EGU22-138
https://doi.org/10.5194/egusphere-egu22-138
EGU General Assembly 2022

Spatial and Temporal Variability of Basal Melt Rate beneath Getz Ice Shelf

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Basal melting of ice shelves in the Amundsen Sea – caused by inflows of relatively warm and salty ocean water – has caused widespread thinning and acceleration of their tributary glaciers. In this study, we present novel time series from 2016 with sub-weekly resolution of direct measurements of basal melt rate from four sites on the western Getz Ice Shelf, including one site close to a grounding line. We examine spatial differences between the sites and complement these time series with mooring records from outside the cavity to investigate driving mechanisms of the basal melt rate from sub-seasonal down to tidal time scales. Far from the grounding line, melt rates display strong variability at fortnightly frequencies, caused by spring-neap tidal cycles increasing turbulence and subsequently mixing up heat towards the ice base. No variability at fortnightly frequencies is visible close to the grounding line, implying that well-mixed conditions there reduce the effect of the spring-neap tidal cycle. On longer time scales, the melt rate appears to show sensitivity to the depth of the thermocline, which previous studies have linked to wind forcing at the shelf break. As glaciers in West Antarctica are rapidly thinning, contributing significantly to sea level rise, it is becoming increasingly urgent to understand driving mechanisms of the basal melt rate.