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Reconstructing the distribution of surface mass balance over East Antarctica (DML) from 1850 to present day

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Over recent decades, the Antarctic Ice Sheet has witnessed large spatial variations at its surface through the surface mass balance (SMB). Since the complex Antarctic topography, working at high resolution is crucial to represent accurately the dynamics of SMB. While ice cores provide a mean to infer the SMB over centuries, the view is very spatially constrained. Global Climate models estimate the spatial distribution of SMB over centuries, but with a too coarse resolution with regards to the large variations due to local orographic effects. We have therefore explored a methodology to statistically downscale the SMB components from the climate model historical simulations (1850-present day). An analogue method is set up over a period of 30 years with the ERA-Interim reanalysis (1979-2010 AD) and associated with SMB components from the Regional Atmospheric Climate Model (RACMO) at 5 km spatial resolution over Dronning Maud in East Antarctica. The same method is then applied to the period from 1850 to present days using an ensemble of 10 simulations from the CESM2 model. This method enables to derive a spatial distribution of SMB. In addition, the changes in precipitation delivery mechanisms can be unveiled.