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Early Holocene lake ecosystem development in the southern Baltic lowlands

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The first millennia of the Holocene are characterized by gradual and rapid environmental changes following the warming at the beginning of the Holocene superimposed by short-term climatic instability. Landscape evolution during this period occurred at different time scales due to specific response times of landscape compartments like vegetation succession, soil formation and permafrost thawing. As a consequence, a spatiotemporally heterogeneous pattern of changes occurred particularly in regions close to the margins of the continental ice sheets like the Baltic region. Regional atmospheric circulation patterns were affected by cold catabatic winds from the remains of the Fennoscandian ice sheet. The ongoing deglaciation further influenced the regional climate through meltwater release and related changes in the North Atlantic thermohaline circulation. Both effects declined with the progressive ice sheet melt down. Additionally, the land-sea distribution in the North Sea changed drastically during the final melting phase of the glacial ice sheets. The Baltic Sea development is even more complex due to the strong glacio-isostatic adjustments effects that resulted in open and closed water stages affecting the entire Baltic realm.

Consequently, the early Holocene interval of sediment records from the southern Baltic lowlands are not considered as straightforward palaeoclimate archives but need to be interpreted in a broader context. We present five partly varved lake records from northern Poland all including an intriguing highly organic-rich interval interrupting biochemical calcite precipitation at about the same time between 10.5 and 10.2 cal kyr BP. These sediment records have been correlated by independent age models based on varve counting, AMS 14C dating, biostratigraphy and tephrochronology. We present multi-proxy records of early Holocene sediments and our preliminary interpretation suggests hydrological processes as the main reason for the intriguing shifts in lake sedimentation. Possible triggers for this hydrological change include regional climatic fluctuations as well as catchment processes driven by factors like vegetation succession and, possibly, late permafrost thawing which modified the groundwater system.

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