



Basal characteristics of the main sticky spot in the ice plain of Whillans Ice Stream

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Understanding the processes that affect streaming ice flow and the mass balance of glaciers and ice sheets requires sound knowledge of the subglacial environment. Areas of high basal drag along ice streams and glaciers, termed sticky spots, are of particular interest because they inhibit the fast flow of the overriding ice and can act to redirect subglacial water flow. Whillans Ice Stream (WIS), along the Siple Coast of the West Antarctic Ice Sheet, conducts diurnal stick slip motion, largely due to a sticky spot within the main trunk of the ice stream. Previous studies have shown evidence of continuous deformable subglacial sediment presence, which is a prerequisite for fast ice stream flow. We present results from a seismic reflection experiment performed along the flow of the WIS sticky spot to image the subglacial setting related to this basal feature and elucidate its role in ice dynamics. Our results show a presence of a laterally continuous 6 m thick basal till, having P wave velocities of greater than > 1800 m/s and densities upwards of 1900 kg/m³ indicative of a stiff till suggesting the underlying bed is stronger than the overflowing ice, causing drag to the ice stream flow and possibly the main cause of the sticky spot.