

Publication

A dual-biomarker approach for quantification of changes in relative humidity from sedimentary lipid D/H ratios

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Past climatic change can be reconstructed from sedimentary archives by a number of proxies. However, few methods exist to directly estimate hydrological changes and even fewer result in quantitative data, impeding our understanding of the timing, magnitude and mechanisms of hydrological changes. Here we present a novel approach based on $\delta^2\text{H}$ values of sedimentary lipid biomarkers in combination with plant physiological modeling to extract quantitative information on past changes in relative humidity. Our initial application to an annually laminated lacustrine sediment sequence from western Europe deposited during the Younger Dryas cold period revealed relative humidity changes of up to 15% over sub-centennial timescales, leading to major ecosystem changes, in agreement with palynological data from the region. We show that by combining organic geochemical methods and mechanistic plant physiological models on well characterized lacustrine archives it is possible to extract quantitative eco-hydrological parameters from sedimentary lipid biomarker $\delta^2\text{H}$ data.

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