



Subglacial sediment provenance and transport in West Antarctica from micropaleontologic analysis of Subglacial Lake Whillans and the upstream sectors of the Whillans and Kamb ice streams

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The WISSARD (Whillans Ice Stream Subglacial Access Research Drilling) project recovered sediment cores from Subglacial Lake Whillans (SLW) in West Antarctica. We report preliminary micropaleontological analyses of SLW sediments, augmented by analysis of sediments previously recovered from beneath the upstream camps of the Whillans Ice Stream (WIS) and Kamb Ice Stream (KIS). Microfossils in these sediments (notably diatoms, sponge spicules, and organic-walled palynomorphs), include information regarding sediment transport, subglacial physical processes and ice sheet history. Absolute abundance (particles per gram dry sediment) of identifiable diatoms and diatom fragments in different size classes were calculated to compare and contrast each environment. Sponge spicules are being analyzed for taphonomic effects from subglacial transport and shearing. Palynomorphs are analyzed for abundance, diversity, and source rock ages.

In SLW the upper 30 cm is softer and more water-rich than the underlying sediments. However, no statistically significant variation in microfossil and fragment abundance or taphonomy is noted in these diamictons, which is in agreement with the stratigraphic homogeneity evident from geochemical and geological analyses performed to date. SLW contains 1.52×10^6 to 1.13×10^7 diatom fragments per gram, compared with 6.43×10^6 to 4.63×10^8 at upstream WIS and 6.13×10^7 to 1.58×10^8 at KIS. Whole diatoms are orders of magnitude lower in concentration. Low abundance and poor preservation of diatoms and spicules at SLW suggests relatively long distance transport from their marine sediment source, with evidence of high shear strain, following the subglacial shearing index of Scherer et al. (2004). Upper Miocene diatoms dominate all samples analyzed, though older and younger diatoms are noted as well. The WIS samples exhibit the highest diversity of diatoms, including Paleogene freshwater diatoms. KIS sediments have the highest abundance of whole diatoms, but they are characterized by low diversity, indicating local erosion of an Upper Miocene deposit. Palynomorphs in all of the samples demonstrate a sizable contribution of Eocene terrigenous material. The quantitative analysis of microfossils preserved in these sediments is revealing a complex set of subglacial processes. Constraining the heterogeneity of subglacial sedimentary environments and sediment transport is providing important data for understanding and modeling current and past WAIS behavior.