

An experimental look at subglacial water drainage

Caitlin Meadows¹, Timothy T. Creyts²

¹University of Michigan, National Science Foundation Summer Internship at Lamont-Doherty Earth Observatory, New York; ²Columbia University, Lamont-Doherty Earth Observatory, New York

Discharge of land-based ice to the global ocean occurs mainly through the fast flow of outlets that are often lubricated by water at the bed. Understanding subglacial water flow gives insight into how lubrication works. Field studies cannot image the small-scale features to show the water distributes spatially over the bed beneath the glacier or ice sheet. A more detailed understanding is gained by combining observations and experimentation. Here, we use tabletop experiments to understand the spatial dynamics of subglacial drainage. We use gelatin as an analog for ice and water is injected from below. The experiments were recorded using a JAI BB-141 High Speed Camera, to observe the motion of the water, and an Xbox 360 Kinect to observe the surface deflection. We observe internal fracture, basal fracture, channelization and viscous fingering that are consistent with the ideas presented by theoretical models and other experiments. Knowledge gained through these experiments can help explain the spatial structure of larger scale phenomena such as subglacial flooding events and fast moving ice streams.