



Dynamic environmental response to the Younger Dryas cooling in the sediment record of Lake Gościąż

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The last deglaciation in the northern hemisphere was interrupted by several short cold setbacks of which the Younger Dryas (YD) was the last and most pronounced. This abrupt and extreme cold period provides valuable insights into regional climate and environmental responses. To decipher the rate of such rapid changes continuous climate archives of annually laminated (varved) sediments are crucial.

Lake Gościąż (central Poland) exhibits an iconic varved lake sediment record that is one of the few European lake records preserving varves throughout the complete YD. To re-investigate this archive, 10 new sediment cores have been obtained along a N-S transect through the deepest part of the lake basin. We used a combination of continuous microfacies analyses, XRF element core scanning, μ -XRF mapping, and high-resolution chironomid-inferred mean July air temperature as well as analyses of stable oxygen and carbon isotopes.

Lacustrine sedimentation begins in the late Allerød, is briefly interrupted by a slump during the early YD and proceeds continuously afterwards. Here, we present a first continuous microfacies investigation of the complete YD in Lake Gościąż. Varve composition during the YD is the most complex and variable one, featuring primarily diatom frustules, calcite, re-worked and re-suspended material. Contrastingly, the simpler structured varves during the early Preboreal and late Allerød are characterized predominantly by calcite, rhodochrosite and dissolved organic matter. The change in microfacies at both YD transitions occurs not simultaneously with the other proxy responses.

Causes of and differences in proxy responses in regard to the dynamics of environmental change during a major change in climate are discussed. Further, we conduct a proxy comparison at both YD transitions and provide a detailed documentation of the transitions through μ -XRF mapping.

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