HirlamVerification scores, 1st Quarter 2002.

Per Undén

1 Introduction

The operational Hirlam verification scores from the first quarter of this year have been requested and compiled. The period is 1 January - 31 March 2002 with 00 and 12 UTC forecasts combined. All the Hirlam operational institutes have kindly provided me with the requested scores, RMS and bias for mean sea level pressure, 10 m wind speed, 2 m temperature, 850 hPa temperature, 500 hPa height and 250 hPa wind speed. (The institutes are the ones in Denmark, Finland, Ireland, the Netherlands, Norway, Sweden and Spain.) Ireland lacked T_{2m} and 250 hPa wind scores. Sweden, Norway and Denmark did only have values for every 12 hours forecast range for the upper air verification (and Denmark actually every 12 hours for the other near surface variables as well). The Netherlands provided wind vector values for 10 m winds rather than speed and their 500 hPa height values seemed to have a problem and were left out. Apart from those exceptions the verifications are complete.

Also Météo-France have supplied their scores for ARPEGE over a European/Atlantic area and their ALADIN-France ones. They are not so easy to compare directly due to the global model in the first case and the very limited area in the second case. The results are not shown due to these reasons and the already crowded graphs, but they are commented about in connection with the other global results supplied by some institutes.

The data has been compiled and processed for plotting. The results are commented below. It should be pointed out that the displayed scores cannot be used to compare or rank the forecast quality of the various Hirlam installations and operations. The model domains are all different and proximity of the verification stations to boundaries varies between installations. Furthermore, a somewhat different sample of verification stations has been employed at each institute due to the area, reception (and possibly quality control) all being individual. In addition to this, the Netherlands changed both model version and resolution on 5 March.

2 Mean sea level pressure

There is some variation in the growth rate mean sea level RMS errors. Denmark, Finland and Spain have (as last year) the lowest error growth and then Norway, Sweden and Ireland a bit higher, whereas the Netherlands have the largest error growth rate.

The average (00 and 12 UTC) bias is fairly small for most but with a negative trend for a few countries (Ireland, Netherlands and Norway).

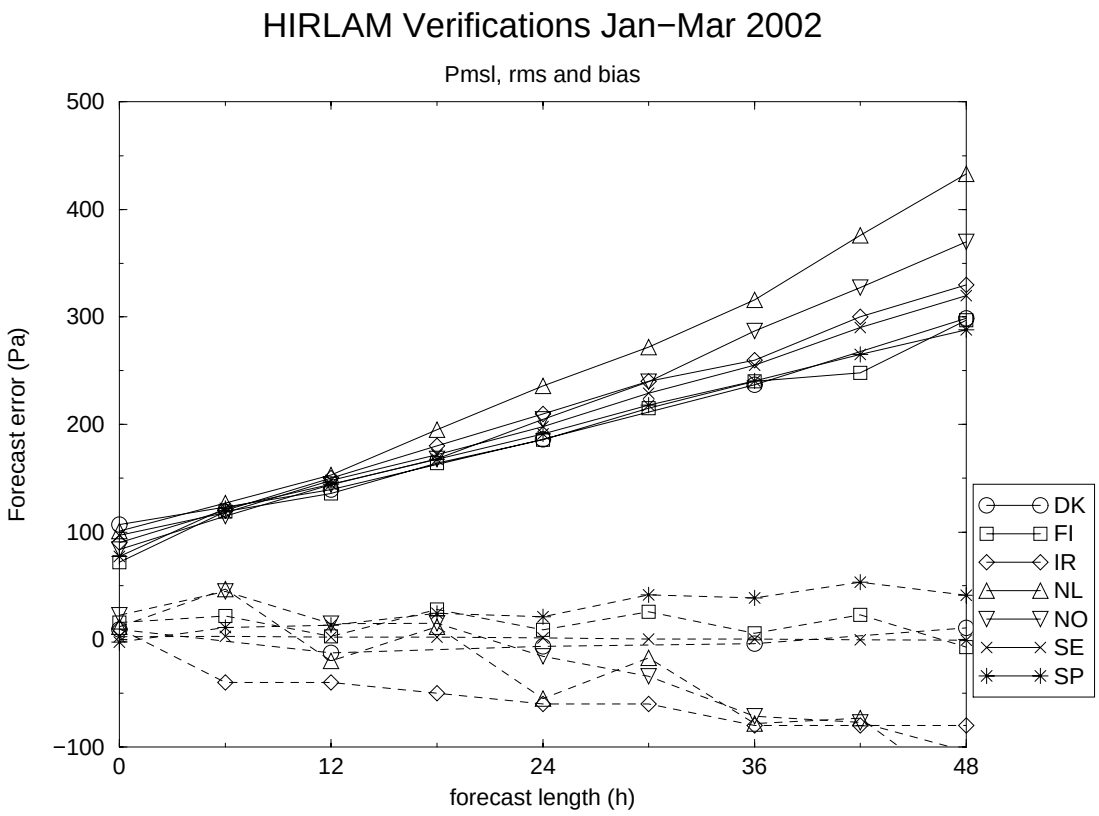

Figure 1: HIRLAM RMS errors and bias for mean sea level pressure forecasts.

