Dynamics of the Grounding Line of Whillans Ice Stream

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The dynamics of a portion of the grounding line of Whillans Ice Stream is reported using a combination of satellite data and GPS observations. The grounding line is considered at two time scales. Firstly, Radarsat interferometry grounding line picks from late 1997 are compared to late 2003 GLAS ICESat picks, and a kinematic GPS survey from late 2004. Secondly, a strain grid occupation, which straddled the grounding line in late 2004, is reported and interpreted.

The grounding line picks between 1997 and 2004 show a small apparent retreat, of the order of a kilometer, over the seven year period. This may, however, be due to uncertainties in the Radarsat grounding line positions and how they relate to the grounding zone (i.e. which point in the grounding zone the Radarsat picks correspond to).

The strain grid data allows a detailed examination of the grounding zone over a tidal cycle, during which strain is correlated with tidal motion. Even at timescales as short as one day, a period at which others have assumed elastic behavior, we observe inelastic deformation. We address this inelastic deformation by comparing Young's modulus at different phases of the tidal cycle, and observing the magnitude of strain evident across the network.