EGU25-12360, updated on 15 Oct 2025
https://doi.org/10.5194/egusphere-egu25-12360
EGU General Assembly 2025

Ice marginal lakes enhance outlet glacier velocities across Greenland

Connie Harpur, Mark Smith, Jonathan Carrivick, Duncan Quincey, and Liam Taylor
University of Leeds, Faculty of Environment, School of Geography, Leeds, United Kingdom of Great Britain – England, Scotland, Wales

Glaciers terminating in lakes typically flow, thin and lose mass more rapidly than those that terminate on land. This is due to a range of thermomechanical processes exerted at the lake-ice interface, where lake waters drive melt-induced undercutting, enable flotation and facilitate calving. In Greenland, ice marginal lakes (IMLs) have increased in size and number over recent decades and now occupy more than 10% of the ice sheet margin. Despite this, very few observations of their effects on ice dynamics exist, meaning they remain largely unaccounted for in models of ice sheet change.

Here, we use ITS_LIVE ice surface velocity data and the How et al. (2021) IML inventory to compare the flow characteristics of 102 lake-terminating outlet glaciers and 102 neighboring land-terminating outlet glaciers across the Greenland Ice Sheet (GrIS) during 2017. We find that along-flow decelerations are much less pronounced at lake- versus land-terminating glaciers, and that some lake-terminating glaciers (n = 33) even speed up towards the ice margin. In turn, lake-terminating glaciers are on average 4.6 times faster than their land-terminating counterparts within the terminus region. Moreover, the fastest flowing glaciers are found to terminate in the largest lakes, suggesting that lake influence evolves with lake development. Ultimately, these observations demonstrate the capacity of IMLs to enhance the surface velocity of Greenlandic outlet glaciers, highlighting their potential to accelerate future mass loss from the GrIS.