Operational NWP at *met.no*

Ole Vignes, April 2004

HIRLAM models

The operational HIRLAM model grids are the same as last year. They are listed in Table 1, and the areas covered are shown in Fig. 1. The model versions were all upgraded in December 2003, to version 6.2.0, with some local modifications. These modifications mainly consist of Jan Boerhout's optimizations of the data transposition routines.

Name	Resolution	Grid	Boundaries
HIRLAM 20	0.2°	468x378x40	EC frames 0.5°/3h
HIRLAM 10	0.1°	248x341x40	EC frames 0.5°/3h
HIRLAM 5	0.05°	152x150x40	HIRLAM 10

Table 1: Operational HIRLAM model grids

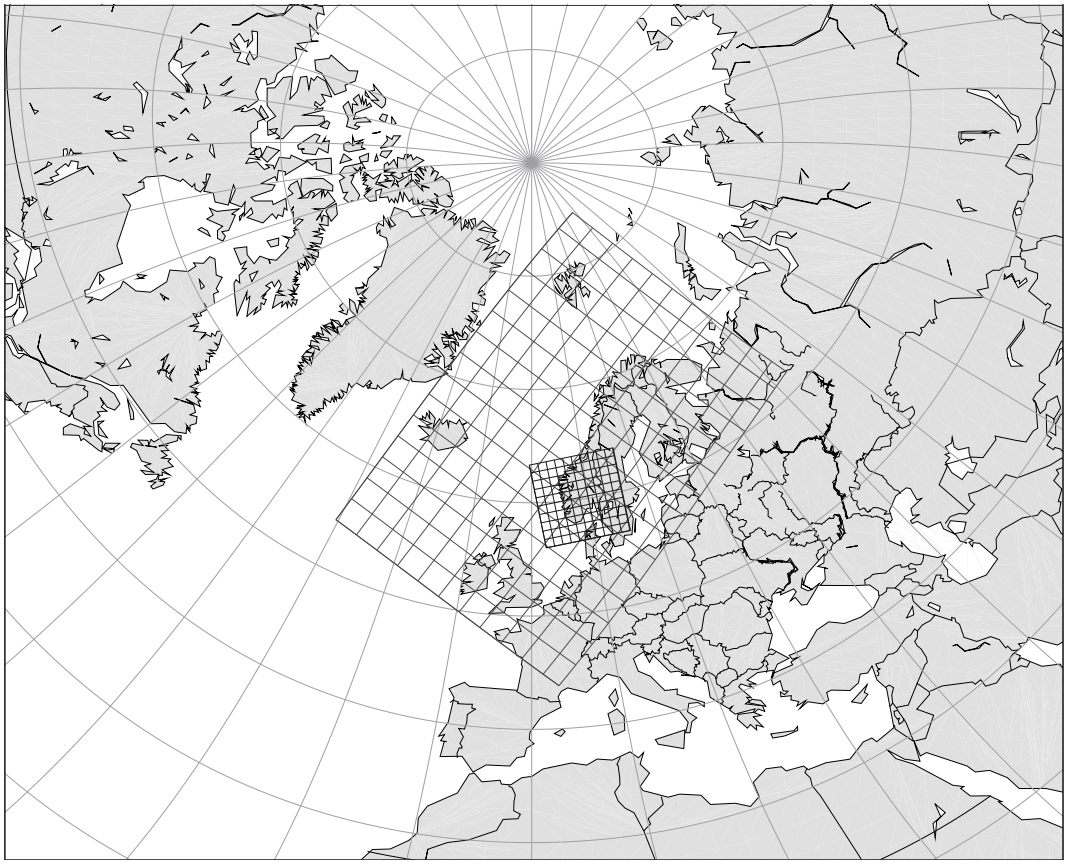

Figure 1: Areas covered by HIRLAM 20, HIRLAM 10 and HIRLAM 5

Unified Model

For high resolution forecasting, *met.no* has decided to try the Met. Office Unified Model. At the moment two versions of this model are running twice a day, both covering the same area as HIRLAM 5 (southern Norway). One of the models run with boundaries from the Met. Office EUROLAM 20km model. Due to limited line capacity this model has boundary updates every 2 hours and runs for only 24 hours. The second model runs with hourly boundaries interpolated from HIRLAM 10, with a forecast length of 48 hours.

