



Spatiotemporal patterns of hydrological changes during the onset of the Younger Dryas along a W-E transect in Europe from decadal resolved lacustrine lipid biomarker D/H records

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To better understand mechanisms and feedbacks of hydrological changes during abrupt climatic changes, such as the onset of the Younger Dryas (YD) cold period, we applied biomarker based paleohydrological proxies to three well dated, high-resolution lacustrine sediment profiles along a 900km W-E transect from Western Germany to Eastern Poland.

Here we present biomarker hydrogen isotope records (δD values) from terrestrial and aquatic sources from three sites (Meerfelder Maar, western Germany [MFM]; Rehwiese, eastern Germany [RW]; Trzechowskie, central Poland [TRZ]) that contain annually laminated sediments and common tephra layers, allowing the identification of leads and lags in the response of the hydrological cycle to YD cooling on decadal timescales.

We observed a decrease in biomarker δD values 170 and 100 years before the biostratigraphically defined onset of the YD at 12,679 in western (MFM) and eastern Germany (RW), respectively. These changes coincide with the onset of Greenland Stadial 1 in the NGRIP icecore at 12,846 years BP and imply a common climatic forcing, likely cooling. In eastern Poland however, at TRZ biomarker δD values start to decrease only at the YD onset. Further, we observed that the onset of aridification at all three sites coincided with the onset of the YD. A decrease in the magnitude of changes in biomarker δD values and aridification from W to E suggests a more gradual and less strong aridification in eastern Europe.

Our results suggest that hydrological changes at the onset of the YD were strongest and most abrupt in western Europe, where a substantial increase in aridity occurred over just 80 years, resulting in widespread environmental changes [1]. These differences in magnitude and the distinct temporal succession could be related to the influence of the Fennoscandian ice sheets and/or the Siberian High on atmospheric circulation in eastern Europe.

[1] Rach O, Brauer A, Wilkes H, Sachse D. Delayed hydrological response to Greenland cooling at the onset of the Younger Dryas in western Europe. *Nat Geosci.* Nature Publishing Group; 2014;7:109–112.