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Evaluation of Polar WRF for different Planetary Boundary Layer schemes over Svalbard

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High frequency of stable atmospheric conditions in Polar regions makes it a very challenging region to accurately downscale local meteorological phenomena. Keeping that in mind authors decided to evaluate the robustness of dynamical downscaling techniques with the use of the Polar Weather Research and Forecasting (Polar WRF) model version 3.7.1 for the area of Svalbard. The Weather Research and Forecasting (WRF) model is often used as a tool for dynamical downscaling. However, its application for relatively complex topography in polar regions like over the area of investigation are sparse.

This study introduces some preliminary results of the research project, funded by the Polish National Science Centre, focused on application of the Polar WRF model for the Svalbard area at high spatial and temporal resolution. We show the sensitivity of the surface wind speed, air temperature and sea level pressure calculated by the Polar WRF model for three different parameterizations of the planetary boundary layer. Two-way nested domains were applied with the finest horizontal resolution of 3 km for the smallest domain. June 2008 and January 2009 are selected for tests of the WRF model with the GFS FNL data used as initial and boundary conditions. The results of simulations are compared with in-situ meteorological data measured at synoptic stations running in the nested model domains. Three independent simulations let to evaluate the sensitivity of downscaling results in each of nested domains and assess the role of chosen PBL schemes for model's accuracy. The results allow to quantify the role of different Polar WRF's PBL settings, which may be useful for long-term climatological mesoscale simulations as a tool for recognition of local aspects of Svalbard's climate. The long-term climatological simulations are the further aims of this project.