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Customizing the Weather Research and Forecasting Model for west Spitsbergen fjords

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The state-of-the-art Weather Research and Forecasting Model has been applied for the West Spitsbergen fjords: Hornsund and Kongsfjorden. Parameters such as: surface pressure, relative humidity, 2-m air temperature and 10-m wind speed have been simulated for the purpose of further implementation in fjord –ocean water circulation, hydrodynamic model of. Special emphasis was put on obtaining proper wind conditions. Results from simulations with different reanalysis data sets used for the boundary condition: ECMWF - Era Interim and NCEP - Climate Forecast System Reanalysis (CFSR) have been compared. The results have been validated against observations performed in the Polish Polar Station in Hornsund and measurements conducted in the Bayelva/Ny-Ålesund in Norwegian synoptic station. Preliminary results show good agreement with 2-m temperature, relative humidity, surface pressure and wind speed. However results show high bias associated with higher wind speeds. For the sake of large wind impact on the water circulation in fjord, especially due to the phenomena of “topography tunnelling” along the fjord axis, further studies have been performed considering specially attention on the wind field. The problem has been diagnosed as a bad representation of subgrid-scale orographic effects. Therefore the dedicated parameterizations have been applied. The presentation points up the problem of lack of topographic data for Arctic regions and unreliability of existing ones. The simulations were performed for January 2010. The chosen parameterizations will be applied for long term 2010-2015 hindcast.