

### **Late Quaternary dinoflagellate cysts and pollen from Porcupine Basin (IODP 307, Hole 1318B): indication of small-scaled climate variations**

Koen Verhoeven and Stephen Louwye

High resolution palynological analysis of latest Quaternary sediments of Hole 1318B (IODP Leg 307) revealed the presence of a well-preserved assemblage of marine and terrestrial palynomorphs. Thirty five samples were analysed for dinoflagellate cysts and pollen, and a total of at least 350 specimens were counted. A statistical minimum for the pollen sum was not always obtained, hence the limited vegetational information. The total pollen sum is situated between 34 specimens in pollen-poor sediments, and 1250 specimens in pollen-rich sediments. Wind is by far the most important transportation medium for the terrestrial palynomorphs, since most pollen are bisaccate (mainly *Pinus*). A total of 52 different pollen types are recorded, of which 47 can be attributed to angiosperms. This pollen is brought into the depositional area through river transport and currents. The relative high number of pollen number is not surprising given the location of the drill site, approximately 100 km off southwest Ireland.

Five dinoflagellate zones indicative for colder sea surface temperatures could be directly recognised in the uppermost 10m of Hole 1318B. Two cold-water species are especially abundant in these zones: *Bitectatodinium tepikiense* and *Operculodinium centrocarpum* sensu Wall and Dale. *Bitectatodinium tepikiense* is the dominant thermophilic species during warmer intervals, and is almost absent during glacial times. Transfer functions executed with the program 3PBase and based on MAT (Modern Analogue Technique) made it possible to detect not five but a total of eight colder intervals.

In general, the eight colder intervals alternate cyclic with warmer periods of a comparable duration and precede the Holocene climate amelioration.

### **Plio-Pleistocene land-sea correlations in the Icelandic region: a palynological approach - First results**

Koen Verhoeven and Stephen Louwye

The first results of a palynological analysis of Pliocene and Pleistocene deposits from northern Iceland are presented. The aim of the study is to quantify the effects of the onset of the late Pliocene cooling and the beginning of the Pleistocene glaciations on terrestrial and marine palynomorphs.

Pliocene marine and terrestrial palynomorphs are analysed from the well-exposed Tjörnes Beds in northern Iceland. Next to the climatic information, a secondary aim of the study is to have a better biostratigraphical insight in the oldest exposed sediments in Tjörnes who are probably of Miocene age. During the summer of 2007, a more than 1000m thick section in Iceland was logged and sampled for palynological analysis. Previous paleontological and palaeoecological studies on this section comprise analysis with molluscs and ostracods and indicate deposition in a shallow marine environment. The section was deposited in less than 4.3 Ma and points towards high sedimentation rates. As a consequence, the concentration of marine palynomorphs (mainly dinoflagellate) and pollen is low. However, the proximity of the land gives a continuous input of sufficient pollen. A core from the island of Flatey, a few kilometres further down the paleo-shelf, is the first step in the land-sea correlation. Correlation between this drilling and the Tjörnes section was facilitated through geochemical distinctive ash layers. Test samples from the Tjörnes Beds and from the Flatey core show a moderate till good preservation of dinoflagellate cysts. In contrast with the marine sediments of the land section, dinoflagellate cysts are abundant and the pollen scarce. A possible explanation lies in the different depositional environments and possible oxidation of the land section. Further research must clarify this issue.

The deepest depositional environment for the land-sea reconstruction is represented in ODP Drilling Leg 151 Hole 907A and ODP Drilling Leg 162 Hole 985A, both located on the Icelandic Plateau. These two cores lie in the closest vicinity of the Iceland section and have an excellent magnetostratigraphic record and sediment recovery. The palynological analysis of both cores will complete the land-sea correlation. Ice cover in times of glaciations will be detected in the poor and partly reworked dinocyst assemblages. Interglacial assemblages on their hand will be characterised by dinoflagellate cysts as well pollen because of the relative close vicinity of the island.

