NWP at Met Éireann – Ireland – 2002

Introduction

The Hirlam system is used at Met Éireann – the Irish Meteorological Service – to produce operational forecasts out to 48-hours. [Last year the system was ungraded from version 4.3.5 to version 5.0.1, the resolution was enhanced and 3DVAR was added]. The model is run four times per day using an IBM RS/6000 SP with 9 nodes each with 4 processores sharing 2 Gbytes of memory [i.e. a total of 36 CPUs and 18 Gbytes of memory].

Data Assimilation

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

Analysis : Hirlam 3D-Var [3-dimensional variational assimilation]. The analysis runs on 31 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].

Analysed Variables : Wind components (u,v), geopotential and specific humidity.

Forecast Model

Forecast Model : Hirlam 5.0.1 reference system grid point model.

Horizontal grid : A rotated latitude-longitude grid is used with the South-Pole at $(-30^o$ longitude, -30° latitude). Fields are based on a 438x284 grid corresponding to a 0.15^o x 0.15^o horizontal Arakara C-grid.

Vertical Grid : Hybrid [eta] coordinate system with 31 levels.

Initialisation : Digital Filter.

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, respectivly]. ECMWF data is received on a 0.3^o x 0.3^o rotated latitude-longitude grid on a selection of the 60 ECMWF eta levels. The data is interpolated both horizontally and vertically to the Hirlam 0.15^o x 0.15^o rotated latitude-longitude grid on 31 [Hirlam] eta levels. [The selected 0.3^o x 0.3^o grid corresponds to half the resolution of the 0.15^o x 0.15^o grid, the line speed is not sufficient to receive the data at full resolution].

ECMWF Rotated Frame Boundaries : As part of an optional project at ECMWF we receive boundary data data on a rotated latitude-longitude grid defined as a hollow frame. This is used to update the boundary files four times per day.

Data Monitoring

The analysis departures/flags are fed back to the original BUFR reports to create 'feedback' files which are used to monitor the quality of the data on an ongoing basis and to identify problems [e.g. station elevation errors].

Verification

Verification against Fields : A small number of Hirlam parameters are verified against the corresponding Hirlam analysis fields. [This is to provide continuity with an earlier model which was used before Hirlam became operational].
Verification against Observations : The Hirlam verification system is used to verify forecasts against observations from EGWLAM stations within the area.

Operational Usage

General Forecasting : Hirlam forecasts are used for general forecasting in Met Éireann out to 48-hours. [ECMWF forecasts are used beyond that period]. Hirlam output can

be displayed using an interactive graphics sytem called **xcharts** (developed at Met Éireann).

WAM model : Forecast 10-metre winds from Hirlam are used to drive a WAM wave model.

Roadice Prediction System : Forecast surface parameters [temperature, wind, cloud-cover, humidity and rainfall] are used [after forecaster modification] as input to a roadice model.

SATREP : Hirlam output can be overlaid on satellite plots as part of the ZAMG SATREP analysis scheme.

Nested Hourly Analysis

A separate nested version of Hirlam is run every hour on a dual-processor 500Mhz PC running Linux. The purpose of the run is to provide an hourly analysis and also a short range [3-hour] local forecast.

Forecast Model : Hirlam 4.3 forecast model in conjunction with the Hirlam 4.8 analysis scheme.

Vertical grid : A set of 24 hybrid [eta] levels .

Horizontal grid : A rotated latitude-longitude grid is used with the South-Pole at $(-9^o$ longitude, -38° latitude). Fields are based on a 97x98 grid corresponding to 0.15^o x 0.15^o horizontal Arakara C-grid. It is planned to upgrade this system to a finer grid in the near future.

Research Activities

Better specification of boundary conditions for NWP models; 3DVAR; Operational Implementation of a Nested System.