Annual WWW Technical Progress Report on the Global Data Processing System

Portugal **Instituto de Meteorologia**

1. Summary of Highlights

During 2002 no major actions occurred on the Portuguese data and products processing systems. However, the migration of these systems from the VAX platform to the DecAlpha server in cluster has started. In the same way, no relevant changes have taken place on the numerical weather prediction systems, where a continuous effort has been focused on the validation of diagnostic tools and implementation of an operational OI objective limited area analysis scheme.

2. Equipment in use at the institute

To handle GTS links:

A cluster of 4 Micro VAX's (2x3400,2x400) –dual system, with 5 Gbytes of mirrored disk space

To handle other GDPS functions:

2 DecAlpha Servers 2000 4/275 in cluster, with 128 Mbytes of memory (each) and 12 Gbytes of mirrored disk space

To handle graphical applications:

1 DecAlpha XP1000 server, with 500 Mbytes of memory

To handle the numerical weather prediction activities:

1 DecAlpha XP1000 server, with 1 Gbytes of memory

3. Data and products from GTS

Typical number of reports received daily:

SYNOP (including automatic)	32539
SHIP	5290
TEMP and TEMPSHIP	1067

PILOT	511
DRIBU	10563
METAR	6371

NWP model products available:

GRIB (ECMWF – ATL_1 Area)
GRIB (EGRR – YR Area)
GRIB (LFPW – ARPEGE)
GRIB (LPMG – Local Area)

4. Data input system

Fully automated.

5. Quality control system

For national SYNOP and TEMP data, checks are applied against WMO international code forms; if error detected, messages are routed for manual inspection and correction, when possible.

During the pre-processing, checks are applied based on recommendations from the GDPS manual. For upper-air data (TEMP's and PILOT's) vertical consistency checks are performed, using all available parts, for temperature, geopotential and wind.

6. Monitoring of the observing system

Monitoring of the observing system is not implemented.

7. Forecasting system

The forecast system consists of a mesoscale limited area model hereafter called ALADIN / Portugal model.

7.1 System run schedule and forecast ranges

Pre-processing GTS data system runs in quasi-real-time basis.

Forecast run schedule is:

0255	00UTC ALADIN / Portugal (up to H+48 step)
1455	12UTC ALADIN / Portugal (up to H+48 step)

7.2 Medium range forecasting system (4-10 days)

None.

7.2.1 Data assimilation, objective analysis and initialisation

None.

7.2.2 Model

None.

7.2.3 Numerical Weather Predition products

None.

7.2.4 Operational techniques for application of NWP products

A mean sea level pressure objective analysis system exists by the Successive Corrections Method each 6 hour. ECMWF shorter range forecast available is used as first guess as well with GTS observations from the neighbouring Atlantic Ocean and close west Europe geographical area.

Pseudo-TEMP's are produced up to H+24h.

7.2.5 Ensemble Prediction System (Number of runs, initial state pertubation method, clusterig)

None.

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

None.

7.3.1 Data assimilation, objective analysis and initialisation

ALADIN / Portugal does not have its own assimilation system: it runs on a dynamical adaptation mode in which initial and boundary condition are provided by global model ARPEGE (via Méteo-France).

7.3.2 Model

ALADIN / Portugal is a spectral limited area model and the operational version runs in hydrostatic mode with the digital filter initialisation option; the temporal discretization is the two-time level semi-Lagrangian scheme with 600s of time step The integration domain covers the Iberian Peninsula and part of the neighbouring Atlantic Ocean and has 100 x 90 point size with 31

vertical levels and 12.7 Km horizontal resolution; the coupling frequency is 6h.

The ALADIN / Portugal model is integrated twice a day - 00 and 12 UTC - up to H+48h, and post-processing is applied every 1 hour with conversion of all required fields done into GRIB (projection used Lat / long) for further handling, visualisation and archiving.

7.3.3 Numerical Weather prediction products

Surface parameters: surface pressure, mean sea level pressure, two metre temperature, soil temperature, soil wetness, deep soil temperature, deep soil wetness, snow depth, height geopotential, land sea mask, ten metre u wind component, ten metre v wind component, two metre relative humidity, two metre maximum temperature, two metre minimum temperature, total cloud cover, convective cloud cover, convective precipitation, convective snow-fall, large scale precipitation, large scale snow-fall.

