Geophysical Research Abstracts,
Vol. 11, EGU2009-12567, 2009
EGU General Assembly 2009


# Abrupt climatic events during OIS-3 recorded in terrestrial sediments in the Netherlands: a multi-proxy approach

J.A.A. Bos (1), S.J.P. Bohncke (1), C. Kasse (1), J. van Huissteden (2), J. Schokker (3), F.P.M. Bunnik (3), and J. Wallinga (4)

(1) Department of Paleoclimatology and Geomorphology, Faculty of Earth and Life Sciences, Vrije Universiteit Amsterdam, De Boelelaan 1085, NL-1081 HV Amsterdam, The Netherlands (email: hanneke.bos@falw.vu.nl), (2) Department of Hydrology and Geo-environmental sciences, Faculty of Earth and Life Sciences, Vrije Universiteit Amsterdam, De Boelelaan 1085, NL-1081 HV Amsterdam, The Netherlands, (3) TNO, Geological Survey of the Netherlands, Princetonplein 6, NL-3508 TA Utrecht, The Netherlands, (4) Netherlands Centre for Luminescence Dating, Delft University of Technology, Faculty of Applied Sciences, 2629 JB Delft, The Netherlands

Abrupt climatic changes during Oxygen Isotope Stage 3 (OIS-3 or Weichselian Middle Pleniglacial) are revealed in the oxygen isotope records of the Greenland ice cores and in the North Atlantic marine cores. In the Greenland ice cores, these so-called D/O cycles start with a rapid warming of 5-10˚C within a few decades, followed by a phase of gradual cooling over several hundred to more than a thousand years and often end with a final reduction in temperature back to cold, stadial conditions. On the adjacent European continent, however, climatic variability during this time interval is poorly known. High-resolution terrestrial records are scarce and the discontinuous nature of sedimentation and repeated erosion on the continent combined with poor dating control often hampers a detailed study of the vegetation and climate.

In this contribution, a Middle Weichselian sequence with shallow lacustrine deposits, intercalated by fluvial sediments with permafrost features, is presented from the Netherlands. Within this Middle Weichselian sequence, rapid warming events are assumed to have given rise to thawlake formation and/or deposition of organic-rich lacustrine sediments, while the extreme cooling events of the D/O cycles are probably represented in the sequences by clastic intervals during which periglacial features developed.

In the sixties of the last century, two warming events or “interstadials” were first recognized and described from terrestrial Middle Weichselian sequences from the Hengelo basin in the Netherlands, the Hengelo- and Denekamp interstadials, respectively. The shift from a polar desert to shrub tundra (i.e. Hengelo interstadial) and tundra to shrub tundra (i.e. Denekamp interstadial), visible in the pollen diagrams of this area, was interpreted as a temporary amelioration of the climate and were therefore given the names of interstadials. In time the Hengelo- and Denekamp interstadials were also correlated with D/O cycles 12 respectively 8 in the oxygen isotope records. However, in the oxygen isotope records of the Greenland ice cores and in the North Atlantic marine cores many more D/O cycles are present that are not recognized in terrestrial deposits from NW Europe.

In this new study the locality of the Denekamp and Hengelo interstadials in de Hengelo basin was re-visited and relatively new methods were employed (e.g., OSL- and AMS 14C dating, delta 18O and delta 13C analyses on terrestrial calcareous deposits), which were not available during the 1960’s. This new high-resolution multi-proxy study includes analyses of botanical and zoological remains, measurements of organic matter (LOI) and determination of stable isotopes ratios of oxygen (delta 18O) and carbon (delta 13C). A more accurate absolute chronology of the sediment sequence will be obtained by the combination of a large number of AMS 14C dates from the organic intervals and OSL dates from the clastic intervals. With this new study the following questions can be answered:

Does the combined evidence from the Denekamp- and Hengelo interstadials show a rapid warming signal followed by a gradual cooling?

Are these well-known interstadials a reflection of a D/O cycle and with which D/O event can they be correlated?

Was the formation of these organic deposits not influenced by climatic factors but by local hydrological factors?