



Reconstructing Late Pleistocene air temperature variability based on branched GDGTs in the sedimentary record of Llangorse Lake (Wales)

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This study aims to provide a temperature reconstruction of the Lateglacial sediments of Llangorse Lake. A new temperature proxy is used, based on the occurrence of different membrane lipids of soil bacteria (de Jonge et al., 2014). Application of this proxy on lacustrine environments is difficult because of in situ (water column) production and co-elution of isomers. Pollen analysis provides a palynological record that can be used for biostratigraphical correlation to other records.

Llangorse Lake lies in a glacial basin just northeast of the Brecon Beacons in Powys, South Wales. The lake is located upstream in the Afon Llynfi valley, at the edge of the watershed of the River Wye. The lake consists of two semi-separated basins with a maximum water depth of 7.5 m, arranged in an L-shape with a surface area of roughly 1.5 km².

Previous studies have focused on the Holocene development of the lake and its surrounding environment (Jones et al., 1985). This study focuses on the deglacial record that appeared to be present in the basal part of the sequence. The lake was cored in the September, 2014 with a manual operated 3 m piston corer from a small coring platform. Overlapping cores were taken to form a continuous 12 m core, spanning the Holocene and the Lateglacial sediments.

Six adjacent Lateglacial core segments from the southern basin of Llangorse lake were scanned for their major element composition using XRF scanning at 5 mm resolution to discern changes in sediment origin. Furthermore, loss on ignition (LOI) analysis was used to determine the changes in organic content of the sediments.

Subsamples of the Lateglacial sedimentary record were analyzed for the occurrence of different bacterial membrane lipids (brGDGTs: branched glycerol dialkyl glycerol tetraethers) by means of HPLC-MS (high performance liquid chromatography and mass spectrometry) using two silica columns to achieve proper separation of isomers (de Jonge et al., 2013). Air temperatures are reconstructed using a multiple linear regression index based on the relative abundance of the brGDGTs. This allows for the quantification of the temperature fluctuation in the events leading up to the Holocene warming, especially the Interstadial (GI-1) warming, subsequent Stadial (GS-1) cooling and eventual transition into the Interglacial period.

References:

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