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Exposing Underestimated Channelized Basal Melt Rates in Antarctic Ice Shelves

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Ice shelves play a pivotal role in stabilizing the Antarctic ice sheet by providing crucial buttressing support. However, their vulnerability to basal melting poses significant concerns for ice sheet and shelf stability. Our study focuses on assessing basal melt rates at a 50 m posting of 12 ice shelves where earlier studies have identified high melt rates. We make use of the Reference Elevation Model of Antarctica (REMA) strips to generate surface elevation- and melt rates using the Basal melt rates Using Rema and Google Earth Engine (BURGEE) methodology.

BURGEE reveals higher melt rates in areas with thinner ice than existing remote sensing basal melt products. This is for instance the case for basal channels on both Dotson, Totten and Pine Island ice shelves. Modelling studies have already shown that remote sensing inferred basal melt rates are underestimated at the thinnest part of basal channels, and that this underestimation scales with resolution coarsening. Since the thinner parts of an ice shelf also represent its weakest part, it is crucial that we capture its melting well to fully grasp the vulnerability of the ice shelf.

Our work, therefore, represents a crucial step in uncovering the vulnerability of Antarctic ice shelves. By exposing detailed melting patterns, particularly in areas like basal channels, we highlight not just extensive melting but also potential weak points, significantly contributing to our understanding of ice shelf stability. These findings bear substantial importance in comprehending the broader implications of ongoing climate changes on Antarctica's ice sheet integrity and, consequently, global sea levels.