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Palynological results from the New Jersey shallow shelf: vegetation development on the Atlantic Coastal Plain and estimation of water depth and site-shoreline distance

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IODP Expedition 313 aims at estimating amplitudes, rates and mechanisms of sea-level change and at the evaluation of sequence stratigraphic facies models that predict depositional environments, sediment compositions, and stratal geometries in response to sea-level change. Several hundred cores from three sites (313-M0027, M0028, and M0029) from the New Jersey shallow shelf (∼35 m water depth) were retrieved during May to July 2009. An ECORD "mission-specific" jack-up platform was used to execute the drilling, 45 to 67 km off the coast of New Jersey. The recovery rate for the three sites exceeded 80%, with over 1300 m total core length. The oldest sediments recovered are from the late Eocene (Hole M0027A) according to biostratigraphy, magnetostratigraphy and Sr-isotopy-based age estimates.

The ratio between the cysts of organic-walled dinoflagellates and pollen grains found in late Eocene (Priabonian) to Miocene (Serravallian) sediments from Hole M0027A is used as a proxy to estimate the site-shoreline distance. In addition, assemblages of benthic foraminiferal species were used to determine inner, middle, and outer neritic paleodepths, primarily based on fauna characterized by various species of Elphidium, Hanzawaia, Pseudononion, Buliminella, Uvigerina, Cibicidoides, and/or Oridorsalis. Paleodepth estimates based on benthic foraminiferal data show close agreement with the paleo-sea-level estimates derived from the palynomorphs. Furthermore, the micropaleontology-based reconstructions of paleodepth and site-shoreline distance contribute to a pollen-transport model, allowing more confident pollen-based reconstructions of the vegetation development in the hinterland of the New Jersey margin from the Priabonian to the Serravallian.

While oak forests dominated the vegetation in the hinterland during the Eocene and Oligocene, the Miocene witnessed the spreading of hickory-oak forests. At the Aquitanian-Burdigalian boundary different hemlock (Tsuga) species were present in the hinterland of the New Jersey shelf, indicating humid, but probably relatively cool conditions. Subsequently, the spreading of deciduous oaks and further broad-leaved tree taxa during the late Burdigalian, points to warmer temperatures. During the Langhian to Tortonian, grass- and herbs-dominated landscapes expanded, probably due to decreasing humidity.