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Characteristics of the sticky spot of Kamb Ice Stream, West Antarctica

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Amplitude analysis of reflection seismic data has revealed the presence of highly variable bed conditions under the main sticky spot and adjacent regions of the Kamb Ice Stream (KIS—formerly ice stream C). The sticky spot is a local topographic high composed of sediments. Any meltwater draining from upglacier along the base of the ice is routed around the sticky spot. The ice over the sticky spot includes a seismically detectable basal layer containing a low concentration of debris in at least some places, which locally thickens to 40 m over a topographic low in the bed. The ice-contact basal material ranges from soft and highly porous to more-compacted and stiff, and perhaps locally frozen. The softer material is preferentially in topographic lows, but there is not a one-to-one correspondence between basal character and basal topography. We speculate that the 40-m-thick frozen-on debris formed by glaciohydraulic supercooling of lake-drainage events along a basal channel during the former, active phase of the ice stream. We also speculate that loss of lubricating water, perhaps from piracy upstream, contributed to the slowdown of the ice stream, with drag from the sticky spot playing an important role, and with the basal heterogeneity greatly increasing after the slowdown of the ice stream.