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Passive margin shelf drilling and its significance: preliminary results of IODP Expedition 313 New Jersey Shallow Shelf

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The New Jersey continental margin is a suitable location, a so-called "natural laboratory", to investigate the relation between global sea level and depositional sequences for several reasons. Sediments were deposited rapidly so that a thick and continuous sequence was allowed to develop; the area is stable, with no earthquakes or other geological events that would disrupt the deposition ; the fossils here are well preserved and are suitable for determining the age of the sediments. In addition, the Cretaceous to Miocene New Jersey margin has already been well studied through drilling on the coastal plain (ODP Legs 150X and 174AX), shelf edge (Leg 174A) and slope (Leg 150) areas during two decades. However, it is technically difficult to drill the mid-shelf Miocene sandy sequences that show complicated stacking of clinoforms in seismic sections below the seafloor.

In May-July 2009, IODP Expedition 313 succeeded in drilling and logging Upper Paleogene-Neogene sequences on the mid-shelf in 35 m water depths and 45-65 km off the coast of New Jersey by using the "mission-specific" jack-up platform (L/B Kayd). Despite the difficulties of coring the sandy shallow shelf, we collected a total of 1311 m of cores at three sites (M0027A, 28 A and 29A) with about 80% recovery for target intervals. The total composite penetrated length was 2056 m. The deepest hole was 757 mbsf, and the oldest sediment was late Eocene in Hole M0 027A (631 mbsf). These three holes drilled through the mid-shelf clinoforms complement the coastal plain to slope core datasets, building up a large "New Jersey transect" across the US Atlantic passive margin. During the Onshore Science Party in early November to early December 2009 at the Bremen Core Repository (Bremen, Germany) basic core descriptions and physical measurements were carried out after core splitting.

The main goals of Exp. 313 are to estimate the time, amplitudes, rates and mechanisms of sea-level change and to evaluate sequence stratigraphic facies models that predict depositional environments, sediment compositions, and stratal geometries in response to sea-level change. Furthermore, the important aspects are to learn how the sea-level change is related to changes of shoreline position, sediment transport from land to sea, nearshore ecosystems, pore-water chemistry below the seafloor and extent of biosphere buried under the seafloor.

The lithostratigraphic descriptions of split cores show sand- and sandy silt-dominated, continuous successions of shallow-marine (shoreface to shelf) sediments developed in late Eocene to middle Miocene forming more than 10 sedimentary cycles. These cycles are represented by clinoform bodies in seismic sections. They seem to reflect 50-100 m sea-level changes controlled by global eustasy, high sediment supply and some local factors during 35-14 Ma. Lenses of freshwater were discovered as much as 400 m below the seafloor 50 km offshore, and will allow us to detect the fresh- and marine-water behavior below the seafloor. As well as micropaleontological age determinations by foraminifers and calcareous nannoplankton, tree pollen fossils carried offshore

by ancient winds testify climate changes on the basis of their composition.

Keywords: New Jersey shelf, shallow marine sediments, sea level change, Miocene, passive margin, sequence stratigraphy