

Operational experiences at KNMI 2000-2001

Status

The implementation of HIRLAM for routine forecast production at KNMI has remained unchanged since the introduction of the Y2K proof system. The HIRLAM reference system 4.3 is used, with a horizontal resolution of 0.5° in latitude and longitude and a standard distribution of 31 vertical levels. The system is run with a 3 hour assimilation cycle and produces 48 hour forecasts 4 times a day, starting from 00, 06, 12 and 18 UTC. For a detailed description of the operational system at KNMI the reader is referred to previous year's status reports.

Slotted in with the operational production is a semi-operational 3 hour cycle, producing 12 hour forecasts using the HIRLAM 4.6.3 reference system at a resolution of 0.1° . Products of the high resolution run are available for routine forecast production on the bench forecasters meteorological workstation MWS.

The absence of changes in the operational implementation of HIRLAM and hence the absence of improvements on critical parameters leads to a growing discontent with the performance of the model by the forecasters, who are able to compare HIRLAM output to the improving output of the other models available them, most notably the ECMWF model and the UKMO regional model. At the same time the forecasters have learned to appreciate the advantages of the 0.1° version of HIRLAM in particular for extreme wind forecasts.

The major problems of the current operational implementation lie with the representation of the soil-surface, with the representation of the boundary layer, in particular vertical mixing, and with the representation of low level clouds. These problems are believed to be closely coupled. Most notably these problems show themselves in the prediction of near surface temperatures. The model has an extreme cold bias in the 2 metre temperature in the winter months and early spring. Experiments have shown that this problem is much reduced in the latest versions of the HIRLAM system, 5.0 and higher. A binary search of modifications introduced in the HIRLAM system showed a strong correlation with a bug fix for the treatment of initial cloudiness. It is believed that there also is a contribution to the 2m problem from a too high evapotranspiration from vegetation in winter. A quick fix has been developed, but so far has not been introduced in operations. Other operational problems were of a more practical nature: erroneous sea surface temperature reports, ill-conditioning of matrix inversions in the OI, probably due to an abundance of AMDAR reports, and an insufficiently tested change in the production of lateral boundaries at ECMWF.

Plans

The performance of the 0.1° high resolution version of HIRLAM, known as XHRLAM, has elicited favourable responses from both forecasters and end users. These responses have been part of the motivation for the allocation of an additional yearly budget for computational resources for operational HIRLAM forecasting. An ITT for a new operational computing system has been put out. Delivery of the new system is foreseen for September 2001. The increase in computer power the new system will bring will be used to introduce a new version of HIRLAM with a much increased resolution. Current plans are to implement the newest stable version of the reference system (5.x) at a resolution of 0.2° over much the same area as the current operational forecast area and with similar cycling. Four times daily +48 hour forecasts will be produced. Parallel to this a nested 0.1° version will be run out to +24 hours.