

JOINT WMO TECHNICAL PROGRESS REPORT ON THE GLOBAL DATA PROCESSING AND FORECASTING SYSTEM AND NUMERICAL WEATHER PREDICTION RESEARCH ACTIVITIES FOR “2007”

Ireland / Met Éireann

1. Summary of highlights

Met Éireann – the Irish Meteorological Service – runs the Hirlam numerical weather prediction system, operationally, four times per day. Forecasts are produced out to 48-hours. Hirlam is an international co-operative project and details may be obtained from the Hirlam web site [<http://www.hirlam.org>] or from papers by Lynch et al. [2000] and by Undén et al. [2003].

Early in 2007, Met Éireann and ICHEC – the Irish Centre for High-End Computing – signed a collaboration agreement. As part of this collaboration, ICHEC provides computational facilities and support to Met Éireann to enable it to run its operational high-resolution forecast models on ICHEC's flagship supercomputer, walton [see <http://www.ichec.ie>]. In addition, a backup version of Hirlam [with fewer levels] is run, in house, on a small Linux cluster based on Intel Xeon hardware. (See Hamilton [2004])

2. Equipment in use

The Hirlam model [version 7.0rc1 with some bug fixes and alterations for local BUFR/GRIB] is run four times per day using 32 dual-CPU nodes of the walton cluster at ICHEC [Irish Centre for High-End Computing]. This cluster is ICHEC's flagship supercomputer and comprises an IBM eServer cluster 1350 consisting of 476 IBM e326 compute nodes with 20 TB of tightly integrated high-performance SAN based around an IBM DS4500. The backup version of Hirlam runs on an, in house, 9-node dual Xeon cluster [i.e. a total of 18 cpu's].

3. Data and Products from GTS in use

SYNOP, SHIP, BUOY, AIREP, AMDAR, ACARS, TEMP, TEMPSHIP, PILOT, SATOB and SATEM observations are used. The data are packed into BUFR format both for storage and for input to Hirlam.

4. Forecasting system

4.1 System run schedule and forecast ranges

Met Éireann runs the Hirlam system 4 times per day [starting from the analyses of 00UTC, 06UTC, 12UTC and 18UTC]. The forecast length is 48-hours.

4.2 Medium range forecasting system (4-10 days)

Met Eireann does not run a medium range forecasting system.

4.3 Short-range forecasting system (0-72 hrs)

4.3.1 Data assimilation, objective analysis and initialization

4.3.1.1 In operation

Analysis : Hirlam 3D-Var [3-dimensional variational assimilation]. The analysis runs on 60 hybrid [eta] levels. Upper-air observational data is accepted on all standard and significant levels (10 hPa to 1000 hPa) and interpolated to eta levels.

Assimilation Cycle : Three-hour cycle using the forecast from the previous cycle as a first-guess. [It is also possible to use an ECMWF forecast as a first-guess].

Initialisation : Digital Filter

4.3.1.2 Research performed in this field

No current research in this area.

4.3.2 Model

4.3.2.1 In operation

Forecast Model : Hirlam 7.0rc1 reference system grid point model. This is hydrostatic model and it is run on a rotated latitude-longitude grid with the South-Pole at (-30° longitude, -30° latitude). Fields are based on a 438x284 grid corresponding to a 0.15° x 0.15° horizontal Arakara C-grid. There are 60 levels in the vertical.

Integration Scheme : We use a two time-level three-dimensional semi-Lagrangian semi-implicit scheme with a time-step of 300 seconds.

Filtering : Fourth order implicit horizontal diffusion.

Physics : CBR vertical diffusion scheme; Sundqvist condensation scheme with the 'STRACO' (Soft TRAnSition COndensation scheme) cloud scheme; Savijarvi radiation scheme.

Lateral Boundary Treatment : Davies-Kallberg relaxation scheme using a cosine dependent relaxation function over a boundary zone of 8-lines. The latest available ECMWF 'frame' files are used [based on 4 ECMWF runs per day at 00Z, 06Z, 12Z and 18Z,

4.3.2.2 Research performed in this field

No current research in this area.

4.3.3 Operationally available NWP products

Upper-air products [such as temperature and wind] are available in GRIB code on standard levels. A variety of surface products [such as rainfall] are also produced.

4.3.4 Operational techniques for application of NWP products

4.3.4.1 In operation

MOS techniques are used to produce input to a model used to predict road surface conditions.

4.3.4.2 Research performed in this field

No current research in this area.

4.3.5 Ensemble Prediction System

Met Eireann does not run a medium range forecasting system.

4.4 Nowcasting and Very Short-range Forecasting Systems (0-6 hrs)

Short range forecasts [based on Hirlam] are run operationally on a one-hour cycle [out to 6 hours] with a short cut-off time.

4.5 Specialized numerical predictions

WAM wave model

Dispersion model for foot and mouth disease

Air quality forecasting

4.6 Extended range forecasts (ERF) (10 days to 30 days)

Met Eireann does not run an extended range forecasting system.

4.7 Long range forecasts (LRF) (30 days up to two years)

Met Eireann does not run a long range forecasting system.

5. Verification of prognostic products

We do not carry out verification on the areas suggested.

6. Plans for the future (*next 4 years*)

6.1 Development of the GDPFS

6.1.1 [major changes in the Operational DPFS which are expected in the next year] We hope to continue to use the most recent version of Hirlam – that should mean moving to Hirlam 8 when it becomes available.

6.1.2 [major changes in the Operational DPFS which are envisaged within the next 4 years] Currently we use 3DVAR as our analysis scheme; as the Hirlam 4DVAR becomes the default we hope to move to that system.

6.2 Planned research Activities in NWP, Nowcasting and Long-range Forecasting

[Summary of planned research and development efforts in NWP, Nowcasting and LRF for the next 4 years]

6.2.1 Planned Research Activities in NWP

6.2.2 Planned Research Activities in Nowcasting

6.2.3 Planned Research Activities in Long-range Forecasting

7. References

Hamilton, J (2004). Running the Hirlam NWP model on a 6 x dual-Xeon cluster at Met Éireann, 11th Workshop on High-Performance computing in Meteorology, ECMWF.

Lynch, P., Gustafsson, N., Sass, B., and Cats, G. (2000). Final report of the hirlam 4 project, 1997-1999. HIRLAM 4 Project Report, 59 pp.

Undén, P., Rontu, L., Järvinen, H., Lynch, P., Calvo, J., Cats, G., Cuxart, J., Eerola, K., Fortelius, C., Garcia-Moya, J. A., Jones, C., Lenderink, G., McDonald, A., McGrath, R., Navascues, B., Nielsen, N. W., Ødegaard, V., Rodriguez, E., Rummukainen, M., Room, R., Sattler, K., Sass, B. H., Savijärvi, H., Schreuer, B. W., Sigg, R., The, H., and Tijn, A. (2003). HIRLAM-5 scientific documentation. Hirlam scientific report.