

Tidal Modulation of Siple Coast Ice Stream Flow

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The discovery of tidal modulation on the motion of Whillans Ice Stream and ice stream D and the seismicity of ice streams C and D was followed up with a more extensive survey of motion and seismicity on all Siple Coast ice streams in 2003-04. 21 GPS stations sampling at 15-second intervals, 7 event-triggered seismometer networks and one tiltmeter collected data for more than two summer months. Seismic data are discussed elsewhere.

All ice streams showed tidal modulation of flow. On streams with multiple stations, the magnitude of tidally modulated flow variations decreased upstream. Whillans Ice Stream was the only case where stick-slip motion was observed. There the magnitude of slip events appears positively correlated with tidal amplitude—four full spring/neap tidal cycles were observed. Slip events were observed as much at the station 190 km from the grounding line, but not at the next station 320 km upstream (Upstream B camp). Slip events were nearly synchronous along Whillans Ice Stream. 3-station solutions of the initial slip location clustered at a point at or near the north margin of the ice plain and produced a propagation speed of 89.9 ± 12.6 m/s, very close to the previously published value.