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Radar studies of the lower trunk of Kamb Ice Stream

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During the past two Antarctic field seasons, we acquired approximately 1600 km of ground-based ice-penetrating radar data on the lower trunk of Kamb Ice Stream (KIS) as part of a larger radar, GPS and modeling study examining the possibility of ice stream reactivation. Some of the profiles explore a region of near-stagnant ice, the 'sticky spot, which was the focus of extensive borehole studies by California Institute of Technology (Cal Tech) in 1996 and 2000 (Engelhardt, 2005). We also investigated portions of the trunk of KIS including a 294 km along-flow profile starting from approximately 80 km upstream of the sticky spot and extending to Siple Dome drill site.

The St. Olaf $\sim$3 MHz radar imaged bedrock and internal layer stratigraphy in detail, in many cases depicting layers nearly to the bed. We have identified a very strong internal reflector at about two-thirds to three-fourths of the ice thickness in all profiles. The reflector is likely the same one that has been detected throughout West Antarctica in ITASE traverses (Jacobel and Welch, 2004) and dated to 17.5 KY from highly acidic eruptive material in the Byrd ice core (Hammer *et al.*, 1997). The layer reflections are strongest within the trunk of KIS and decrease in amplitude abruptly at the ice stream margins, suggesting that the (unknown) source of the volcanic material is closer to the catchment-area of KIS rather than being equidistant from the KIS trunk and nearby inter ice stream ridges (e.g. Siple Dome).

We have also produced maps of variations in bed reflectivity that corresponds closely (but not identically) with the surface expression of the sticky spot in satellite imagery. Bright areas of the bed are found in the trunk of the ice stream on both sides of the sticky spot extending well upstream and downstream. The south margin of the sticky spot also has a highly reflective bed, an area where a layer of liquid water was iden-

tified in Cal Tech borehole 00-01 (Engelhardt, 2005). If we interpret the bright areas as indicating the presence of water at the bed, KIS appears to be capable of resuming fast flow after a shut down of some 170 years.

Our bed amplitude studies are augmented by four densely-spaced constant midpoint profiles that enable us to characterize attenuation and EM-wave speed within the ice at locations that are both stagnant and fast-moving. In addition, we have re-imaged fold features in the internal layering of the ice that correspond to structures seen in our 1988 ground-based radar studies on KIS when the sticky spot was first identified as overlying an area of raised bedrock (Jacobel *et al.*, 1993, Retzlaff *et al.*, 1993). These two surveys enable us to measure components of the accumulated strain over the intervening 16 years.

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