



All-season observation of surface and near-surface lakes on the Greenland Ice Sheet using Sentinel-1 C-Band SAR

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Lakes on the surface of the Greenland Ice Sheet play a role in surface mass balance and act as a source of water input to the ice sheet bed, influencing basal sliding. While the distribution and sizes of lakes have been studied extensively using optical remote sensing, little is known about the behaviour of the lakes outside of the peak melt season and the possible multi-year behavioural patterns that lakes and clusters of lakes exhibit. Limited radar investigations using Operation IceBridge have demonstrated the persistence of liquid water in buried lakes near the ice sheet surface over the winter but these data are only available on an annual or semi-annual basis. Early work has demonstrated the potential for C-Band SAR to observe near-surface buried lakes hidden from optical view. These tools may be used to better understand how the water that remains in a lake at the end of a melt season impacts surface hydrology in subsequent months and years.

This study uses Sentinel-1 C-Band SAR to observe lakes on the Western Greenland Ice Sheet over a two year period, using images that span all months of the year. Observations indicate a general gradual transition of lakes from buried liquid water to ice through the winter. Evidence of changes in surface water distribution with time from SAR data will be presented.