The New Jersey Coastal Plain Drilling Project: Continental scientific drilling meets the ODP

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Scientific drilling is a global endeavor that knows no boundaries between oceans and land. This is especially true of efforts to reconstruct the history and effects of global sea-level change: drilling must occur not only on continental shelves and slopes, but also onshore in the coastal plains of the world. Recognizing this, New Jersey Sea Level Transect encompassed drilling on the slope by Leg 150, the shelf by Leg 174A, and onshore by the New Jersey Coastal Plain Drilling Project (NJCPDP). The latter is a joint effort of the Continental Scientific Drilling, ODP (designated Legs 150X and 174X), the National Science Foundation (Earth Science Division, Continental Dynamics Program, and Ocean Sciences Division, Ocean Drilling Program), the U.S. Geological Survey, and the New Jersey Geological Survey. The NJCPDP drilled 4 onshore boreholes at Island Beach, Atlantic City, Cape May, and Bass River. By drilling along dip and strike profiles, we assembled a mosaic of 29 Paleocene to Miocene sequences and dated them using integrated magneto-, bio-, and isotopic stratigraphy. Onshore sequence boundaries correlate with Miocene unconformities on the New Jersey shelf and slope (Fig. 1), Oligocene to middle Miocene unconformities in Florida, late Eocene to early Oligocene unconformities in Alabama, and the sequence boundaries of Exxon. Such regional and interregional correlations indicate a eustatic control. We compare the New Jersey sequence boundaries with global $\delta^{18}O$ records that provide a proxy for glacioeustasy. New Jersey onshore late middle Eocene to Miocene sequence boundaries (42-10 Ma) correlate with $\delta^{18}O$ increases (inferred glacioeustatic lowerings), confirming that eustasy exerts a primary control on sequence boundaries. Early middle Eocene (52-49 Ma) correlations between sequence boundaries and $\delta^{18}O$ increases are equivocal and it is not clear that glacioeustatic changes occurred at this time. In contrast, early Eocene (55-52 Ma) sequence boundaries do not correlate with $\delta^{18}O$ change and we infer probable ice-free conditions at this time; nevertheless early Eocene sequence boundaries do correlate with those of Exxon, indicating that they may record global sea-level events. Future challenges include determining if the Cretaceous to early Eocene was actually ice free and if so what mechanisms caused large, rapid global sea level changes in this “Greenhouse World.”

Cretaceous/Tertiary transition in the Bass River, NJ Borehole

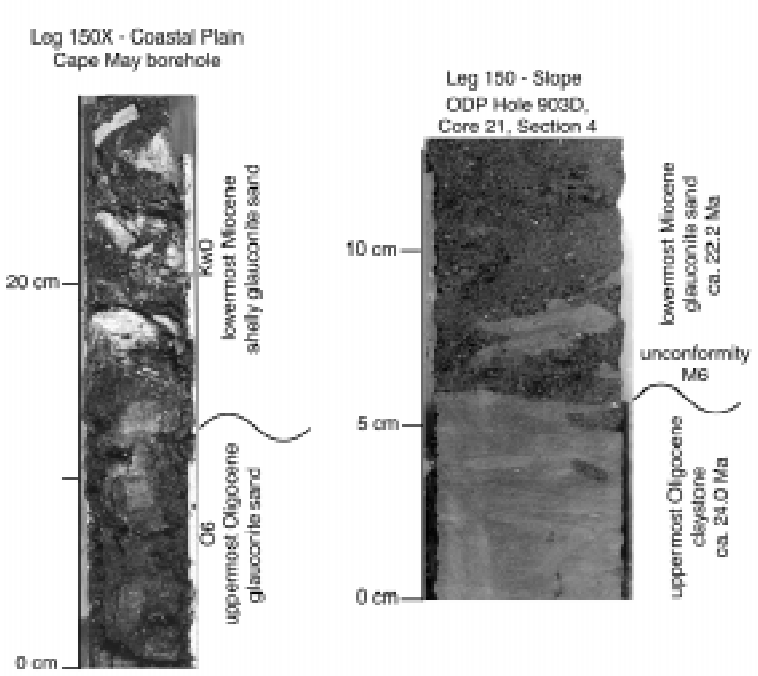

Fig. 1. Comparison of a sequence boundary onshore (base Kw1a) and offshore (m6 equivalent) that spans the Oligocene/Miocene boundary. These sequences boundaries have been precisely dated (better than 0.5 m.y resolution) in both locations and correlated with a major global $\delta^{18}O$ increase.