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Interest of the Assimilation of Surface Melt Extent Derived From Passive and Active Microwave Satellites Into the Regional Climate Model MAR Over the Antarctic Peninsula

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Melting ice sheets are a major contributor to the rising sea level. At the Liège University, the Regional Climate Model MAR (Modèle Atmosphérique Régional) has been developed to monitor and study the current and future evolution of various properties of ice sheets. However, uncertainties remain on the surface melt extent upon Antarctic ice sheets as models are subject to error propagation and need some external data to model the climate.

In Antarctica, unlike Greenland, the produced surface meltwater does not leave the ice sheet through visible rivers in which the quantity of meltwater can be estimated. Remote sensing is then the only product able to provide an estimation of the surface melt extent with a satisfying spatial and temporal coverage. The assimilation of melt spatial extent estimated by remote sensing allows the mitigation of the uncertainties linked to the models as well as a better quantification of the melt quantity.

In this research, active (Sentinel-1) and passive (AMSR2 & SSMIS) microwave satellite data are assimilated into MAR model over the Antarctic Peninsula, where surface melt has caused hydrofracturing and destabilization of ice shelves in the past. The assimilation of the different satellite products is also conducted to study the effect of spatial resolution on melt detection, Sentinel-1 having a pixel size of a few meters while passive satellites are at the 10km scale. This difference can be crucial upon the Peninsula as Foehn effects are occurring locally and can generate local surface melt, not detectable while using a coarser resolution.