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Correlation and Astronomical Calibration of Pacific Sediments From ODP Leg 199

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One of the great successes of Leg 199 was the recovery of a high-resolution $(~ 1-2 cm / ky)$ biogenic sediment record from the late Paleocene to the early Miocene. These sediments were found to contain an uninterrupted set of geomagnetic chrons, as well as a detailed record of calcareous and siliceous biostratigraphic datum points. In addition, lithological measurements revealed clearly recognisable cycles that can be attributed to climatic change, driven by Milankovitch style orbital variations of the Earth. Discovering drill sites with a well-defined magneto- and biostratigraphic record that also show clear lithological cycles is rare and valuable, and opens the opportunity to develop a detailed stratigraphic inter-site correlation, as well as providing the data to refine and extend the astronomical time calibration for parts of the Cenozoic. The basis for stratigraphic correlation and time scale calibration is a complete and representative sedimentary record with a high signal-to-noise ratio in the lithological data. Shipboard work allowed the generation of a continuous "spliced" record, formed by correlation of at least two holes drilled at the same site. However, differential stretching and squeezing of sedimentary features, due to both coring and geological processes, result in events that are not aligned in the depth domain. We present the results of extensive post-cruise work that resulted in the generation of a revised composite depth stack that puts data from all holes of sites 1218 and 1219 into a common depth framework. It was possible to extrapolate magneto- and biostratigraphic datum points between these two sites (separated by ~ 750 km). This procedure allowed the generation of a "site composite record", which provides smaller uncertainty intervals for bio- and magnetostratigraphic zones, as well as giving refined and more detailed preliminary age models for either site. We then use the aligned and stacked lithological data from sites 1218 and 1219 to develop a preliminary astronomical time scale calibration that also spans the Eocene-Oligocene (E/O) boundary. First results indicate that (1) all main orbital frequencies (long and short eccentricity, obliquity and climatic precession) are present in the record, but (2) the dominant cyclicity changes across the (E/O) as well as within the Oligocene, possibly related to the evolution of the CCD. (3) A plateau in a step-like transition observed across the E/O from Site 1218 can be constrained to approximately one eccentricity cycle, and (4) distinct eccentricity cycles (~ 400 ky and 100 ky) in the Oligocene can be matched to amplitude modulation cycles of climatic precession observed from Atlantic ODP cruise Leg 154, which was astronomically calibrated by Shackleton et al.\ (1999).

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