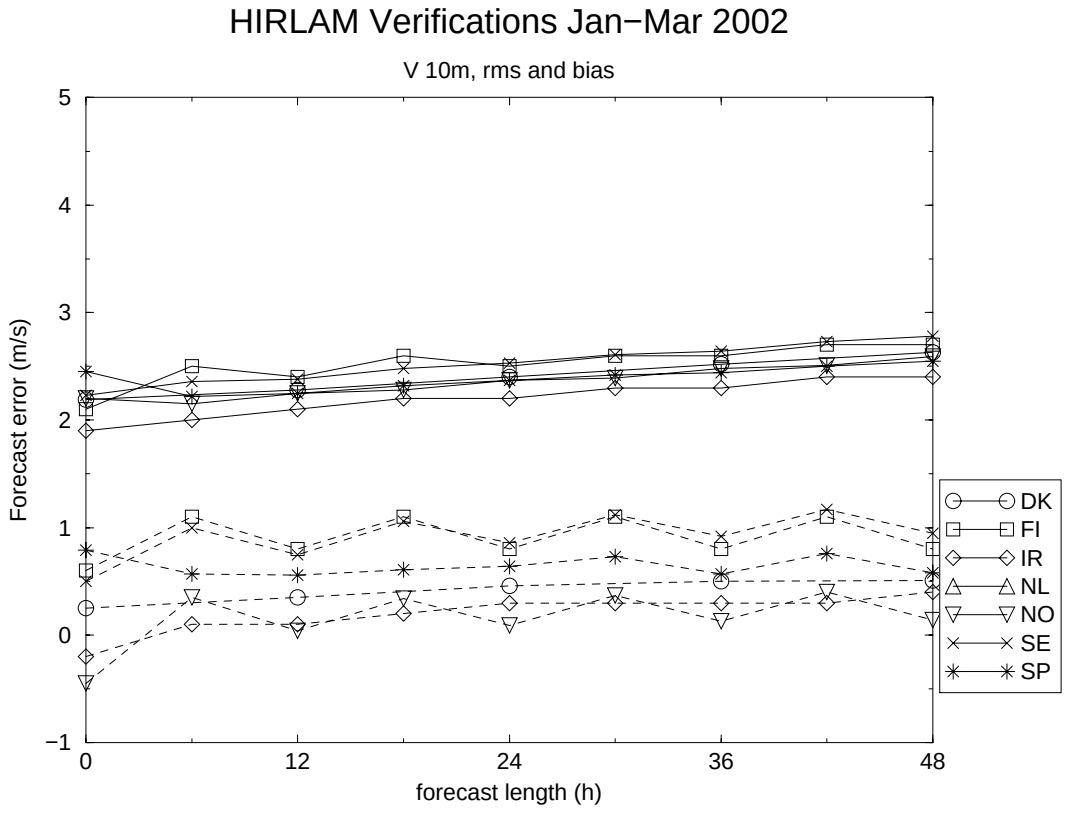

Figure 2: HIRLAM RMS errors and bias for 10 m wind speed forecasts.

3 10 m wind speed

The RMS errors of 10 m winds are very similar to last year's (NL38) and increase only slowly with forecast range. Most of the centres are close to each other. Ireland has slightly lower errors than the rest (as last year).

Bias curves differ again much more than what can be seen for RMS. Ireland and Norway have almost zero bias, presumably due to older versions of the turbulence scheme. Finland and Sweden have a positive bias (even though they use different turbulence schemes).

4 2m temperature

For this parameter there is an even slower increase of RMS error with time (than for 10 m wind). The curves are fairly close together. (N.B., for last year in NL38, there was an error in the Irish scores where the T_{2m} values were erroneously the repeated ones for 10 winds; this year we do not have any values from Ireland). Spain, Denmark and Finland and Sweden have generally a bit lower errors than Norway and the Netherlands.

The biases vary a lot between institutes. Most have a clear negative bias, with the Netherlands and Finland having biases around $-1°$.

