

The influence of stick-slip motion on the present deceleration of the Whillans Ice Stream

Paul Winberry¹, Sridhar Anandakrishnan², Richard B. Alley², and Doug Wiens³

1: Central Washington University

2: Penn State

3: Washington University in Saint Louis

The Whillans Ice Stream (WIS) is major route for ice transiting from the interior of the West Antarctic Ice Sheet (WAIS) into the Ross Sea. It has been observed that the WIS has been slowing, contributing to a positive mass balance in the Ross Sea sector of the WAIS. Superimposed on this decadal-scale deceleration is a tidally modulated stick-slip characterized by extended periods (6-24 hours) of minimal motion followed by brief periods (30 minutes) of rapid motion when the ice stream lurches forward by ~ 0.5 m. Comparison of new results collected during 2010-2011 with earlier measurements show that the deceleration has continued and the timing of slip events has become less regular, often slipping only once during a day instead of previously observations that documented two slip events daily. The reduced regularity of slip events has resulted in a less efficient release of stored elastic strain during slip events. These observations highlight non-linear feedbacks at the daily-scale that influence the decadal time-scale behavior of the ice stream.