

Subglacial lakes and logical extensions thereof

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With the repeat track satellite-based laser altimetry from the GLAS / ICESat mission of 2003 – 2009, it is now commonly known that subglacial lakes that periodically fill and drain underlie many of the fastest flowing ice streams and outlet glaciers of the Antarctic Ice Sheet. This finding has raised two questions for modeling subglacial hydrology: 1. How do subglacial lakes fill and drain? 2. What effect does subglacial lake activity have on the mass balance of the ice streams in which they are found?

Using surface elevation timeseries data from GPS sensors placed over two connected subglacial lakes, Mercer (SLM) and L78, we have extended this record of volume change from the end of the ICESat mission in 2009 to early 2012. Models for flood initiation indicate that outflow from SLM commences before the lake attains maximum value. L78 appears to swell up during times of high discharge from SLM upstream, quickly subsiding following the cessation inflow. At the end of the 2011 – 2012 field season the rate of volume change for SLM, which had been filling, decreased substantially. At this same time L78 appeared to increase in volume. This along with our modeling efforts indicate that at the time of this talk, SLM and the area downstream of it are in full flood stage with water from this system entering the southernmost portion of the Ross Sea.