Limited Area Modelling Activities at Portuguese Meteorological Service (2005/2006)

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1. Summary of main activity

Since the last year main effort was (still) devoted to the progress of our operational system and training of the NWP team. GDPFS and GTS data processing is now being fully mounted under UNIX/Linux environment and a new computer platform is being used to run an updated version of ALADIN/Portugal in operational mode. A new computer platform is being tested for our local model now under parallel processing, on a PC's cluster, using the scientific live Linux distribution PaiPix/cluster. The restricted version of PaiPix + ECMWF tools is used both for development work and for operational graphical production. Finally, we started our historical archive of operational production under the home made TIDB2 relational data base. Verification tools for inter-comparison of NWP models present at IM are still being reviewed and prepared to became fully operational.. CANARI is now being validated to our domain and the wind dynamical adaptation is being tested against MM5 (University) as possible forcing fields to the management models of wind power supply stations. Finally, training was a priority inside the team and inside our meteorological service were a internal workshop has just taken place.

2. Workstation version of ALADIN/Portugal

2.1 History of the Main Events

Since 24 of April 2000, IM has a Limited Area Model (LAM) running in operational mode. This NWP model is a local installation of the ALADIN model, hereafter called ALADIN/Portugal model.

As a brief history, we refer the following operational changes:

- Apr 2000 → cycle AL09
- Jun 2000 → cycle AL11T2 (CYCORA included)
- Jul 2001 → cycle AL12_bf02 (CYCORA_bis included)
- Apr 2002 → change of the time step (540s to 600s)
- Jun 2006 → cycle AL28T03 with new geographical configuration

Under test:

- Midle 2006 → cycle AL29T02 installed on a PC's cluster
- Midle 2006 → CANARI (AL12)
- Midle 2006 → Wind dynamical adaptation (AL12, new climatologies)

2.2 Foreseen activities

- Upgrade of ALADIN/Portugal WS actual operational version (+ levels)
- Validation of RISCON
- Improvement of verification tools
- Start of dynamical adaptation for the wind as support of forest fire prevention and wind power supply management
- Dissemination of coupling fields as forcing of navy oceanographic models (cont.)
- Dissemination of ALADIN/Portugal fields to INM (Spain) (cont.)
- Operationality of CANARI

2.3 Operational version

The operational environment and main characteristics of ALADIN/Portugal are:

Computer characteristics (OLD/NEW)

DecAlpha cluster ES40 2/667, 3Gb mem.
True 64 UNIX V5,1A
DIGITAL F90 and 77 Compilers, native C Compiler

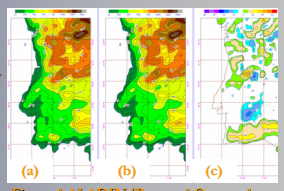

Figure 1 ALADIN/Portugal Orography: (a) AL12; (b) AL28; (c) AL28-AL12

Model characteristics

Spectral hydrostatic model
Hybrid vertical co-ordinates
DF initialisation
6 hour coupling frequency from ARPEGE
ISBA surface parametrisation scheme
Semi-Implicit Semi-Lagrangian two-time-level advection scheme
Initial and lateral boundary conditions from the latest ARPEGE forecast
Integration domain:
Size: 108x108 points
Number of vertical levels: 31
Horizontal resolution: 12,7 km
Time step: 600 s
Integration frequency: twice a day
Forecast range: 48 hours
Output frequency: 1 hour

Available configurations

001, e927, e923 and 701

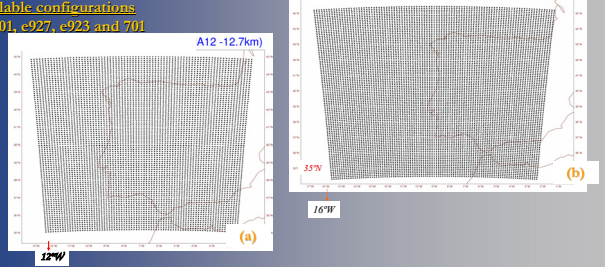

Figure 2 ALADIN/Portugal geographical domain: (a) old operational version; (b) number of points in lat, lon: 85,96; central coordinates: 30,0°N,330,9°E; Lat/lon of most SW: 34,76°N, 345,2°E; Lat/lon of most NE: 44,84°N, 356,6°E; resolution: 0,12°

Graphical software

The METVIEW/MAGICS graphical software (ECMWF) is used to display NWP products. Besides, a user-friendly visualisation tool for Windows PC's – GENIO – was designed to display up to a maximum of three overlapped meteorological fields coming from the last two operational runs of the model.

3. Diagnostic tools

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Since last report, the verification of diagnostic tools has been successfully done. By now, diagnostic tools post-processed from direct model outputs are fully in use on the weather forecasting room for the identification of severe weather situations. The composite of some diagnostic fields was recently created as a risk assessment – RISCON – for heavy precipitation situations. This tool is under validation.

