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Climatic and environmental conditions during the Younger Dryas-Holocene-Transition in Lake Gościąż

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The termination of the last deglaciation in the northern hemisphere was marked by the abrupt Younger Dryas (YD) cold event. This abrupt event provides valuable insights into the sensitivity of the climate system, especially into high-resolution climate archives, like annually laminated (varved) lake sediments.
Lake Gościąż (central Poland) offers one of the longest and best-preserved varved lake sediment sequences in Europe, ideal for the climatic and environmental reconstruction of the YD. Therefore, three new parallel sediment cores have been obtained to re-investigate this iconic record. A high-resolution methodological approach was applied, combining microfacies data with μ-XRF element core scanning, which was complemented by organic carbon, carbonate and stable oxygen and carbon isotopes analyses.
Due to a major slump in our cores, the Allerød/YD transition is not recovered and the varved record starts in the early YD. The YD/Holocene transition is defined by means of biostratigraphy which correlates well to previously investigated cores. Our new floating varve chronology comprises 1346 $\pm$ 14 varve years reaching from the early YD into the early Holocene. Detailed microfacies analyses revealed two different varve microfacies types for the YD and Holocene. The YD is characterized by sublayers of resuspended material, calcite and diatom frustules. The detrital flux is slightly increased, but does not form a distinct sublayer. In contrast, the Holocene varves are less complex and mainly consist of calcite and organic sublayers. Discrete diatom sublayers are not formed, detrital material is almost completely absent, and resuspension is clearly decreased. The sharp transition in varve microfacies occurred 47 varves after the biostratigraphically defined onset of the Holocene. The distinctly larger interannual variability in varve microfacies during the YD indicates less stable climate conditions than in the Holocene.
In more general, the YD/Holocene transition is characterized by successive shifts of different proxies within at most 160 varve years. Chemical element variations show either a single sharp shift or a sequence of oscillations, occurring around the biostratigraphic boundary. δ18Ocarb values increase and δ13Ccarb values decrease within 37-62 varves, commencing roughly at the biostratigraphic boundary and ending after the change in microfacies.
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