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Geochemistry of subglacial Lake Whillans, West Antarctica: Implications for microbial activity.

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Subglacial Lake Whillans is located beneath the Whillans Ice Stream in West Antarctica. The lake is situated beneath 800 m of ice and ~ 70 km upstream of the grounding line where Whillans Ice Stream terminates into the Ross Sea. Water and sediment samples were recovered from the lake, using clean access drilling technologies, in January, 2013. Isotopic analysis of the lake waters indicates basal meltwater from the ice sheet as the dominant water source. Geochemical analysis of the lake waters reveal it is freshwater with total dissolved solids concentrations about 1/70th that of sea water. However, mineral weathering is a significant source of solute to the lake water with a contribution also from sea water. Nutrients N and P are present at micromolar concentrations.
The sediment porewaters from shallow cores (~ 40 cm depth) of the subglacial lake sediments indicate increasing solute concentration with depth, with up to ~ five times greater solute concentrations than in the lake waters.
Collectively the aqueous geochemistry indicates an environment favorable for microbial activity. Thus, microbially-driven mineral weathering appears likely beneath the Whillans Ice Stream, as has been demonstrated in other subglacial systems, including in subglacial sediments of the neighboring Kamb Ice Stream.

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