



## **Vegetation and climate development on the Atlantic Coastal Plain during the late Mid-Miocene Climatic Optimum (IODP Expedition 313)**

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The major aims of IODP Expedition 313 are estimating amplitudes, rates and mechanisms of sea-level change and the evaluation of sequence stratigraphic facies models that predict depositional environments, sediment compositions, and stratal geometries in response to sea-level change. Cores from three Sites (313-M0027, M0028, and M0029) from the New Jersey shallow shelf (water depth approximately 35 m) were retrieved during May to July 2009, using an ECORD "mission-specific" jack-up platform.

We have investigated the palynology of sediment cores from Site M0027, 45 km off the present-day coast of New Jersey. For this study, we have focused on pollen studies for the second half of the Mid-Miocene Climatic Optimum (MMCO) and the subsequent transition to cooler conditions (ca. 15 to 13 million years before present). Transport-caused bias of the pollen assemblages was identified via the analysis of the terrestrial/marine palynomorph ratio and these results were considered when interpreting palaeo-vegetation from the pollen data. Pollen preservation in the interval analyzed herein was generally very good. Pollen grains were analyzed via both light and scanning electron microscopy.

For most samples, the pollen assemblages were not highly diverse. The most abundant taxa through all samples were *Quercus* (oak) and *Carya* (hickory). Typical wetland elements like Cyperaceae, *Taxodium* (cypress), *Nyssa* (tupelo tree) and taxa today growing in the tropics and subtropics like Sapotaceae, Symplocaceae, Arecaceae (palm trees) and *Alangium*, which indicate particularly warm climate conditions, were only sporadically found, but indicate warmer phases during the second half of the MMCO. Herbal pollen was generally rare, but members of the Asteraceae, Apiaceae, and Ericaceae families, together with infrequent occurrences of Poaceae pollen indicate the presence of areas with open vegetation.

The Mid-Miocene pollen assemblages reflect a vegetation in the hinterland of the New Jersey shelf which was reminiscent of Oligocene and early Miocene ecosystems analyzed in previous studies (e.g. Kotthoff et al. 2014). The ecosystem was characterized by oak-hickory forests which probably dominated in the lowlands, while frequent occurrence of conifer pollen (*Pinus*, *Picea*, *Abies*, *Sciadopitys*, and *Tsuga canadensis*) indicate that conifer forests prevailed in higher altitudes during the MMCO. We assume that the Miocene uplift of the Appalachian Mountains (e.g. Gallen et al., 2013) led to the proliferation of mountainous taxa and thus to an increase of related pollen taxa in the palynological record.

### References:

Gallen, S. F., Wegmann, K. W., Bohnenstieh, D. W. R.: Miocene rejuvenation of topographic relief in the southern Appalachians, *GSA Today*, 23, 4–10, 2013.

Kotthoff, U., McCarthy, F.M.G., Greenwood, D.R., Müller-Navarra, K., Prader, S., Hesselbo, S.P., (2014): Vegetation and climate development on the Atlantic Coastal Plain from 33 to 13 million years ago (IODP expedition 313). *Climate of the Past* 10, 1523-1539.