



Fifty-two new subglacial lakes discovered beneath the Greenland Ice Sheet

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Over 400 subglacial lakes exist beneath the Antarctic Ice Sheet, and they constitute a fundamental component of the basal hydrological system. Subglacial lakes can accelerate local ice flow velocity, by actively modifying the thermal regime of the ice sheet, or through periodic lake drainage events. In comparison, only four subglacial lakes have so far been identified beneath the Greenland Ice Sheet (GrIS). This study presents the first ice sheet-wide survey of radar depth sounding data from 1993 to 2016, acquired from Operation IceBridge. We have discovered 51 new subglacial lakes beneath the GrIS, inferred principally by characteristic flat, smooth and relatively bright radar reflections at the ice-bed interface. An additional ‘active’ subglacial lake was detected from ice-surface elevation change data and the presence of a new large collapsed basin on the surface of the GrIS. These findings suggest that the storage of basal meltwater in the form of subglacial lakes may be more prevalent in Greenland than previously assumed. In contrast to Antarctica, the majority of Greenlandic subglacial lakes are small (lengths: <5 km) and stable features found beneath relatively slow-moving ice, towards the ice sheet interior. Lakes also show a preferred distribution beneath the northern, northeastern and eastern sectors of the ice sheet. Active subglacial lakes in the ablation zone may have been overlooked due to high surface meltwater input contributing to efficient water routing at the bed and flushing of lakes, causing large seasonal variations. The detection of these subglacial water bodies will have important implications for future hydrological investigations of the GrIS.