### **Holocene dinoflagellate cysts as salinity indicators from the southwestern Black Sea**

Thomas Verleye, Kenneth Mertens, Stephen Louwye and Helge Arz

Dinoflagellate cysts are used as a proxy for the reconstruction of the salinity variations during Holocene times in the southwestern Black Sea. Core GeoB 7625-2, located 50 km northeast of the mouth

of the Sakarya River, was sampled with a 200 year resolution between 0.25 ka BP – 7.8 ka BP. In the lower part of the core, some extra crucial intervals were sampled with a higher resolution for the determination of the reconnection between the Black Sea and the Sea of Marmara. The drastic change in the dinoflagellate cyst assemblage – from a fresh-brackish water to saltwater association – is observed between ~9.6 and ~8.1 ka BP, which is earlier than observed in the dinocyst studies of e.g. Marret *et al.* (in press), Mudie *et al.* (2001) and Wall & Dale (1973). This could indicate a diachronic salinification of the Black Sea. The fresh to brackish water indicator species are *Spiniferites cruciformis* form 1-4 and *Pyxidinospis psilata*, while the most important saltwater species are *Lingulodinium machaerophorum* and cysts of *Pentapharsodinium dalei*. The first occurrence of euryhaline species took place synchronous with a sea level rise and an increase in productivity. The process length of *L. machaerophorum*, a salinity proxy, indicates a gradual salinity increase. This assumes a gradual reconnection between the Black Sea and the Sea of Marmara, which conflicts with the catastrophic flood (Noah's Flood Hypothesis) introduced by Ryan *et al.* (1997, 2003). The 500 to 800 year cycles observed in the sedimentary record by Lamy *et al.* (2006), and related to the North Atlantic Oscillation, were not only recorded by us in the salinity proxy but also in dinoflagellate cyst abundances (productivity). The observed productivity changes are furthermore related to the sedimentation rate: the increase in precipitation in Anatolia possibly results in a higher sediment discharge leading to a better preservation of the organic-walled microfossils. This makes it difficult to determine whether the fluctuations of the dinocysts/gram ratio are the result of fluctuations in productivity or are an artefact due to changes in the sedimentation rate. Furthermore, it is shown that *Peridinium ponticum*, a species restricted geographically to the Black Sea, is a good proxy for the reconstruction of Holocene salinity variations since its relative abundance fluctuates synchronous with the process length variations of *L. machaerophorum*.

### **History of Florida East Coast *Karenia brevis* Red Tides, with Emphasis on the Unusual 2007 Bloom**

Jennifer Wolny, Earnest Truby and Jacob Tustison

Blooms of the toxic dinoflagellate *Karenia brevis* occur commonly in the eastern Gulf of Mexico. Here, prevailing winds and currents can move blooms from offshore to inshore and impacts to

beach goers and coastal communities are more acute. Less common, however, is the occurrence of *K. brevis* blooms on Florida's east coast. In 1946 and 1947 *Karenia brevis*, the organism responsible for Florida red tides and associated human and animal health impacts was identified from a bloom occurring off the central west Florida coast. In 1946 respiratory irritation and fish kills were reported on the Jacksonville coast, suggesting that the red tides could occur on Florida's east coast as well. However, it wasn't until 1972 that the transport of *K. brevis* from the west Florida coast to the east Florida coast via the Gulf Stream System was documented when red tide came inshore in the St. Lucie and Martin County areas. Transport of *K. brevis* from the west Florida coast to the east Florida coast has since been documented in 1977, 1980, 1983, 1990, 1997, 1999, and 2006 and persisted for a month or less. The Gulf Stream System, which included the Loop and Florida Currents and the Gulf Stream, plays a major role in the distribution of red tide.

In September 2007 reports of respiratory irritation and fish kills were received from the Jacksonville area. Water samples collected from these areas indicated a bloom of *K. brevis*. For the next 4 months, *K. brevis* was found along the coast and in the intercoastal waterways from Jacksonville to Jupiter Inlet. This event represents the longest and most extensive red tide the east coast of Florida has experienced to date. The dynamics, extent, as well as impacts of east coast Florida *K. brevis* red tides will be discussed.

### **Barremian-early Cenomanian nonmarine micro-phytoplankton from the north part of Hailar basin, Inner Mongolia, China**

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A deep oil well was drilled in the North Hailar Basin, Inner Mongolia, China, and Cretaceous sediments with an accumulative thickness of about 3000m were recovered. Early Cretaceous formation has been subdivided in ascending order into five formations: Tamulangou, Tongbuomiao, Nantun, Damuoguaihe and Yimin Formation. The late cretaceous is represented by the Qingyuangang Formation. Two oil wells from North Hailar Basin have been investigated for this study. The samples lithology is mainly green ash (deep and shallow), celadon mudstone, powder sand and mudstone. Fifty samples were prepared for palynological analyses. Palynomorphs are composed mainly by dinoflagellates, chlorophytes (*Botryococcus braunii*)