

EGU25-12249, updated on 20 Apr 2026  
<https://doi.org/10.5194/egusphere-egu25-12249>  
EGU General Assembly 2025  
© Author(s) 2026. This work is distributed under the Creative Commons Attribution 4.0 License.



## Using data inversion to infer basal melt rates underneath ice shelves

**Max Brils** and Hilmar Gudmundsson

Northumbria University, Newcastle upon Tyne, United Kingdom of Great Britain – England, Scotland, Wales  
([max.brils@northumbria.ac.uk](mailto:max.brils@northumbria.ac.uk))

More than 80% of the grounded ice of the Antarctic ice sheet drains into the ocean through ice shelves. It is estimated that roughly half of the ice shelves' mass is eventually lost through melting from the underside, where the ice gets in contact with warmer ocean waters. Loss of these ice shelves could cause an increase of the discharge of grounded ice which would lead to additional sea-level rise. It is thus important to accurately quantify the rate at which ice shelves are melting if we wish to estimate future sea-level rise. Here, we present a novel methodology for estimating basal melt rates, by assimilating remotely derived estimates of surface velocities, ice sheet thickness, surface elevation changes and modelled surface mass balance using an ice sheet model (Ua). This methodology allows for a less noisy, physically consistent estimate of the ice mass divergence, and considers the uncertainty associated with each data product. The resulting estimates of the melt rate pattern at almost every Antarctic ice shelf is compared with previous remotely derived estimates.