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# Surface mass balance and melting projections over the Amundsen coastal region, West Antarctica

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We present Surface Mass Balance (SMB) and surface melt rates projections in West Antarctica for the end of the 21$^{st}$ century using the MAR regional atmosphere and firn model (Gallée 1994; Agosta et al. 2019) forced by a CMIP5-rcp85 multi-model-mean seasonal anomaly added to the ERA-Interim 6-hourly reanalysis.

First of all, we assess the validity of our projection method, following a perfect-model approach, with MAR constrained by the ACCESS-1.3 present-day and future climates. Changes in large-scale variables are well captured by our anomaly-based projection method, and errors on surface melting and SMB projections are typically 10%.

Based on the CMIP5-rcp85 multi-model mean, SMB over the grounded ice sheet in the Amundsen sector is projected to increase by 35% over the 21$^{st}$ century. This corresponds to a SMB sensitivity to near-surface warming of 8.3%.°C$^{-1}$. Increased humidity, resulting from both higher water vapour saturation in warmer conditions and decreased sea-ice concentrations, are shown to favour increased SMB in the future scenario.

Ice-shelf surface melt rates at the end of the 21$^{st}$ century are projected to become 6 to 15 times larger than presently, depending on the ice shelf under consideration. This is due to enhanced downward longwave radiative fluxes related to increased humidity, and to an albedo feedback leading to more absorption of shortwave radiation. Interestingly, only three ice shelves produce runoff (Abbot, Cosgrove and Pine Island) in the future climate. For the other ice shelves (Thwaites, Crosson, Dotson, Getz), the future melt-to-snowfall ratio remains too low to produce firn air depletion and subsequent runoff.