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A long-term hindcast simulation with COSMO-CLM^2 over Antarctica

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The surface mass balance (SMB) of the Antarctic ice sheet (AIS) is crucial to understand Antarctica's contribution to 21st century sea level rise. Therefore, it is essential to understand the large scale atmospheric processes that affect accumulation as it is the only source term of the ice sheet.

Given the scarcity and low spatial coverage of observations over the AIS, the regional climate modeling approach, which is not very common over Antarctica, is the adequate tool to gain insights in AIS SMB. In this respect, COSMO-CLM 5.0 was coupled to the Community Land Model (CLM4.5) and adapted for Antarctic conditions. ERA-Interim is used as initial and lateral boundaries for a time period of 30 year (1986-2016; excluding 3 years of spin-up time) at a resolution of 0.22° by 0.22° over the whole Antarctic continent. Lackings in the model representation of basic climatic variables such as temperature and wind speed were tackled by adapting the turbulence scheme, implementing a two-moment cloud microphysics parametrization, as well as several modifications to the Community Land Model (e.g. snow metamorphosis, wind dependent compaction,...).

Here, we present the results of this long-term COSMO-CLM^2 simulation adapted for Antarctica. Results are compared to observations from automatic weather stations, field campaigns and radiosondes. In the next steps a blowing snow module and refined cloud-aerosol-precipitation interactions will be implemented into the model.