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Uncovering basal melt channels on the Dotson Ice Shelf

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Like most of the ice shelves in the Antarctic Amundsen Sea Embayment, intrusion of warm circumpolar deep water onto the continental shelf causes basal thinning to the Dotson Ice Shelf (DIS). Studies on other ice shelves have shown how Digital Elevation Models (DEM) of high spatial resolution can reveal basal melt patterns that are crucial in understanding the dynamics of basal melting and the underlying ocean circulation. In this study we aim to achieve high spatial and temporal resolution basal melt rates of the DIS to try to uncover new basal melt patterns which products of coarser resolution do not capture. This will be done by using the high spatial resolution Reference Elevation Model of Antarctica (REMA) and a method based on the Google Earth Engine (GEE). This allows for fast co-registration and subsequent thinning and basal melt rate analysis of the 2-m resolution REMA strips from 2010-2017. Ice shelf thinning is calculated both in a Eulerian and Lagrangian framework, the latter providing information to the basal melt rate analysis. In agreement with other studies of the DIS a melt channel is found on the western side of the ice shelf. Furthermore, our study indicates a second smaller channel, which has not been revealed by existing altimetry studies. This suggests that high-resolution basal melt rate products could be of great importance. Furthermore, it enlightens the difficulties in coupling ocean and ice models, since such models often run on a coarser grid and therefore, they will not capture the small-scale variabilities.