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Dynamics and evolution of subglacial to postglacial environments inferred from Pingualuit Crater Lake sediments (Nunavik, Canada)

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High latitude glacial environments are particularly sensitive to current climatic changes. The main objective of this study is to characterize the succession of late Pleistocene glacial environments using a multiproxy approach on high latitude lacustrine sediments (Pingualuit Crater Lake, Nunavik) in order to examine the natural variability and glacier dynamics since the Last Glacial Maximum. The Pingualuit Crater Lake (water depth: 246 m) is located near the former centers of successive North-American ice sheets and has probably subsisted to a certain degree as a subglacial lake during past glacial periods, as suggested by hydraulic potential modeling performed for the Last Glacial Maximum. These results support the hypothesis that the sediments accumulated in the meteoritic impact crater since its formation (1.4 Ma) may have escaped glacial erosion and potentially contain a unique paleorecord covering several glacial/interglacial cycles in the terrestrial Canadian Arctic. The 9 m-long sedimentary sequence retrieved (part of a minimum of 140 m-thick sediment sequence according to previous seismic surveys) in the deep basin of the lake mainly reflects the last phase of the deglaciation and the postglacial period, which is notably characterized by the inception of lacustrine productivity ca. 6850 cal BP. The major environmental transition recorded at 6800 cal BP in numerous terrestrial and marine archives from eastern Canada could thus be related to the final disintegration of the last remnants of the Laurentide Ice Sheet. Moreover, detailed micro-morphological analysis of the sediments allowed to determine and characterize the succession of original glaciolacustrine environments (subglacial to proglacial) during the last deglaciation. The highly deformed glacigenic sediments released by the melting of the above ice-sheet provide insights into the dynamics and timing of the past glacial (e.g. glacial dispersion trains, estimation of the crater englaciation by infrared stimulated luminescence around 70 ka) and interglacial periods (e.g. pollen grains from former warm periods). However, future paleoclimatic studies of the entire sedimentary record archived in Pingualuit Crater Lake may be complicated by glacial reworking and mass wasting processes, as well as by the low sedimentation rates during ice-free periods.