Geophysical Research Abstracts
Vol. 20, EGU2018-1887, 2018
EGU General Assembly 2018

Proglacial lake temperature observations from an actively calving Arctic glacier front

Adrian Dye (1), David Rippin (1), and Rob Bryant ()

(1) University of York, Environment Department, York, United Kingdom (ard527@york.ac.uk), (2) University of Sheffield, Sheffield, United Kingdom

It has been shown that where glaciers terminate in proglacial lakes, this contact accelerates glacier mass loss through mechanical and thermal processes, particularly through the formation of thermal notches in the ice front (Carrivick and Tweed, 2013). Such responses are important for considerations of widespread glacier retreat and decay under a warming climate. Despite this, there are limited studies into the thermal regime of proglacial lakes and very limited observations of temperatures near to the ice-water contact point. These proglacial lakes are abundant throughout Arctic Sweden, with 33% of glaciers having a proglacial lake in their forefield. Despite proglacial lakes becoming more common as glaciers retreat from their Little Ice Age maxima (∼100 years ago), the thermal regime of these lakes in Arctic glacier systems has received relatively little attention.

Here, for the first time, we present the results of the application of ground based thermal infrared (IR) imagery to explore changing proglacial lake surface temperatures. Observations were supplemented by several temperature point surveys, depth profile surveys as well as a number of continuous surveys conducted along the ice front using a remote controlled boat. Previous melt models for lacustrine terminating glaciers have been compromised by a lack of data from the hazardous water to ice contact point, and we directly address this previous limitation here. We report temperatures of 3 C directly at the ice-water contact point, which is substantially warmer than the uniform 1 C lake temperatures assumed in recent glacier melt models (Chernos et al., 2016). Furthermore, we report rapid thermally cut notch formation associated with these warmer temperatures, which triggered numerous iceberg calving events. These temperature observations are some of the first from Arctic proglacial lakes. In addition, we also work towards using these in-situ measurements of temperature and IR imagery to validate the ASTER L2 surface temperature product.