Increasing the horizontal resolution in numerical weather prediction

Páll Ágúst Þórarinsson (1,2), Haraldur Ólafsson (1,2), Halldór Björnsson (2), Bolli Pálmason (2), and Christina Henriette Wilckens (1)

(1) University of Iceland, Reykjavik, Iceland, (2) Icelandic Meteorological Office, Reykjavik, Iceland

The aim of this research was to compare two forecasts with different resolutions in the West- Fjords forecast area 2.5 km and one with 750 m horizontal resolution. The data used was derived from the numerical weather prediction model (NWP) Harmonie Arome and from automatic weather stations in the forecast area. Data was GRIB files and time series extracted from the files were used for verification. Data in the files was also used to plot weather maps for visual comparison. The data analysis included statistical analysis to compare, calculate and plot statistical values and, the programming language python to plot weather maps for visual comparison of two differing resolutions. The results of data analysis and statistical comparison showed that the models were generating too much wind for both resolutions and too low temperatures. By increasing the horizontal resolution from 2.5 km to 750 m the models showed significant improvements, especially in complex landscape, but still not a perfect fit to observations. Results of visual comparison of weather maps showed more details for the 750 m than for the 2.5 km horizontal resolution, both for the predicted temperature and wind field. The comparison of 2.5 km and 750 m horizontal resolution forecasts for the West-Fjords area showed significant improvement in predicting for wind in complex landscapes, both in statistical analysis and in the visual comparison of weather maps. Improvements for temperature prediction were not as substantial as for wind. When looking at the results for temperature, the predictions exhibited a cold bias over all. This research was based on data that spans eight months' period. That could surely affect the results of the statistical analysis and it would be necessary in further work to include a longer period.