Hardware

The operational forecasts are still run on the SGI Origin 3800 system located at NTNU, Trondheim. This installation consists of two main computers, one with 512 CPUs and another one with 384 CPUs. The operational HIRLAM models run on 196+ processors, but since last year a switch has been made from SHMEM to MPI communication. The reason for this was that after Jan Boerhout's optimizations, the MPI version seemed faster than the SHMEM version. In addition, at least on SGI, the MPI version of asynchronous I/O is running more stably than the IPC version.

As backup solution a new AMD Opteron cluster with 40 nodes (80 CPUs) is now replacing the old 20 CPU Pentium cluster. This also means that it is possible to run full HIRLAM 20 and HIRLAM 10 backups, instead of running the main model at 0.5° resolution (and interpolating results to 0.2°).

Assimilation of observations

The HIRVDA (3D-Var) code has been upgraded to version 6.2.0 since last year. The assimilation is running on 90 CPUs, since it appears that the domain decomposition in grid-point space prohibits going to a larger number for our area.

Assimilation is done only in the main model. HIRLAM 10 interpolates its initial upper air fields from the HIRLAM 20 analysis. We have also made some modifications so that most ISBA surface fields are also interpolated from the HIRLAM 20 analysis instead of being taken from the climate file.

The assimilation is right now using only conventional observations (AIREP/AMDAR, DRIBU, PILOT, TEMP, SYNOP, SHIP). With the last HIRVDA upgrade the radiation code was changed from RTTOV-5 to RTTOV-7. This means that we need new bias coefficients for assimilation of ATOVS data, a job that has not yet been completed. When this is finished, we will also use EARS (EUMETSAT retransmission) data instead of data locally received.

The surface analysis scheme has been modified so that we only analyze land surface temperature and soil wetness. Sea surface temperature, snow depth and sea ice are read in directly from fields supplied by the "Ice Map Service" in Tromsø (updated once a week).

Model output

The 0.2° model is run up to +60h. The increase from +48 to +60h is mainly in order to produce input to a nuclear accident program (SNAP). HIRLAM 10 and HIRLAM 5 are run up to +48h as before. MSLP, T2m, precipitation and 10m winds are written out each hour.

6 fields on 15 pressure levels, and 8 fields on 40 model levels are written out at 0, +3, +6, +9, +12, +18, +24, +30, +36, +42, +48h (+54 +60h).

Operational schedule

The atmospheric models in the operational schedule are listed in Table 2. In addition HIRLAM data are also used to force various ocean and wave models.

UTC	Model	CPU min.	Description
00	HIRLAM 20km	23(35)	Surface + 3D-Var an., +60h, EC frames
	HIRLAM 10km	12(20)	H20 analysis, +48h, EC frames
	MM5, 3+1 km	90	Air quality (Linux cluster)
	HIRLAM 5km	7(13)	+48h, HIRLAM 10 boundaries
	UM 3km (21UTC)	50	+24h, Met. Office boundaries/2h
	UM 3km	90	+48h, HIRLAM 10 boundaries/1h
06	HIRLAM 20km	35(50)	00r+9h (FGAT), 06+60h
12	HIRLAM 20km	23(35)	+60h
	HIRLAM 10km	12(20)	+48h
	HIRLAM 5km	7(13)	+48h
	UM 3km (09UTC)	50	+24h, Met. Office boundaries/2h
	UM 3km	90	+48h, HIRLAM 10 boundaries/1h
18	HIRLAM 20km	35(50)	12r+9h (FGAT), 18+60h

Table 2: Operational schedule (atmospheric models)

The "r" runs are reruns with more observations (longer cut-off) in the assimilation, and more recent boundaries. The CPU times in parentheses for HIRLAM are last years numbers, before the new optimizations.

Plans

HIRLAM plans

Perform assimilation impact study. Look at:

- AMSU-A data (EUMETSAT retransmission)
- QuikScat winds (100 km)
- Radar winds
- 3 hourly vs. 6 hourly cycling
- blending of ECMWF analyses
- 20km structure functions, new balance?
- observation cutoff sensitivity

Unified Model plans

- Set up a new model (4 km) covering all of Norway.
- Upgrade from UM version 5.3 to 5.5.
- Replace MM5 and MC2 runs (air quality etc.) with UM.
- Compare verification scores for runs with HIRLAM 10 and EUROLAM boundaries.
- Get more boundaries from the Met. Office.
- Understand the model (physics) better.
- Optimize code?, install on Opteron cluster.