Astronomical calibration of the Paleocene time scale

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Ocean Drilling Program Legs 165 and 171B drilled four sites (ODP 999, 1001, 1051, and 1050) that include nearly complete sequences through the Paleocene and magnetochrones C24 to C29. ODP Sites 999 and 1001 (2800-3800m water depth) recovered calcareous nannofossil chalk to limestone with clay in the Caribbean Sea, ODP Sites 1050 and 1051 (2300-2000m water depth) each double cored siliceous nannofossil chalk through the Paleocene at the Blake Nose margin of Florida. Well defined magnetostratigraphies were found at all sites, chron assignments were confirmed with planktic foraminifera and calcareous nannofossil biostratigraphy. All sites display pronounced cyclicity in magnetic susceptibility, iron (Fe) content, Formation Microscanner (FMS) resistivity and color reflectance. High-resolution geochemical variations of Fe-abundance associated with Milankovitch orbital-climate cycles of obliquity and precession that have been used to construct time scales. We have applied spectral analysis methods to these high-resolution geochemical scans of Paleocene sediment cores from two independent oceanic basins and obtained a consistent cycle-tuned duration of polarity chrons C24 to C29.

Cycle-stratigraphy derived durations of polarity chrons of the early Cenozoic constrains the spreading rates for the associated magnetic anomalies and the corresponding assignment of absolute ages to the magnetic polarity time scale. For the synthetic South Atlantic marine magnetic profile that serves as a standard for scaling magnetic polarity chrons, spreading rates were decreasing through the Maastrichtian and Danian, maintained a constant rate during the late Paleocene and early Eocene epochs before accelerating during the middle Eocene.