

CONTROL ID: 1779412

TITLE: Climate aberrations during the middle Miocene: evidence from the eastern North Atlantic Ocean

AUTHORS (FIRST NAME, LAST NAME): Willemijn Quaijtaal¹, Timme Donders², Stefan Schouten³, Stephen Louwye¹

INSTITUTIONS (ALL): 1. Department Geology and Soil Science, Research Unit for Palaeontology, Ghent University, Gent, Belgium.

2. Department of Physical Geography, Palaeoecology, Utrecht University, Utrecht, Netherlands.

3. Department of Marine Organic Biogeochemistry, Royal Netherlands Institute for Sea Research (NIOZ), Texel, Netherlands.

ABSTRACT BODY: During the Middle Miocene Climatic Optimum (MMCO; 17-14.5 Ma) the relatively warm climate of the Miocene reached peak temperatures. After the MMCO, the global climate started cooling through several short-lived cooling events, represented by positive oxygen isotope excursions: the Mi-events (Miocene isotope events). One of the more severe events, Mi-3, is associated with East Antarctic Ice Sheet growth and potential Northern Hemisphere ice expansion, as well as marine and terrestrial species turnover and aridification. The causes and consequences of the Mi-events are not well constrained yet. CO₂ reconstructions combined with the abovementioned consequences suggest that a drawdown of CO₂ and/or changes in ocean led to the changes surrounding Mi-3. A minimum node in both eccentricity and obliquity amplitude modulation, an orbital configuration creating favourable conditions for ice growth, has been suggested as a possible triggering mechanism as well. However, an exact cause cannot be pinpointed yet and more high-resolution records are needed in order to investigate the impact and order of events surrounding the Mi-events.

Integrated Ocean Drilling Program (IODP) Leg 307 recovered such a high resolution record from the middle Miocene of the Porcupine Basin (offshore south-western Ireland). We have analyzed well-preserved palynomorphs (mainly organic-walled dinoflagellate cysts, acritarchs and pollen) and organic molecules for paleothermometry (e.g. TEX₈₆ and U^{K'}₃₇) from site U1318. With these proxies, the development of the Mi-3 event and following Mi-4 have been reconstructed in high resolution (ca. 13 kyr), by assessing e.g. temperature, sea level, thermocline depth and productivity. A pronounced cooling can be observed at Mi-3, and to a lesser degree in Mi-4 as well, together with a sea-level fall and a turnover in the dinocyst record. Our findings also include indications of aridification and a change in wind patterns during Mi-3. This confirms the dramatic impact of the Mi-3 event, not only on the North Atlantic Ocean, but also on the continent.

KEYWORDS: 4950 PALEOCEANOGRAPHY Paleoecology, 4952 PALEOCEANOGRAPHY Palynology, 1050 GEOCHEMISTRY Marine geochemistry, 9605 INFORMATION RELATED TO GEOLOGIC TIME Neogene.

(No Image Selected)

(No Table Selected)

Additional Details

Previously Presented Material: About 50% of the data was presented at the 34th IGC, Brisbane, Australia, the 4th International Geologica Belgica Meeting, Brussels and the PAGES Open Science Meeting, 2013, Goa, India. An age model update however changes the novelty and interpretation of the previously presented results.

Contact Details

CONTACT (NAME ONLY): Willemijn Quaijtaal

CONTACT (E-MAIL ONLY): willemijn.quaijtaal@ugent.be

TITLE OF TEAM: