Poster

The Miocene Mi-events: New paleobiological and paleotemperature data from Porcupine Basin, SW Ireland

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The Miocene is a geological period during which the climate toppled globally, and is pivotal in the comprehension of the Cenozoic climate evolution. A warm phase was established during the later part of the Oligocene and resulted in the waning of the Antarctic ice sheets and a global increase of bottom water temperatures. The warming phase culminated in the Middle Miocene Climatic Optimum (MMCO) between 17 and 14.5 Ma, and this period is considered to have been the warmest interval during the last 34 Ma. However, the climate during Miocene times was anything but uniform, and was punctuated by several short-lived cooling events of differing intensity, the Mi-isotope zones or Mi-events. Several causal mechanisms for the Middle Miocene climate transition have been advanced (large-scale change in oceanic circulation induced by opening or closing of oceanic gateways or changing atmospheric circulation; massive burial of organic carbon in the marine realm leading to a drawdown of atmospheric pCO_2, impairing the greenhouse capacity and resulted in global cooling – the Monterey hypothesis). Although various proxies of paleoatmospheric CO_2 show different results, the most recent Miocene data point to a stepwise lowering of CO_2 levels in conjunction with Mi-events (Kürschner et al. 2008). Amplitude variation of eccentricity and obliquity is now regarded as a major driving force behind the Neogene climatic variations.

For this reason we want to examine the role of the Gulf Stream in the cooling and subsequent warming of the Mi-events, since it is a possible mechanism to amplify regional changes in Northwestern Europe.

IODP Leg 307 recovered a fairly continuous Lower and Middle Miocene sequence in the Porcupine Basin, offshore southwestern Ireland.

The Middle Miocene sequence from core 1318B was examined with a very high resolution for organic-walled palynomorphs (mainly organic-walled dinoflagellate cysts, acritarchs, some pollen) and organic molecules for paleothermometry (e.g. TEX_{86} and $U^{K'}_{37}$). With these proxies the development of the Mi-3 and Mi-4 events are reconstructed on high resolution, by assessing e.g. temperature, sea level, thermocline depth and productivity. First results indicate a pronounced cooling as recorded simultaneously in TEX_{86}, $U^{K'}_{37}$ and dinoflagellate cyst assemblages during Mi-4. The TEX_{86} record indicates a cooling of surface waters of as much as 4°C. This cooling is similar to sea surface temperature cooling at the Eocene/Oligocene transition, when the buildup of the East-Antarctic ice was initiated (Wade et al, 2012). On top of the Mi-4 shift dinoflagellate cyst assemblages show a clear 100-kyr eccentricity signal in temperature, productivity and sea level. This feature might be useful to correlate the Porucpine Basin, that lacks stable isotope data, with other high-resolution records. The presented results will focus in detail on the phasing and rates of change in the reconstructed Mi-events.