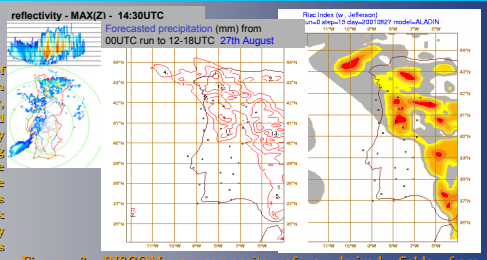

Figure 3 RISCOM a composite of a derived fields from ALADIN/Portugal, verified against a radar image and the acumulate value of forecasted precipitation

4. NWP data archive

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Since last report, our TIDB2, an open source Reports Data Base Management System is under test as the heart of operational and development work, being used to store our GRIB production; the coupling files to ALADIN/Portugal, BUFR near-real time observations. An historical archive of ALADIN/Portugal is finally being created. Besides, GRIB data from a local version of MM5 and GRIB data from HIRLAM/Spain is also available and will be verified against ALADIN/Portugal.

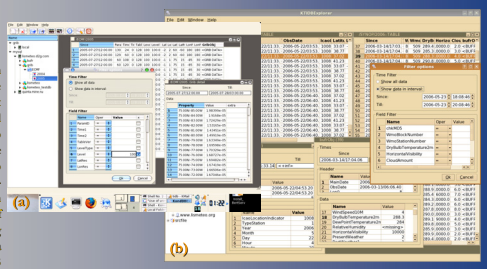

Figure 4 Portuguese NWP archive details: (a) GRIB data; (b) BUFR data

5. Wind dynamical adaptation

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Wind dynamical adaptation is being validated for 3 different domains of Portugal. Tests have been performed as case studies under different synoptical situations. The temperature dynamical adaptation has been tried as well. Preliminary conclusions are: results are good for the wind field (in opposition to direct fields); however, incresed value over the direct wind output fields depend on the synoptic situation; we will need an objective verification to understand if results are better with 15 or 26 vertical levels; time step and adaptation step seem to be irrelevant for this tool on the studied cases.

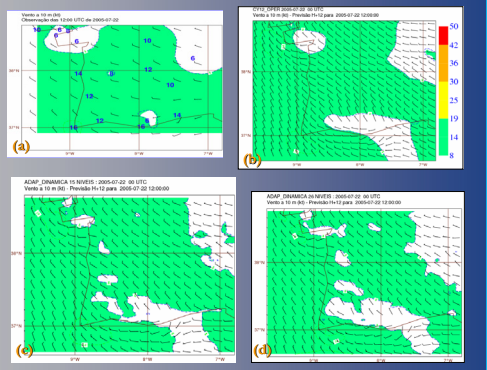

Figure 5 Wind dynamical adaptation in the South of Portugal: (a) obs; (b) oper; (c) 15 levels; (d) 26 levels

6. ALADIN/Portugal on AMD64 dual core processors

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With the new models generation of the ALADIN community NWP challenges are grown for countries with few resources. The new computer requirements of the community trigger local strategies based on low price solutions[1]. Recently, the PaiPix[2]/IM Linux distribution has been locally implemented as an optimised development environment for NWP activities. This work consisted in creating the appropriate Debian packages and patches for the ECMWF applications using the Debian Sarge distribution and the Linux kernel 2,6. The PaiPix work also integrated the database tools currently being developed at IM, or TIDB2[3]. Although this platform could be directly booted from a DVD (live)it has been locally installed on the hard disk of each AMD64 PC available for each working position. Basic tests with ALADIN source code have now allowed the installation of the local version of ALADIN/Portugal on a private 6 AMD dual core PC cluster under the PaiPix operating system: *gmkpack* has been used on the installation of CY29T2. Foreseen tests will increase power of this cluster with the compatible AMD64 PC's of each NWP working position. At the end conclusions will be taken about the suitable design of the best quality/price computer platform solution for operational and development NWP activities.

Figure 6 THOR: a 6 AMD 64 PC cluster with main characteristics: chipset ASUS ASN-E, 1Gb RAM, 129 Gb disk space, graphical ATI Radeon 65 Mb card

References

[1] Amorim, A. and Ligia Amorim, 2006, Making the ECMWF tools, including METVIEW, available in a restricted version of the PAIPIX scientific live Linux, Proceedings of the 10th ECMWF Workshop on Meteorological Operations Systems

[2]http://www.paipix.org

[3]Simões, J. et all, 2006, Implementation and Testing Object Extensions of Open Source RDMS for Meteorological Data, Proceedings of the 10th ECMWF Workshop on Meteorological Operational Systems