



A widespread, dynamic sub-glacial water system beneath Whillans and Mercer ice streams revealed using ICESat satellite laser altimetry and image differencing.

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Sequential elevation profiles collected from October 2003 to November 2006 by NASA's ICESat laser altimeter over the Whillans and Mercer ice streams, West Antarctica, have revealed numerous regions of temporally varying elevation. Four of these regions are identified as sub-glacial lakes which form part of a sub-glacial water system, and the signals are interpreted as the surface expression of water movement within the system. Vertical motion and areal extent of some of the regions are confirmed by differencing of MODIS satellite images over the period 2000-2005. One of the new sub-glacial lakes (area $\sim 300 \text{ km}^2$) experienced a rapid 9 m decrease in surface elevation over the period February 2003 to November 2005, which we interpret as a drainage event (volume 2.5 km^3). Overall, the data indicate an active, widespread sub-glacial water system beneath the two ice streams, which shows activity on short timescales. It is likely that this water system exerts an important control on ice flow and mass balance.