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Evaluation of the regional climate model WRF over Svalbard

C. Lang, X. Fettweis, and M. Erpicum
University of Liège, Department of Geography, Liège, Belgium (charlotte.lang@doct.ulg.ac.be)

It is well known that high latitude zones are very sensitive to climate change. As a result of global warming, ice sheet melting has increased which in turn has an influence on climate through modifications of the thermohaline circulation, feedback of ice albedo, sea level rise, ...

Svalbard is an archipelago between 74 and 81°lat N and 60 percent of its area (62 248 km2) is covered with glaciers and ice sheets. The impact of global warming on the Svalbard cryosphere can be estimated with climate models. However, we need to use regional climate models as they offer the possibility of a higher resolution than general circulation models.

We have evaluated here six different physics options available in the regional climate model WRF (Weather Research and Forecasting) forced by ERA-Interim reanalysis by comparing the Svalbard climate simulated over 2006-2009 at a 5 km resolution to near surface measurements at several weather stations through the archipelago.

We have then carried out simulations of the Svalbard climate over the last 30 years (1979-2011) using the WRF configuration that gave the best results as well as simulations of the surface mass balance using a the land-surface model allowing to model the surface mass balance components through its multi-layer snow module.

The results show a large interannual variability of the surface mass balance over Svalbard along with an increasing melting. The increase in temperature is responsible for the melting rate and the interannual variability is due to the variations of the mean summer temperature.