



Antarctic subglacial groundwater: measurement concept and potential influence on ice flow

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Is groundwater abundant in Antarctica and does it modulate ice flow? Answering this question matters because ice streams flow by gliding over a wet substrate of till. Water fed to ice-stream beds thus influences ice-sheet dynamics and, potentially, sea-level rise. It is recognised that both till and the sedimentary basins from which it originates are porous and could host a reservoir of mobile groundwater that interacts with the subglacial interfacial system. According to recent numerical modelling up to half of all water available for basal lubrication, and time lags between hydrological forcing and ice-sheet response as long as millennia, may have been overlooked in models of ice flow. Here, we review evidence in support of Antarctic groundwater and propose how it can be measured to ascertain the extent to which it modulates ice flow. We present new seismoelectric soundings of subglacial till, and new magnetotelluric and transient electromagnetic forward models of subglacial groundwater reservoirs. We demonstrate that multi-faceted and integrated geophysical datasets can detect, delineate and quantify the groundwater contents of subglacial sedimentary basins and, potentially, monitor groundwater exchange rates between subglacial till layers. We thus describe a new area of glaciological investigation and how it should progress in future.