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Greenland's supraglacial lakes increase by a quarter in the last 20 years

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Supraglacial lakes represent a fundamental component of the surface hydrology of the Greenland ice sheet. Understanding the relationship of these lakes with ice sheet surface mass balance, geometry, location, and how this has changed through time also informs how their drainage can impact ice sheet subglacial hydrology and seasonal flow dynamics. However, previous studies of supraglacial lakes have been limited in spatial and/or temporal scale relative to the entire ice sheet.

Here we use the entire MODIS Terra archive within Google Earth Engine to derive maps of supraglacial lake cover every day of every melt season for the last 20 years for the entire Greenland ice sheet. Through generating annual composites of where lakes are observed, we identify that the frequency of lakes has on average increased by 27% from 2000-2019. Lakes are observed to be occurring at higher elevations in all sectors of the ice sheet for 2010-2019 compared to 2000-2009. Output from the regional climate model MAR suggests that in the most recent decade higher numbers of lakes are being formed for a given volume of runoff.

The observation of lakes that can form more easily, further inland and at higher elevations have significant implications for future surface mass balance, and potentially the dynamics of inland regions of the Greenland ice sheet.