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Regional climate signal modified by local factors - multi core study records (Lake Czechowskie region, N Poland)

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Lake sediments can be utilized as valuable paleoclimate and environmental archives as they contain information of past changes. Multi-proxy analyses of sedimentary compartments (e.g. pollen, diatoms, Cladocera) reveal those changes. However, to decipher the spatial variability of past climate changes and to define the proxies suited for local and regional scale reconstructions archive comparisons are needed.
Here we present a detailed multi-proxy study from four different sediment cores covering the Younger Dryas cold period from the Lake Czechowskie region (N Poland). Three cores are located along a transect in the Lake Czechowskie basin from its deepest point towards a former lake bay close to today's shoreline. The fourth lacustrine sediment core was retrieved from the Trzechowskie paleolake, app. 1 km W from Lake Czechowskie. The dataset comprises information from pollen (AP, NAP, Juniperus, Betula-tree, Pinus silvestris), diatom (planktonic/benthic index, diatom valve concentration, dominant species), Cladocera (planktonic/benthic index, dominant species, number of Cladocera species, total sum of specimens) and geochemical (TOC and $CaCO_3$ content, mineral matter, titanium) analyses.
At the beginning of the Younger Dryas the AP pollen share decreased and NAP and Juniperus pollen increased in all studied locations. The mineral matter and titanium record showed higher values in two cores taken from the deepest parts of Lake Czechowskie and the core from Trzechowskie paleolake while in the core located at the marginal part of the lake it was already high in Allerød and it did not change much in Younger Dryas. The Cladocera based indexes: total sum of specimens and number of species decreased at the beginning of YD but on the contrary the Cladocera species composition changes were site-specific. The diatoms valve concentration index significantly lowered in core from the deep location while on the contrary increased in core from paleolake Trzechowskie.
Our results showed that pollen analysis is a sensitive proxy to reconstruct regional vegetation changes during the Younger Dryas. The diatoms assemblages were more influenced by local condition than the Cladocera related proxies. The latter revealed a higher sensitivity to climate change during the Younger Dryas. The geochemical analyses indicates the increase of erosion in three cores during the cold period. The core situated close to a hill slope did not reflect major changes as this location is generally more prone to erosive processes.
In conclusion, multi-proxy investigations are a crucial necessity for a comprehensive understanding of past changes. The value of archive comparison on a local scale furthermore highlights the potential to detect and consider the opportunity of spatial variable responses of paleoclimate proxies.
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