Environmental magnetic studies reveal major events in Earth history

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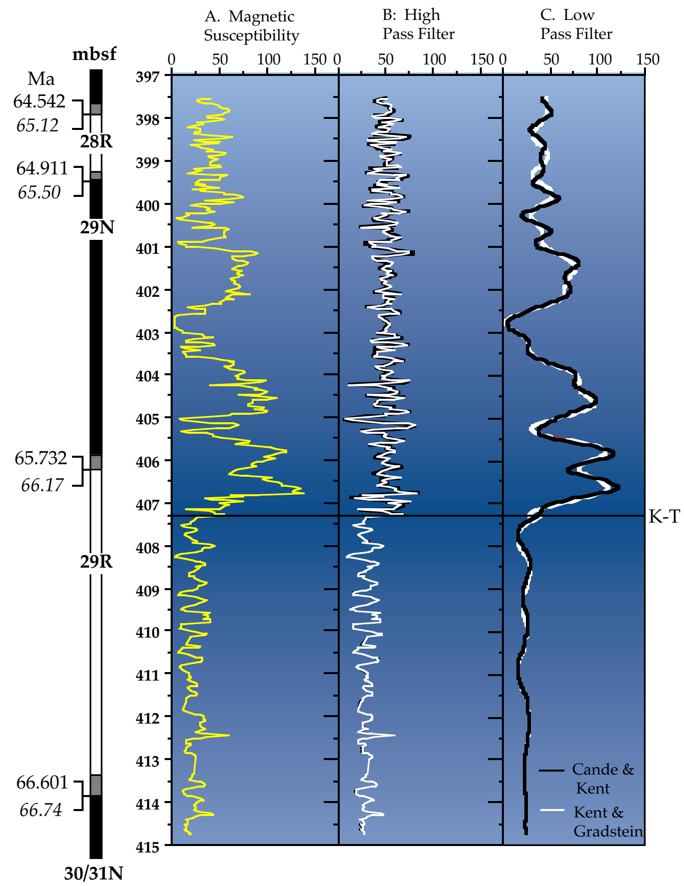

Magnetic susceptibility of uppermost Maastrichtian and lowermost Paleocene record of Deep Sea Drilling Project Site 528 (Cores 31 and 32). Split-core magnetic susceptibility measurements were taken at 3 cm intervals. B: High-pass filtered magnetic susceptibility record of Cretaceous-Tertiary (K-T) interval at Site 528. C: Low-pass filtered magnetic susceptibility record of K-T interval at Site 528. Magnetic-reversal age estimates (Ma) are from Cande and Kent [1992] and Kent and Grastein [1986] (italicized).

Sediments deposited on the seafloor possess many properties that record major events in Earth history. Among these properties are magnetic parameters that indicate the concentration, composition, and grain size of magnetic minerals and provide proxies for paleo-environmental changes. Major general uses of magnetic methods by ODP and DSDP investigators are reviewed in Reynolds and King [1995] and include: (1) core correlation and dating with magnetic susceptibility logs, (2) detection of climatic cycles and characterization of shifts in their frequency, (3) detection of terrigenous fluxes and characterization of the temporal variation of these fluxes, and (4) detection and characterization of post-depositional reduction diagenesis.

A particularly powerful example of using environmental magnetism to characterize major events in Earth history is a recent study of archive core halves containing the Cretaceous-Tertiary boundary in DSDP sites from the South Atlantic [*D'Hondt, King and Gibson,* 1996]. In these cores, the K-T boundary is marked by a pronounced increase in the amplitude of low-frequency variation in the magnetic susceptibility record above the boundary. The record of DSDP Site 528 shows that the magnitude of these low-frequency susceptibility oscillations gradually decreases over the lower Paleocene (magnetochrons 29R to 28N).

The magnetic susceptibility record indicates that the Cretaceous-Tertiary impact amplified or induced strong ~100 Ky oscillations in South Atlantic sediment properties. The timing, amplitude, and persistence of these oscillations suggest that the impact enhanced the sensitivity of the oceans to orbital forcing for almost 1my. Preliminary results from ODP Leg 165 in the Caribbean Sea confirm this pattern.

References:

Cande, S.C. and D.V. Kent, A new geomagnetic polarity timescale for the Late Cretaceous and Cenozoic, *J. Geophys. Res., 97,* 13917-13951, 1992.

D'Hondt, S., J. King, and C. Gibson, Oscillatory marine response to the Cretaceous-Tertiary impact, *Geol., 24,* 611-614, 1996.

Kent, D.V. and F.M. Gradstein, A Cretaceous and Jurassic geochronology, *Geol .Soc. Amer. Bull., 96,* 1419-1427, 1986.

Reynolds, R.L., and J.W. King, Magnetic records of climate change, *Rev. Geophys. Supp., July,* 101-110, 1995.