



Developments in the use of high-resolution X-Ray fluorescence core scanning data of varved sediments for paleoclimate studies: an example of Lake Meerfelder Maar, Germany.

Celia Martin-Puertas (1), Rik Tjallingii (1), Menno Bloemsma (2), and Achim Brauer (1)

(1) Deutsches GeoForschungszentrum Potsdam, 5.2, Potsdam, Germany (celia@gfz-potsdam.de), (2) Delft University of Technology, Faculty of Civil Engineering and Geosciences, Department of Geotechnology, Stevinweg 1, NL-2628CN Delft, The Netherlands

The annually laminated record of the Lake Meerfelder Maar (Germany) is one of the most significant paleoclimatic archives in central Europe because of i) its robust chronology based on varve counting and tephrochronology, and ii) its very high sensitivity to the North Atlantic climate variability. In this study, varve thickness and micro X-ray fluorescence (XRF) data are combined with the published decadal to centennial resolved pollen assemblage between 11,700 to 9,000 yr BP. This period covers two major biostratigraphic stages in Europe, i.e. the Preboreal and the Boreal climatic periods. We focus on the timing and duration of the Preboreal-Boreal climatic transition, as well as short-lived cooling events in the North Atlantic region such as the Preboreal Oscillation (PBO). Due to the predominantly basaltic composition of the MFM catchment, we use normalized Titanium (Ti) intensities as a proxy for detrital influx. This is in close agreement with changes in varve thickness indicating that the lake variability is mainly driven by the annual detrital discharge into the lake. Statistical clustering of the XRF data reveals six chemostratigraphic units coinciding with major changes in local vegetation. The stratigraphical boundary coinciding with the Preboreal-Boreal transition is dated at 10,690 varve yr BP. This is characterized by an abrupt increase in detrital material, likely because of a change to wetter conditions in the central Europe. Although the PBO is not clearly identified in the MFM pollen record, a individual cluster from 11,230 to 11,020 varve yr BP broadly coincides with the timing of the PBO in the North Atlantic region, suggesting this cool event lasted ca 200 years in central Europe. The most significant change in the lake occurred between 9,655 and 10,530 varve yr BP, when detrital influx nearly completely ceased and varves were poorly preserved. However, this interval within the Boreal period has no counterpart in the pollen record and, therefore, no clear climatic cause. Alternatively, an elevated lake level and the development of a river delta might have blocked detrital supply to the deeper part of the lake during this period.