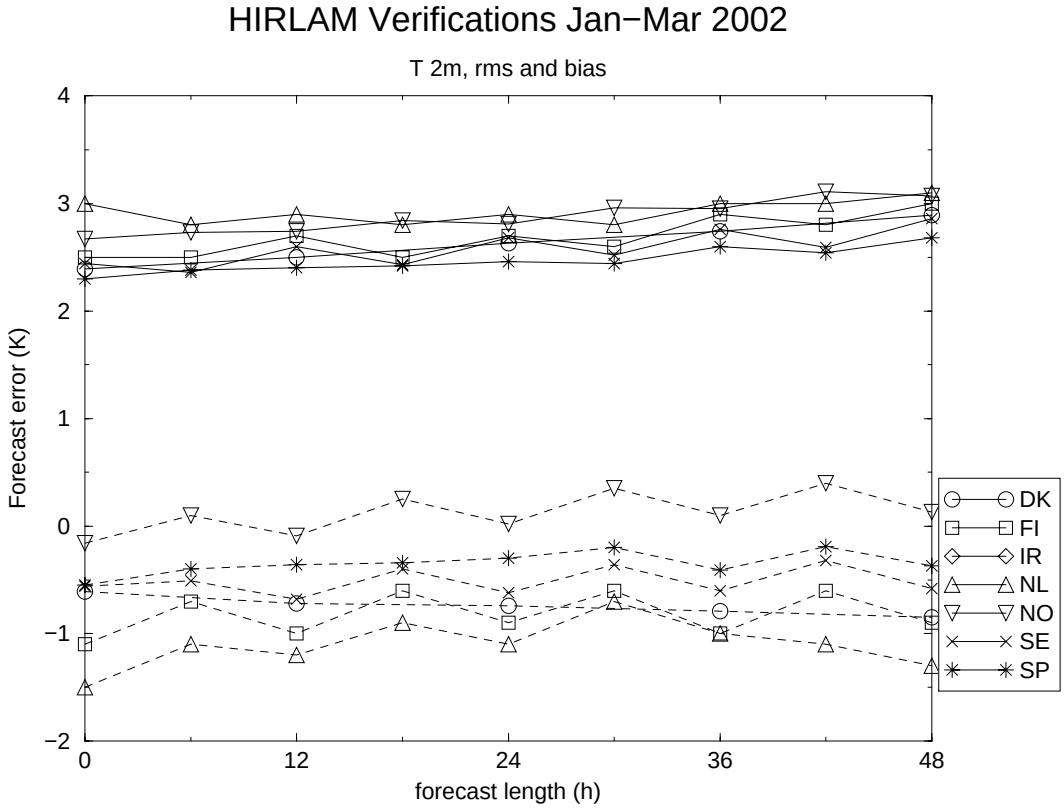

Figure 3: HIRLAM RMS errors and bias for 2m temperature forecasts.

5 Upper air verifications

The 850 hPa temperature RMS scores are also fairly close to each other and similar to last year's. The biases show also a similar separation, with Netherlands and Norway having a positive bias and Denmark showing a negative one.

