EGU2020-15477
https://doi.org/10.5194/egusphere-egu2020-15477
EGU General Assembly 2020

Basal melting of Dronning Maud Land ice shelves twice as high as previously estimated

Sophie Berger[1,2], Veit Helm[2], Tore Hattermann[3], Niklas Neckel[2], Quentin Glaude[4,5], Ole Zeising[2], Sainan Sun[4], Frank Pattyn[4], and Olaf Eisen[2,6]

[1]Université Paris Saclay, IIPCC WG1 Technical Suppport Unit, Saint-Aubin , France (sophie.berger@universite-paris-saclay.fr)
[2]Alfred Wegener Institute, Helmholtz-Centre for Polar and Marine Research , Bremerhaven, Germany
[3]Norwegian Polar Institute, Tromsø, Norway
[4]Laboratoire de Glaciologie, Université libre de Bruxelles, Brussels, Belgium,
[5]Centre Spatial de Liège, Université de Liège, Angleur, Belgium,
[6]Department of geosciences, University of Bremen, Bremen, Germany

Basal melting of floating ice shelves is the main process by which the Antarctic ice sheet is currently losing ice and is responsible for the accelerating Antarctic contribution to sea-level rise. Moreover, basal melting can strongly vary both spatially and temporally. Detailed observations on high spatio-temporal scales remain however challenging, not to mention accounting for them in ice-sheet models.

In this study, we combine CryoSat-2 and TanDEM-X elevation changes to capture in unprecedented detail the spatial (and temporal) variability of ice-shelf basal melting in the entire region of Dronning Maud Land, East Antarctica. The high spatial resolution of TanDEM-X elevations provide us with great details on the spatial variability of the basal mass balance, whereas CryoSat-2 elevations inform us about temporal changes.

We find sub-shelf melt rates that average 1 m/a for the whole of Dronning Maud Land. Those relatively low melt rates conceal however a significant spatial variability on a wide range of scales (from sub-kilometers to ice-shelf wide scales). Spatially integrated, this basal melting represent an annual basal loss ~140 Gt/a. This revised estimate corresponds to a two-fold increase compared to previous estimates, which could question the relative stability of ice shelves in this region.

This study highlights different regimes in sub-shelf melting in Dronning Maud Land and sheds new light on ice-ocean interactions in a region of Antarctica that has long been considered as very stable and which is therfore regularly overlooked.