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Greenland surface melt in a HARMONIE-Climate mini-ensemble

Oskar Landgren (1), Rasmus A Pedersen (2), and Danijel Belušić (3)

(1) Norwegian Meteorological Institute, Model and climate analysis, Oslo, Norway (oskar.landgren@met.no), (2) Danish Meteorological Institute, Copenhagen, Denmark (rap@dmi.dk), (3) Swedish Meteorological and Hydrological Institute, Norrköping, Sweden (danijel.belusic@smhi.se)

The Arctic region is an interesting testbed for regional climate models, in particular for cryospheric processes. We present results from different configurations of the HARMONIE-Climate (HCLIM) regional climate model. Dynamical downscaling was performed for one year (2014) over a Pan-Arctic domain, with ERA-Interim as boundary data. This study investigates model performance over Greenland and compares the simulated conditions to observations, including data from automatic weather stations from the Programme for Monitoring of the Greenland Ice Sheet (PROMICE). Since melt processes are crucial in the cryosphere, we focus on HCLIM's ability to simulate surface melt during the summer months of 2014. We analyse the number of days with surface melt and compare the melting season in the model to observations. As the PROMICE stations are all located less than about a hundred km from the coast, we supplement the analysis with satellite data for a comparison over the central Greenland ice sheet.
The ensemble of experiments allows us to study sensitivity of the results to the choice of atmospheric physics scheme (ALARO and ALADIN), horizontal resolution (12 and 24 km), and sea-ice thickness scheme (dynamic vs constant). We also briefly discuss similarities and differences, and their possible implications, of our HARMONIE-Climate configuration relative to HARMONIE used in operational NWP.

Initial results indicate that the models represent the overall length of the melting season rather well, but with the peak of the season occurring too early. The performance is generally better for low elevation sites compared to the slopes of the ice sheet, but the details are sensitive to the choice of resolution and physics schemes.