Limited Area Modelling Activities
at Portuguese Meteorological Service (2004-2005)

Maria Monteiro
Instituto de Meteorologia (IM)
Rua C, Aeroporto de Lisboa,1749-077 Lisboa, Portugal
Maria.Monteiro@meteo.pt

1. Summary of main activity

During the mentioned period the main effort have been put not only on the local maintenance of actual tools but also on the preparatory studies to change our NWP environment, in particular the operational scheme of ALADIN/Portugal. Data pre-processing is now being fully mounted under UNIX environment, a new computer platform is being tested for ALADIN/Portugal and a restricted version of a scientific Live Linux distribution (PaiPix + ECMWF tools) has been created to allow an efficient exploitation of NWP products. Besides, a NWP historical archive has been designed using an open source RDBMS and is under test. The verification tools are being reviewed and prepared to become fully operational. Training has become a priority inside the team since new people joint the group. Frequent general explanatory sessions have also taken place inside our meteorological service. As a final remark we mention that diagnostic tools post-processed from direct model outputs are now fully in use on the weather forecasting room for the identification of severe weather situations and that the ALADIN/Portugal products are continuously disseminated as forcing fields for operational ocean modelling activities.

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)

and some new pre-operational introductions:

Jan 2003	cycle AL12_bf02 (CYCORA_bis included) installed on a DecAlpha cluster
Jan 2005	new geographical configurations for cycle AL12_bf02 (CYCORA_bis included) are being tested

2.2 Foreseen activities

→ Start of operations of ALADIN/ Portugal on a new DecApha cluster
→ Change of ALADIN/ Portugal WS actual operational version to AL28, with a new geographical configuration
→ Start of a NWP historical archive and improvement of the verification tools
→ Start of dynamical adaptation for the wind as support of forest fire prevention
→ Dissemination of coupling fields as support to MATCH

2.3 Operational version

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

Computer characteristics

Oper: DEC Alpha XP1000 (Compaq), 1/ 500, 1 Gb mem., DIGITAL UNIX V4,0; Pre-oper: DecApha cluster ES40 2/ 667, 3Gb mem., True 64 UNIX V5,1A; In both systems: DIGITAL F90 and 77 Compilers, native C Compiler

Model characteristics

Spectral hydrostatic model; Hybrid vertical co-ordinates; DF initialisation; Semi-Implicit Semi-Lagrangian two-time-level advection scheme; ISBA surface parametrisation scheme; Initial and lateral boundary conditions from the latest ARPEGE forecast; 6 hour coupling frequency from ARPEGE; Integration domain: 100x90 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
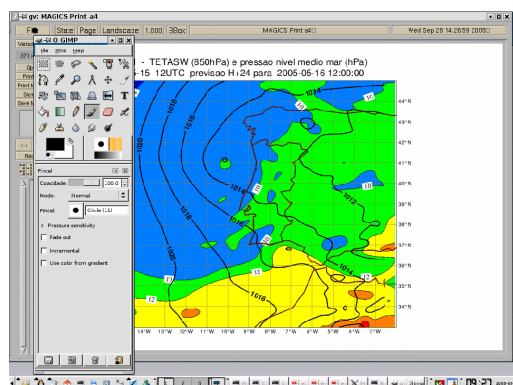
Graphical software

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

3. PaiPix scientific live Linux distribution and the NWP historical archive
(info: Ligia.Amorim@meteo.pt & Joao.Simoes@meteo.pt & Antonio.Amorim@paipix.org)

A new NWP working environment is being designed for each development work position. In order to have a standard and efficient exploitation of NWP products, a PaiPix/ IM distribution meant to be used on a meteorological development environment was created.

Figure 1 A PaiPix/ IM desktop image under a Metview session

Paipix is a bootable Live system on DVD, based on KNOPPIX Live Linux, consisting on a representative collection of GNU/ Linux software, automatic hardware detection and support for many graphical cards, SCSI and USB devices and peripherals. It is used as desktop and locally we installed it on a hard disk.

ECMWF basic tools have been included on this distribution (e.g. EMOSLIB and Metview) and the access to our NWP on-line data base have been considered.

