

Stacking paleointensity and oxygen isotope data for the last 1.5 Myrs (PISO-1500)

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Coupled relative geomagnetic paleointensity (RPI) and oxygen isotope records are used to construct RPI and oxygen isotope stacks for the last 1.5 Myrs. The coupled correlations are accomplished using Match [1] to simultaneously correlate isotope and RPI records. The simultaneous “match” reduces the degree of freedom associated with correlations using RPI or oxygen isotope records alone. The overall compatibility of RPI and oxygen isotopes indicates a dominant global (but independent) component in both signals. The local wavelet power spectrum (LWPS) for the RPI stack indicates little significant orbital power, although the accompanying oxygen isotope stack has all the LWPS characteristics expected of a high resolution oxygen isotope record containing orbital frequencies. The PISO-1500 stack represents a stratigraphic template that can be used to correlate among marine and lacustrine sediment records and link them to polar ice cores via variations in cosmogenic nuclide flux. Scaling the stack to values for virtual axial dipole moment (VADM) indicate maxima at $\sim 15 \times 10^{22} \text{ Am}^2$ and minima that imply a threshold of $\sim 2.5 \times 10^{22} \text{ Am}^2$ below which values are associated with either polarity reversals or magnetic excursions.

Using RPI can not only improve stratigraphic resolution (an outstanding challenge in paleoceanography), but could eventually ameliorate difficulties inherent in oxygen isotope stratigraphy, such as the assignment of phase lag between forcing and response implicit in insolation-driven ice-sheet models, and the assumption that benthic $\delta^{18}\text{O}$ is purely a glacial ice volume signal. In the future, the timing and phase relationships of components of the climate system may be resolvable independent of oxygen isotope stratigraphy, advancing our understanding of the mechanisms of glacial-interglacial and millennial-scale climate change by freeing $\delta^{18}\text{O}$ of its chronological role.

[1] Lisiecki, L.E., and Lisiecki, P.A., 2002. Application of dynamic programming to the correlation of paleoclimate records. *Paleoceanography*, 17: 1049, doi:10.1029/2001PA000733.