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Last Glacial to Holocene lacustrine Environment of a large Impact Lake in the Subarctic of northeastern Canada: Implications for former Meltwater Events

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Two joint Canadian-German expeditions at Lake Wiyâshâkimî (56.2°N, 74.4°W) were devoted to limnogeological research of the deglacial history of the Laurentide Ice Sheet in northeastern Canada. The lake is located on the Canadian Shield, roughly 150 km east of the southern Hudson Bay coast. It was formed by two meteorite impacts in the late Ordovician and early Permian. The intersected double crater structure of the 60 x 30 km large and up to 178 m deep lake is preserved until today. During the Quaternary, it was repeatedly covered by the Laurentide Ice Sheet. A hydrolological survey in summer 2023 confirmed the oligotrophic nature and well mixed water column of the freshwater lake. Geophysical subbottom profiling exhibited an ice-scoured bottom of the lake floor with only a thin veneer of postglacial mud. An 8 m-long sediment core was taken in spring 2024 at 110 m water depth within a depression including a pocket of preserved older sediments. Sediment analytics comprised radiocarbon dating, smear-slide studies, elemental x-ray scanning, determination of total organic carbon and nitrogen, pollen analysis as well as stable-isotope analysis of organic carbon ($\delta^{13}C$) and oxygen of diatom frustules ($\delta^{18}O$). The lower 6.5 m of the sediment core sequence comprises meltwater sands partly varve-like laminated. Radiocarbon ages of this interval scatter around 30 cal ka BP and are difficult to ascertain, because of reworked older organic matter. The sand is overlain by a 0.65 m thick grayish clay layer with a basal age of 22 cal ka BP. It provides evidence for stagnant glaciolacustrine conditions below or in front of the retreating Laurentide Ice Sheet. The deposition of brownish diatom-bearing organic muds started at 6.5 cal ka BP. Pollen data indicate Holocene reforestation in the catchment since that time. This timing is well consistent with geomorphological evidence of regional glacial decay. Based on geochemical indicators, there is no evidence for a marine incursion related to the 8.2-ka event.