

Decadal flow variations of Whillans and Kamb Ice Streams from high resolution GPS measurements

Lucas Beem and Slawek Tulaczyk

The ice streams of West Antarctica may undergo cyclical changes in behavior due to time variant basal conditions. The Whillans and Kamb Ice Streams offer a comparison between two ice streams at different phases within this cycle. Each may be an analogue for future or past behavior of the other.

The Global Positioning System produces high resolution velocities and strain rates of the ice surface. Repeat surveys of velocity profiles and strain grids on the Kamb Ice Stream have occurred periodically between 1980 and 2007. Coupled with remote sensing of ice surface topography from IceSAT and airborne LiDAR an evolution of the Kamb Ice Stream over the last decade and beyond is possible.

For the Whillans Ice Stream, a network of currently deployed continuous GPS stations examine the influence of subglacial Lake Whillans on the surrounding ice motion. The GPS measurements show that the lake has been filling, from near a low stand, for the last two years. A draining of the lake has yet to be observed.

Whether each of these ice streams truly behaves as the other is yet to be seen, but observed changes allow for inferences about the changing and dominate resistive stresses controlling glacial flow.

The results of these surveys show the Kamb ice stream remains within a consistent pattern of deceleration and thickening for the time period investigated, despite modest increases in driving stress. This suggests continued basal strengthening. The Whillans Ice Stream likewise continues to decelerate, but at an increasing rate. The influence of a filling subglacial lake may have limited effect on the temporal and spatial patterns of ice movement.