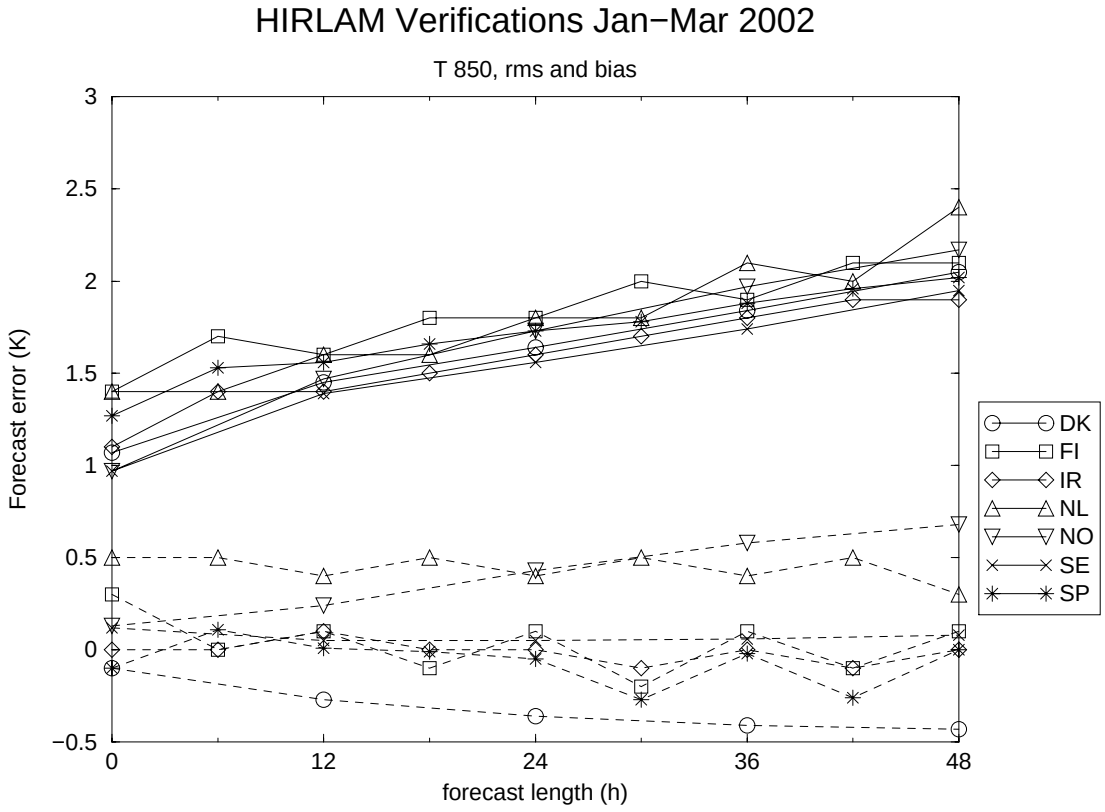

Figure 4: HIRLAM RMS errors and bias for 850 hPa temperature forecasts.

500 hPa geopotential RMS errors are fairly similar between the institutes (no values from the Netherlands). All show a negative trend in their biases, except Spain (as last year). Most end up with a negative bias towards the end of the forecast. Just as last year, the Netherlands and, particularly, Ireland, have more negative bias than the rest.

The 250 hPa wind RMS errors show some variations between institutes, similar to last year. Sweden, Norway and Denmark have the lowest ones. Norway and Denmark had 3D-VAR last year, whereas Sweden only implemented it last June and probably this had the effect of moving Sweden into the group of lowest errors. (Unfortunately Ireland is missing, the other 3D-VAR institute). There is again a pronounced error growth over the first 6 hours of forecast time for the centres without 3D-VAR for the 250 hPa RMS errors of wind speed. It is a sign of initial inbalance or strong impact from the boundaries (probably the former).

Biases are only very slightly negative for most of the centres and closer together than last year.

