Project 3: Comparing high resolution global model and local area model forecasts of wind speed at a windy location in Iceland.

Introduction: One of the long-standing discussions in operational meteorological modelling is whether it is better to run a global model at high resolution or to nest a very high resolution local area model within a global lower resolution model for local forecasting applications. In other words do the negative effects of lateral boundary conditions outweigh the advantages of the higher resolution that is possible with local area models. This project seeks to answer this question for a single location in Iceland, by comparing ECMWF global model forecasts with forecasts from Harmonie (French) and HIRLAM5.

Goal: Compare and contrast the forecasts from the three models, and determine which provides the superior forecasts.

Data: Forecasts of wind speed in m/s for Eyrarbakki, Iceland for one year (2014-2015), for forecast projections 3,6,9,12…48h. Forecasts are from the ECMWF model, run every 12h, Harmonie regional model, run every 6h, and HIRLAM5 also run every 6h. Data is organized chronologically by valid time; all forecasts which verify at each specific valid time (16 for the local area models and 8 for ECMWF) are grouped together.

The data have been organized into 16 files, one for each forecast projection.

Analysis Suggestions: Observed wind speeds tend to be distributed as either a gamma or Weibull distribution. Since the distribution is not Gaussian, and for practical reasons, wind speed forecasts are often verified as either binary or multi-category contingency tables. Light winds, less than 5 m/s, are usually of less interest, while strong winds (gale = >20 m/s, storm = >25 m/s) are of greater interest.

Suggested Steps: 1a. Examine the data for each model using forecast-observed plots.
1b. Compare the distributions with the observation distribution for the three models. Are there under- or over-forecasting biases present?

2. Select a focus for your study. E.g. Performance for higher wind speeds, ability to replicate the observed wind speed distribution). In light of the focus, choose category thresholds for contingency table evaluation of the forecasts; compile the tables (either a series of binary tables or a single multi-category table) for each model over the whole dataset. And for different projection times.

3. Compare the attributes of the forecasts (HR, FAR, bias, accuracy, skill…..) using the appropriate scores. Is one model superior to the others for all attributes? Or does it vary. Does the relative quality of the three sets of forecasts vary with projection time.

4. Prepare the presentation to make a case for the “best” forecasts overall. And, can either or both of the regional models improve on the global model forecasts from ECMWF?

If time permits….do a comparative verification of the two regional models for this location. For this you can go back to the original full dataset and re-extract the data for the 16 projection times. Since the regional models are run every 6 h, there will be twice as much data for each projection, and a more refined assessment of the forecast quality as a function of projection can be obtained.

All comparative results should be supported by bootstrapped confidence intervals.