



Simulation of the ABL over the North Water polynya and comparison with aircraft data

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Simulations for Greenland with focus on the wind regime are presented using the high-resolution non-hydrostatic model COSMO (Consortium for Small scale modeling). The simulations are performed at 15 km, 5.5 km and 1.3 km resolution for the time period of June 2010. The Nares Strait, including the North Water (NOW) polynya, in northwest Greenland was selected as focus of the simulations, since comprehensive measurements of the structure of the boundary layer are available from an aircraft study.

The observations on four different days show a shallow stable boundary layer over the polynya and a pronounced low-level jet associated with the flow channeling in the Nares Strait, particularly at Smith Sound. The reproduction of the vertical patterns of wind and temperature by the simulations is realistic at all resolutions and best results are found for 5.5 km and 1.3 km resolution. A vertical displacement of the patterns and an overestimation of the temperature was found. The measured low-level inversion is not simulated well, but overall the vertical structures of the simulation and observation correlate highly. Thus, the model is well suited for simulations in particular for the situation of flow channeling in a topographically complex area.

The analysis of the synoptic situations associated with channeled flow through the Nares Strait shows that the wind speed increases with higher pressure difference between the Lincoln Sea and Baffin Bay. Channeling effects lead to a prevailing flow direction towards Baffin Bay. A strong increase of the wind speed occurs at Smith Sound, where the flow also passes over mountains of the Greenland coast. The wind maximum is found downstream of Smith Sound, and typical low-level jets with wind speeds of around 20 m/s occur at a height of 100 m.