO_S)
Zone 4	Slow DO cycles	Astronomical cycles	Fast DO and centennial cycles	B(DO_S, A, DO_F)
No zone	Slow DO cycles	Slow DO cycles	Astronomical cycles	N/A
Zone 5	Slow DO cycles	Slow DO cycles	Slow DO cycles	B(DO_S, DO_S, DO_S)
Zone 6	Slow DO cycles	Slow DO cycles	Fast DO and centennial cycles	B(DO_S, DO_S, DO_F)
No zone	Fast DO and centennial cycles	Astronomical cycles	Astronomical cycles	N/A
No zone	Fast DO and centennial cycles	Astronomical cycles	Slow DO cycles	N/A
Zone 7	Fast DO and centennial cycles	Astronomical cycles	Fast DO and centennial cycles	B(DO_F, A, DO_F)
No zone	Fast DO and centennial cycles	Slow DO cycles	Astronomical cycles	N/A
No zone	Fast DO and centennial cycles	Slow DO cycles	Slow DO cycles	N/A
Zone 8	Fast DO and centennial cycles	Slow DO cycles	Fast DO and centennial cycles	B(DO_F, DO_S, DO_F)
No zone	Fast DO and centennial cycles	Fast DO and centennial cycles	Astronomical cycles	N/A
No zone	Fast DO and centennial cycles	Fast DO and centennial cycles	Slow DO cycles	N/A
Zone 9	Fast DO and centennial cycles	Fast DO and centennial cycles	Fast DO and centennial cycles	B(DO_F, DO_F, DO_F)

Supp. Table S1: Bispectral zones. Zones correspond to Supp. Fig. S1. Certain combinations between the three periodicity bandwidths are listed, but do not occur in the bispectrum (marked by N/A). These interactions can be excluded as potential energy-transfer pathways.



Supp. Fig. S2: Bispectrum of the NGRIP $\delta^{18}O_{ice}$ record. The imaginary part of the bispectrum of the NGRIP $\delta^{18}O_{ice}$ record. As in main Fig. 2, but here plotted on a linear-linear scale.



Supp. Fig. S3: Conservativity. Energy conservation (i.e., conservativity) of sum and difference interactions for each zone in the imaginary part of the bispectrum of the NGRIP $\delta^{18}O_{ice}$ record.