

How sticky are sticky spots? Constraints from passive seismic observations

Paul Winberry, Sridhar Anandakrishnan, and Richard Alley

The fast movement of ice streams is permitted by efficient basal lubrication over most of the ice stream bed. For this reason isolated regions of enhanced resistance, or sticky spots, play a significant role in restraining ice stream motion. To help quantify the importance of sticky spots in the force budget of an ice stream we deployed a seismic array approximately 5 km from a small sticky spot near the grounding zone of Bindschadler ice stream. The sticky spot, delineated by heavy surface crevassing, is about 1 km in diameter and is associated with a small bedrock bump. Our array operated for a three week period during the 2005-2006 field season. During our observational period we recorded over 10 large icequakes (larger than magnitude 1) originating from the ice stream bed near the sticky spot. These icequakes are several orders of magnitude larger than icequakes previously observed on the Siple Coast and represent large releases of energy in less than one second. The largest events require as much as 1 meter of displacement on a 1 square kilometer patch of ice stream bed during a single icequake. Given our short observational period, our data suggest that over long time scales this sticky spot may balance a significant portion of the ice streams driving stress. This presentation will report on locations and energy release from these events to provide insight into the dynamics of ice stream sticky spots.