

What are your lakes doing to my glaciers?

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The discovery of numerous active subglacial lakes beneath the Antarctic ice sheet, which exchange water between one another and with other subglacial aquifers, suggests that lake activity may produce large, if temporary, variations in outlet glacier ice velocities, and thus variations in ice discharge into the oceans. This process was observed in 2007 in Byrd glacier, where the discharge of around 1.4 km³ of lake water into the aquifer beneath the glacier resulted in a mean 10% increase in discharge over the course of a year. There are, however, few other examples of simultaneous altimetry and ice speed measurements that would show whether this is the typical glacier response to lake drainage. Here, I present preliminary ice speed variation measurements for Cook and Lambert glaciers. These glaciers are each downstream of large active lakes that discharged 2.7 and 0.8 km³ of water in 2007-08 and 2004-07 respectively. Lambert glacier shows no large variation in ice speed in any of the image pairs examined, and while Cook glacier shows small variations, these may be explained in part by changes in the floating ice around the outlet. Although feature-tracking data from 2009 may yet show significant variations in Cook glacier, it seems likely that neither glacier has responded as strongly as did Byrd glacier, to floods of a similar magnitude. We will discuss the role of basal geometry and substrate in determining the sensitivity of ice speed to subglacial floods, and how this determines the aggregate sensitivity of Antarctic ice discharge to these floods.