Icequakes! Microseismic 'Sticky Spots' in Rutford Ice Stream, West Antarctica.

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Microseismic emissions from the base of Rutford Ice Stream, West Antarctica, were recorded over a 34-day period using ten three-component instruments on the surface of the ice stream. Around 3000 microseismic events were detected and located. Events are concentrated in spatial clusters that are likely to be 'sticky spots': areas of increased basal friction where shear stress is concentrated. The 'sticky spots' turn on and off over the recording period becoming inactive for a period of time before being re-activated in the same location. The constant nature of these locations indicates a temporal stability in the basal regime despite the fact that rapid changes have been seen at the bed in this area (erosion and drumlin formation). Furthermore, events in each location cluster have a consistent waveform at a given receiver and a consistent source mechanism determined by fault plane analysis.

The source mechanisms for these microseismic events show variation between clusters. Evidence of low-angled thrust faults in the ice flow direction suggest basal sliding is occurring in some regions and that in these regions basal flow is in the same orientation as surface flow, despite considerable bed topography. However, more complex source signatures in other regions indicate a spatial change in the basal processes over the survey area. An increased understanding of basal processes is fundamental in our ability to predict the evolution and future contribution to global sea level rise of ice sheets. Passive microseismic monitoring is proving to be an effective tool for investigating many aspects of this.