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# Rapid, catchment scale mapping of supraglacial lakes in Greenland using Google Earth Engine

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The filling and drainage of supraglacial lakes on the Greenland Ice Sheet has a significant impact on seasonal ice dynamics and represents a key component of overall mass balance. However, even with automated methods, the mapping of these on catchment scales can be extremely time consuming due to the requirement to download and process large volumes of imagery.

In this study we leverage the cloud computing capabilities of the Google Earth Engine (GEE) platform to rapidly execute established automated supraglacial lake detection methods. By utilising GEE we are able to circumvent previous requirements to download each image to be analysed, allowing the time series and geographical coverage of supraglacial lake monitoring to be substantially extended compared to previous studies. This is achieved by combining available imagery from Landsats 4, 5, 7, 8; Sentinel 2; and MODIS platforms. This is achieved via a flexible graphical user interface (GUI) that allows users to extract supraglacial lake coverage information from either previously published catchment extents, or user defined regions of interest. The GUI is designed to enable users to obtain these data without the need for additional coding, providing an easy-to-use and intuitive user environment.

We present a test case for the catchment of Kangiata Nunaata Sermia, south-west Greenland (approximately 31,400 km2), with preliminary analysis demonstrating the capability of GEE to extract results for 188 full resolution Landsat 8 images in a processing time of less than 15 seconds. These tools will allow researchers to easily and rapidly extract key information regarding changes in surface ice sheet hydrology for use in both surface mass balance and ice dynamic studies.