

Operational HIRLAM at *met.no*

Ole Vignes, May 2002

Hardware

Since December 2001, the operational forecasts have been run on an SGI Origin 3800 system located at NTNU, Trondheim. This computer has 220 CPUs and 220 Gb memory. The operational HIRLAM models run on 190 – 196 processors, but none of the models are running really efficiently on this many CPUs.

As a backup solution the coarsest HIRLAM model is set up to run on a local Linux cluster, with 10 nodes (20 CPUs) and 5Gb RAM. In this case the finest model results will be interpolated from the coarse model.

Model version

Since last year the model and script system has been upgraded to somewhere between version 5.0.2 and 5.0.5, which means mini-SMS. However, due to stability problems in the test period, and not entirely satisfactory verification scores, the physics was downgraded to that of the previous operational version (≈ 2.6). This means Kuo/Sundqvist condensation, Louis vertical diffusion and 6th order implicit horizontal diffusion.

The model grids are listed in Table 1, and the areas covered are shown in Fig. 1. The new experimental 0.2° model covers the same area as the 0.5° model.

Name	Resolution	Grid	Boundaries
HIRLAM 50	0.5°	188x152x31	EC frames $0.5^\circ/3h$
HIRLAM 20	0.2°	468x378x40	EC frames $0.5^\circ/3h$
HIRLAM 10	0.1°	224x324x31	HIRLAM 50
HIRLAM 5	0.05°	152x150x31	HIRLAM 10

Table 1: Operational HIRLAM model grids

HIRLAM 50 and HIRLAM 20 are now using frame boundaries from the EC special BC project. We get 41 EC levels at 3 hour forecast intervals on points of the 0.5° model. Thus no horizontal interpolation for this model. We have also modified the code (VINETA) to interpolate cloud liquid water on the boundaries.

Assimilation of observations

The HIRVDA (3D-Var) code has been upgraded from version 4.3.1 to version 4.4.3 since last year. The analysis is currently running on (only) 90 nodes, since it appears that the domain decomposition in grid-point space prohibits going to a larger number. This problem should be investigated further. Another alternative for using more CPUs is to combine SHMEM/MPI with OpenMP. This has so far not been successful, but the plan is to have an SGI expert look at the problem (as part of the SGI contract with the Norwegian HPC project).

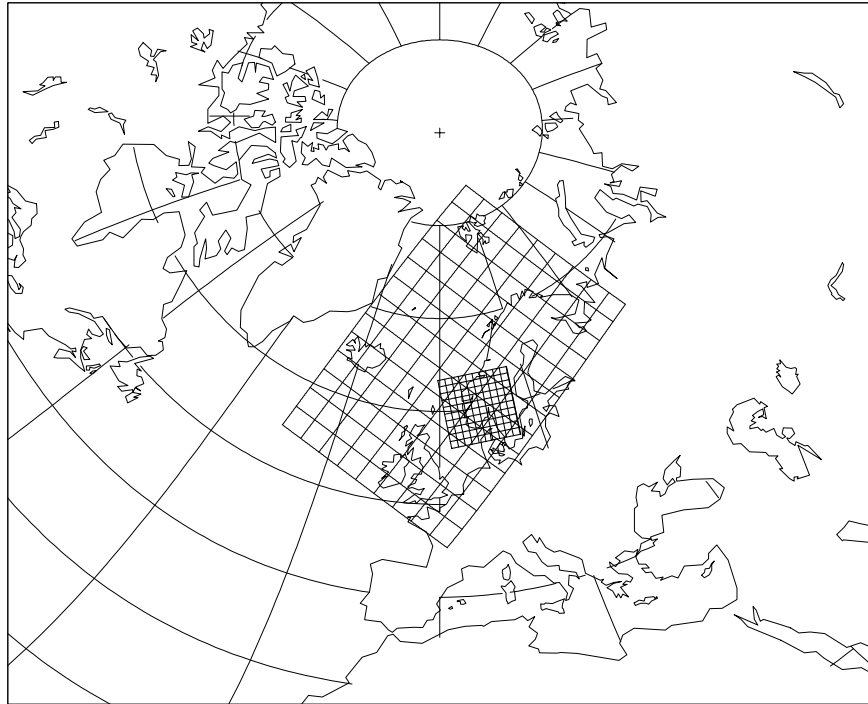


Figure 1: Areas covered by HIRLAM 50/20, HIRLAM 10 and HIRLAM 5

Analysis is done on the large area models (HIRLAM 50 and HIRLAM 20). For HIRLAM 20 structure functions for 40 levels have been interpolated from the standard (SMHI-generated) structure functions for 31 levels.

The analysis is still using only conventional observations. We plan to introduce ATOVS AMSU-A radiances in the near future.

Model output

The 0.5° 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 31 model levels are written out at 0, +3, +6, +9, +12, +18, +24, +30, +36, +42, +48h (+54 +60h).

Operational schedule

The operational schedule is as given in Table 2. Note that HIRLAM data are also used to force various ocean and wave models.

The “r” runs are reruns with more observations (longer cut-off) in the assimilation, and more recent boundaries. Note that we no longer blend with ECMWF fields once a day as was done last year. This was tested in conjunction with the transition to the new version, with

UTC	Model	Min.	Comment
00	HIRLAM 50km	12	+60h
	WAM 75km	3	Wave model HIRLAM+EC forcing
	ECOM3D 20km	6	Ocean model HIRLAM forcing
	HIRLAM 10km	15	+48h
	MM5, 3+1 km	90	Air quality (Linux cluster)
	HIRLAM 5km	17	+48h
	HIRLAM 20km	50	12r+6h,18+6h,00+48h
	WAM 8km	2	HIRLAM forcing
	ECOM3D 4km	35	HIRLAM forcing
06	HIRLAM 50	18	00r+6h, 06+60h
12	HIRLAM 50	12	+60h
	WAM 50km	1	
	ECOM3D 20km	5	
	HIRLAM 10	15	+48h
	HIRLAM 5	17	+48h
	HIRLAM 20	28	00r+6h, 06+6h
18	HIRLAM 50	18	12r+6h, 18+60h

Table 2: Operational schedule winter 2001/2002

inconclusive result, and therefore dropped. The reason it verified positively last time might be related to a systematic staggering bug between the analysis and forecast in the old schedule.

Plans

Plans for operational forecasting:

- Test the new HIRLAM 5.1.4, and ISBA in particular
- Test EC frames directly on the HIRLAM 10 grid
- Replace HIRLAM 50 with HIRLAM 20, introduce asynchronous I/O
- Replace preliminary version of 3D-Var with the reference version when available in HIRLAM 5.3.
- Test FGAT, and assimilation of ATOVS and QuickScat in 3D-Var
- Test the Kain-Fritsch/Rasch-Kristjansson convection scheme (HIRLAM 20)
- Test a 0.05° - 0.1° HIRLAM nested into the new 0.2° model. Test further nesting of “some suitable model” on a 0.03° grid covering all of Norway [2003].