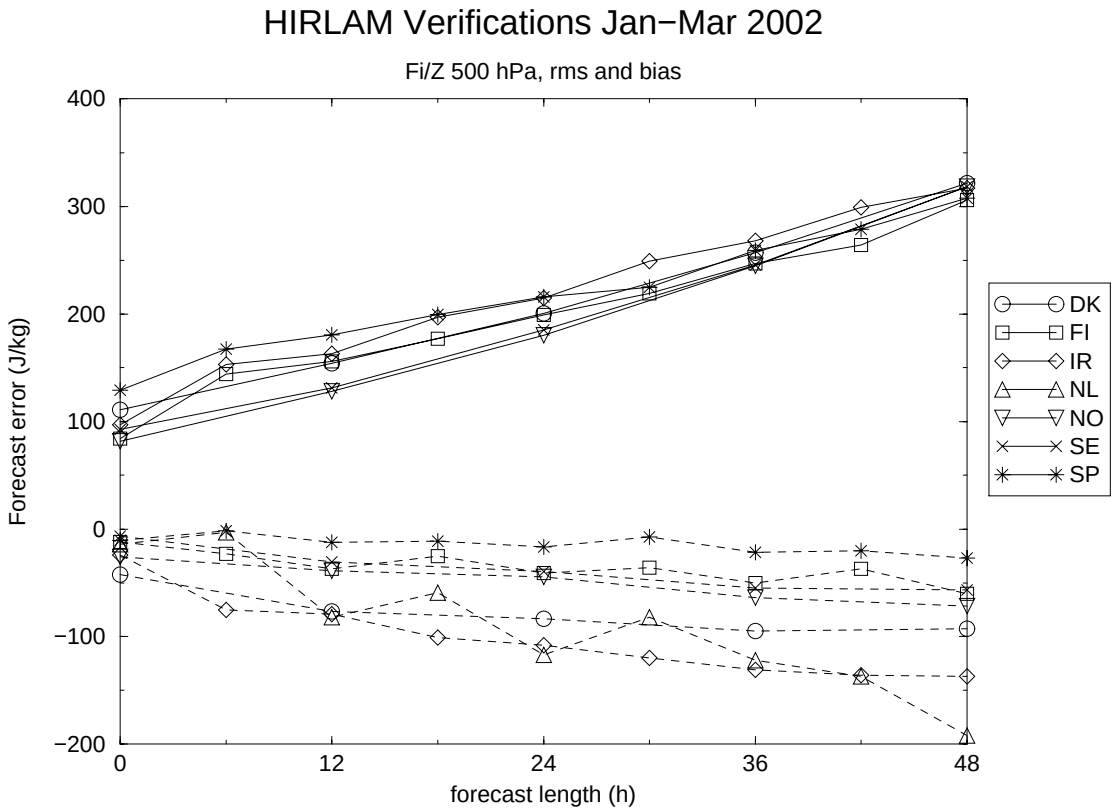

Figure 5: HIRLAM RMS errors and bias for 500 hPa geopotential forecasts.

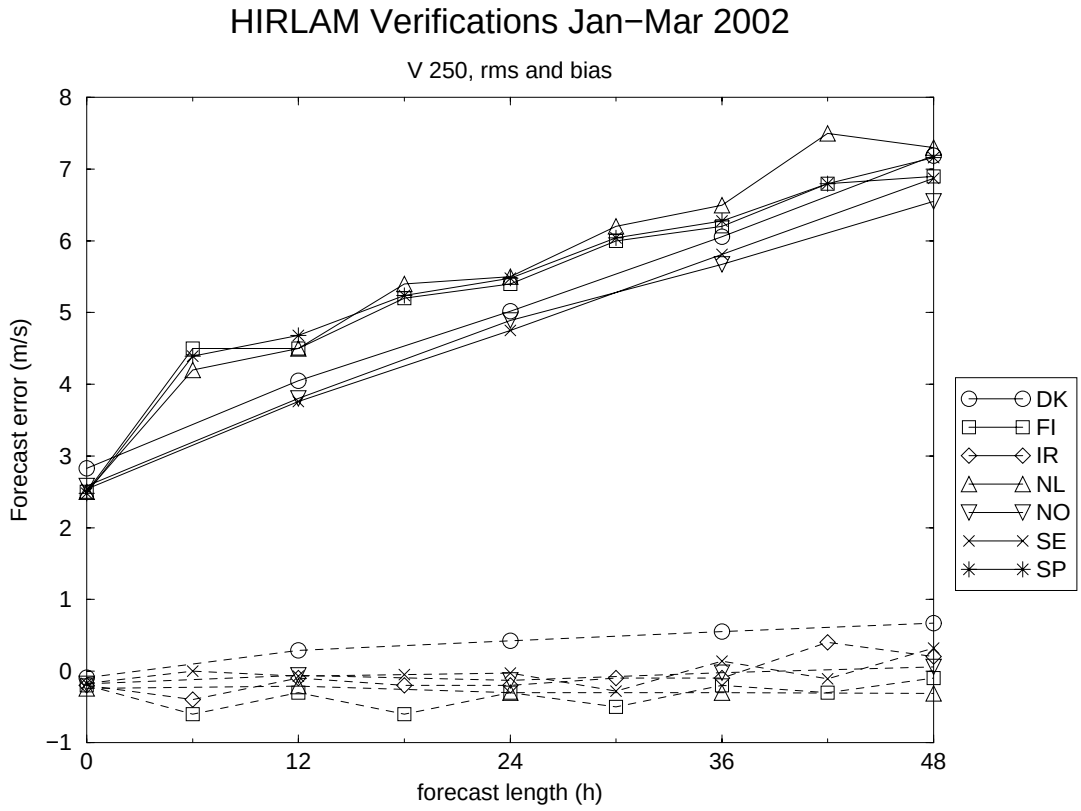

Figure 6: HIRLAM RMS errors and bias for 250 hPa wind forecasts.

6 Global models

Although the global (and non-Hirlam) models are not part of this comparison, results of ECMWF forecasts (12 UTC) have been compiled in Norway and Denmark and UK forecasts by Norway and Météo-France have supplied their own scores. The RMS errors for mean sea level pressure are lower for all the three global systems, particularly for ECMWF. This is a well known feature and presumably due to boundary effects or data assimilation being adversely affected by the boundaries throughout the assimilation cycles. For the forecast parameters of 10 wind and 2m temperatures, the results are much closer. The ECMWF and Météo-France RMS errors are slightly lower than the Hirlam ones, although almost the same as the best Hirlam (although the verification areas are not the same, so it is impossible to draw strict conclusions). The UK values show noticeable biases, affecting the RMS values of these forecast parameters to be slightly worse than Hirlam's.