Standard pressure level parameters: geopotential, temperature, u wind component, v wind component, relative humidity, absolute vorticity, potential temperature, pseudo-wet-bulb potential temperature.

7.3.4 Operational techniques for application of NWP products

Isentropic Potential Vorticity is a derived product locally produced.

7.4 Specialised forecasts (on sea waves, sea ice, tropical cyclones, pollution transport and dispersion, solar ultraviolet (UV) radiation)

During 2002, Portuguese Meteorological Institute (IM) made several improvements in its specialised forecast system on sea waves for North Atlantic Ocean (SOMAR[1] and Ray models). The IM also contributed on the numerical sea-wave prediction of the Plop's and Macao Meteorological Services, adapting and operational implementing the sea wave model SOMAR to the Guinea-Bissau and Macao areas.
The pollutant transport and dispersion of hydrocarbons at sea has been also developed to support marine pollution emergency response operations

[1] SOMAR – Simulação das Ondas do MAR (Ocean Waves Simulation)

7.4.1 Data assimilation, objective analysis and initialisation (where applicable)

None.

7.4.2 Models (as appropriate, related to 7.4)

The SOMAR model is a third generation wind-wave model, where the spectral shape results from the integration of the energy balance equation. The model includes a parameterisation of wave growth induced by wind – Miles mechanism, non-linear wave-wave interaction and dissipation by white capping. The present version of the model covers the North Atlantic using a Mercator projection (propagation in lat-long grid) with a grid step of 1º lat x 1º long and a spectral resolution of 24 directions x 22 frequencies. The model input wind fields are produced by the European Centre for Medium-range Weather Forecasts (ECMWF).
Near-shore, the SOMAR model is terminated by a Ray model that reproduces the effects of shelter by the shore, refraction, shoaling and dissipation by bottom friction. The Ray model uses an inverse ray tracing technique with rays traced at 360 directions x 22 frequencies and it is constrained by the bathymetry, which resolution is 1' lat x 1' long.
The SOMAR and Ray models are integrated once a day (12UTC) up to H+120h.

Trajectory model, used operationally and in emergency to follow the trajectory of radioactive plumes (in cooperation with Environment Institute).

Fire Weather Index (FWI), used to support the forest fires prevention and fighting activities.

7.4.3 Numerical weather prediction products

SOMAR model Parameters: significant wave height, mean wave direction and mean period.
Ray model Parameters: significant wave height, wind sea height, swell height, maximum height most probably in 6 hours, power density, mean period, peak period, peak period unidirectional, power equivalent period, spectral width, peak direction, mean direction, wind sea direction, swell direction and power direction.

7.4.4 Operational techniques for application of NWP

None.

7.5 Extended range forecasts (10 days to 30 days) (Models, Methodology and Products)

None.

7.6 Long-range forecasts (30 days up to two years) (Models, Methodology and Products)

None.

8. Verification of prognostic products

Since August of 1999 ALADIN / Portugal forecasts are objectively verified on a regular basis. Verification scores for surface and upper-level parameter are computed following standard recommendations. Upper level parameters, namely, geopotential, temperature, specific humidity and wind speed are compared against sounding observations or analysis. Rain is treated as a categorical parameter and several statistical measures are computed from it.

9. Plans for the future

?? Update of operational graphical display, using Metview (ECMWF).
?? Keep on going the migration of products processing systems from the VAX to the DecAlpha plataform.
?? Validation and operational implementation of CANARY / DiagPack
?? Validation and operational implementation of diagnostic tools
?? Developed / adapt the SOMAR end Ray models to Mozambique, Cap Verde Angola and S. Tome e Principe;
?? Introduce a spatial resolution variable into SOMAR model to better represent waves in shallow waters and to use an input wind provided by ALADIN / Portugal.

10. References

Horányi, A., I. Ihász, and G. Radnóti, 1996: ARPEGE / ALADIN: A numerical prediction model for Central-Europe with the participation of the Hungarian Meteorological Service. Idojárás, 100, 277-300.
Komen *et al*, 1994. “Dynamics and Modelling of Ocean Waves”, Cambridge University Press, 532p.