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Assessing Performance of a new High Resolution polar regional climate model with remote sensing and in-situ observations: HCLIM in the Arctic and Antarctica

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We present results from a new high resolution regional climate model, configured for both the Arctic and the Antarctic, assessed with a range of in-situ and remote sensing datasets. Under the Horizon 2020 PolarRES project, a set of simulations are performed at a spatial resolution of ~12 km over the Arctic and Antarctic regions using the latest version (cy43) of the HCLIM-ALADIN regional climate model. The model includes a thermodynamic sea ice scheme and has been updated with the latest ice sheet masks and improved topography and other physiographic fields.

The model will be used to provide climate projections over the 100-year period 2001-2100 for two emission scenarios, and driven on the boundaries by General Circulation Models (GCMs) from the Coupled Model Inter-comparison Project (CMIP6). We also present and evaluate hindcast simulations for the period of 2001 to 2020 over both domains, forced by ERA5 on the boundaries. Model precipitation, temperature, sea ice, and other variables are evaluated with observations from automatic weather stations and satellite data in the polar regions, and additionally compared against the new high resolution (2.5km) Copernicus Arctic Regional ReAnalysis (CARRA) dataset. We also examine the effect of spectral nudging on simulation output. Preliminary results show that HCLIM improves on ERA5, capturing the precipitation, temperature, sea ice cover and ice sheet surface mass balance in both polar regions.

In addition, we show that the wealth of earth observation data now available via the ESA climate change initiative and the EUMETSAT climate data programmes are extremely useful tools to the regional climate modelling community. We use example scripts for model evaluation using EO data via an open repository and present user cases that can be replicated by other modelling groups.