Operational NWP activities at the Finnish Meteorological Institute in 2002

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1 Introduction

The present operational NWP system at the Finnish Meteorological Institute (FMI) is based on the HIRLAM version 4.6.2 and has been implemented into operational use 15 November 1999. The technical environment and the differences from the reference HIRLAM 4.6.2 are described by Eerola (2000). The later status and modifications are described in the reports Eerola (2001) and Eerola (2002). The operational system has been kept fixed during the year 2002 and available resources have been directed towards implementing a substantially revised system in a new computing environment. Here we give a short technical and meteorological description of the current system and present a few features of special interest.

2 Technical environment

The co-operation between the Finnish Meteorological Institute (FMI) and the Center for Scientific Computing (CSC) has made it possible for FMI to run the operational HIRLAM system on the most powerful computers available in Finland.

The main computing facility for HIRLAM is still the T3E system, but an identical system has been implemented on the SGI Origin 2000 for backup purposes.Work is going on to replace T3E with a new IBM eServer cluster 1600 before the end of November 2002. The System Monitor Scheduler (SMS), developed at ECMWF, controls all the jobs and takes care of scheduling and dependencies between Hirlam jobs as well as all operational tasks at FMI.

On T3E the outer ATA suite (described below) is ready about 40 minutes after the cutoff time and the inner ENO suite is ready about 90 minutes after the cutoff time.

3 Meteorological setup

The meteorological setup contains two suites, ATA suite and ENO suite. Except area and resolution and related features the two suites are rather similar. The integration area of the Atlantic suite (ATA) contains Europe, North Atlantic and parts of North America

and the resolution is 0.4^o. The European suite (ENO) is run on a smaller area containing mainly North Europe and the resolution is 0.2^o. On both suites the number of vertical levels is 31. The horizontal areas of the two suites are shown Figure 1.

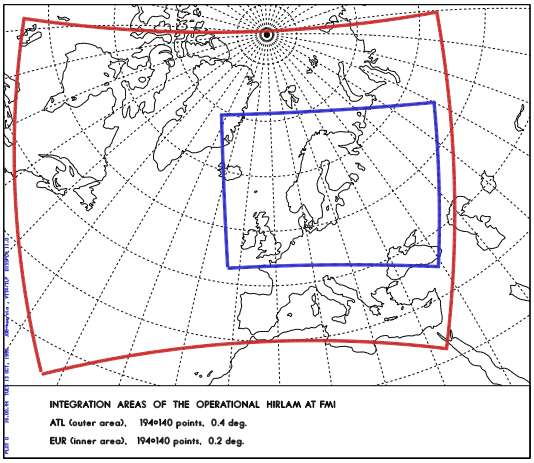

Figure 1: The integration areas of the operational HIRLAM at FMI.

Both suites, ATA and ENO, are run four times a day and the forecast length is 54 hours. This was the users' request to get an effective forecast length of two days in the end-products. The forecasts are available, both on model and pressure levels, at the frequency of one hour.

4 Special features of the FMI system

The HIRLAM-suites provide input for the advanced particle dispersion model SILAM, developed together with VTT Technical Research Centre of Finland (Valkama et al., 2000). It can be used to predict trajectories of harmful substances released into the atmosphere, and contains a module for computing dose rates of harmful radiation. SILAM can be activated to compute the dispersion of releases at any time anywhere within its domain, but the dispersion of particles released continuously at five locations corresponding to nuclear power plants in or near Finland are computed automatically every cycle.

There is a close cooperation between FMI and the Finnish Marine Research Institute (FIMR), extending to operational activities. A dynamically coupled wave-model (Järvenoja, 2002) has been developed together, and is now part of the ENO-suite. It provides forecasts of wave height and direction of propagation, and is operated mainly for the benefit of shipping and authorities. Parallel tests have shown the meteorological impact of the wave-model to be rather modest, effectively amounting to a reduction of near-surface wind speed in gales and storms.

Three times a week FMI receives from FIMR sea surface temperature and ice data covering the Baltic Sea. The data is provided in digital form and is used in the analysis of surface conditions.

Meteorological monitoring of the HIRLAM products is an important task. In order to detect possible problems, a set of diagnostic products are collected operationally on our internal WWW-pages. At the moment the monitoring window contains the following products:

- The observation coverage maps for every observation type.
- The departure of first guess from analysis for geopotential and wind components on the following pressure levels: 200 hPa, 500 hPa, 925 hPa and 1000 hPa.
- Maps of the following surface fields:
  1. sea surface temperature and the corresponding observations
  2. ice coverage of the sea and corresponding observations
  3. surface temperature
  4. surface moisture
  5. snow depth and the corresponding observations
- The EWGLAM Verification scores of the latest full month.

5 Plans for the future

The T3E system at CSC is beeing replaced by a new supercomputer strategy based on an IBM eServer cluster 1600. The current operational HIRLAM is ported to the new environment and will continue to be used until a new, substantially revised system is ready.

The next NWP-system will be based on HIRLAM version 5.2. Statistical interpolation will be abandoned in favour of a 3DVAR scheme in the analysis of upper-air fields, and the surface analysis will include screen-level temperature. The currently-used normal mode initialization will be replaced by a digital filter. Important new features of the forecast model will be semi-Lagrangean dynamics and the new ISBA surface scheme. The new model domain will cover the area of the present ATA-suite on 40 levels with a horizontal grid spacing of 0.3^o.

References

Eerola, K., 2000: The new operational hirlam at the finnish meteorological institute. *Hirlam Newsletter*, **35**, 36–43.

Eerola, K., 2001: The operational hirlam at the finnish meteorological institute. *Hirlam Newsletter*, **38**, 22–28.

Eerola, K., 2002: The operational hirlam at the finnish meteorological institute. *Hirlam Newsletter*, **40**, 19–24.

Järvenoja, S., 2002: Coupled atmosphere-wave model for fimr. *Hirlam Newsletter*, **40**, 9–22.

Valkama, I., P. Siljamo, and M. Ilvonen, 2000: The finnish operational emergency model framework. *Air Pollution Modeling and Its Application - XIV.*, G. S-E. and F. A. Schiermeier, Eds. Plenum Press, 703-704.