With the full migration of our real-time pre-processing system to UNIX, our BUFR and GRIB on-line data base was re-created under the new operating system. The new RDB/ FDB (reports data base/ fields data base) is being tested as a form of object extensions to an open source RDBMS for meteorological purposes. The expected target of this work is the design and
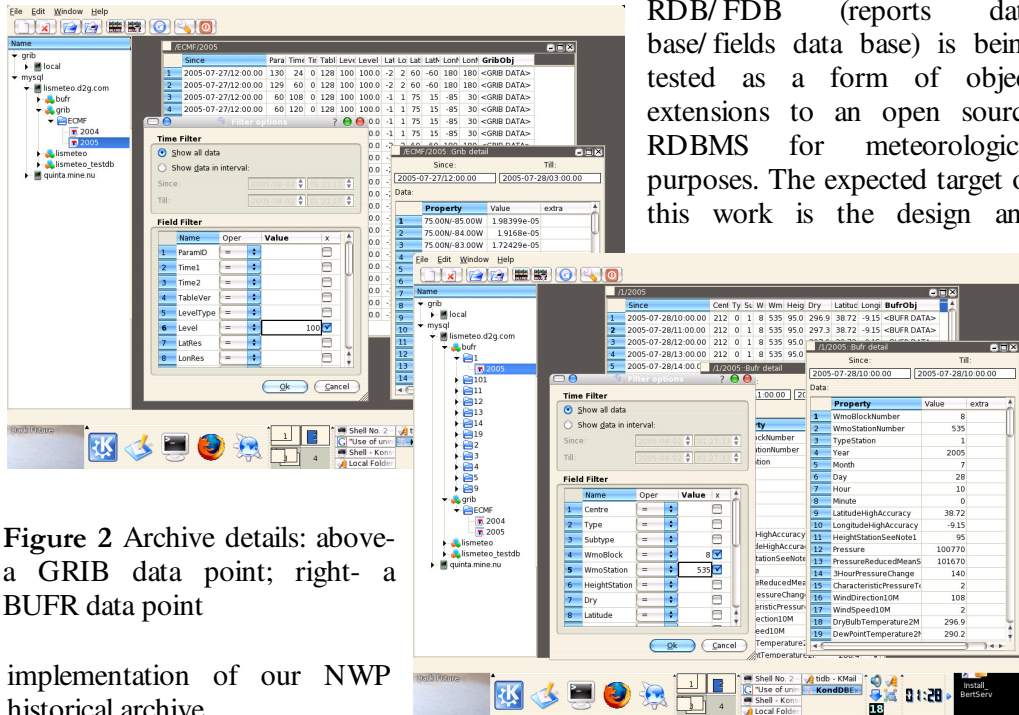

Figure 2 Archive details: above- a GRIB data point; right- a BUFR data point

implementation of our NWP historical archive.

4. New ALADIN/Portugal geographical configuration
(info: Margarida.Belo@meteo.pt & Pedro.Sousa@meteo.pt)

The impact of new geographical configurations of the ALADIN/ Portugal is being tested in order to prepare a better answer of our operational system. Experimental runs are being performed for 3 different geographical area/ resolution pairs of configurations and results are being analysed against ECMWF products and observations: 39 cases from which two third cases of severe precipitation conditions able to cause warning alerts are under analysis, both associated with winter frontal systems and with spring/ summer deep convective systems. The following configurations are available:

- Oper (44.8N/ -12.2W/ 35.1S/ -1.7E & 12,7km)
- S33 (45.1N/ -16.0W/ 32.5S/ -2.5E & 12,7 km)
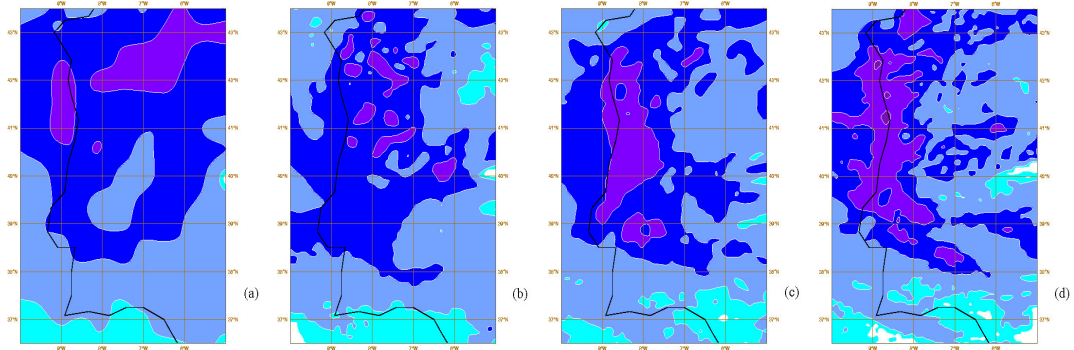- S33_8 (45.1N/ -16.0W/ 32.5S/ -2.5E & 8.0km)

Figure 3 Precipitation field under a frontal system weather conditions. (a) ECMWF model; (b) ALADIN/ Oper; (c) ALADIN/ S33; (d) ALADIN/ S33_8; left- Observations

An objective verification has been performed. Case studies analysis results are positively more conclusive with the increase of Atlantic area of our geographical domain than when we increase resolution.

The diagnostic tools mentioned at 1 were applied to the outputs of the above mentioned experiences and the results for the ALADIN/ S33 experience are shown.
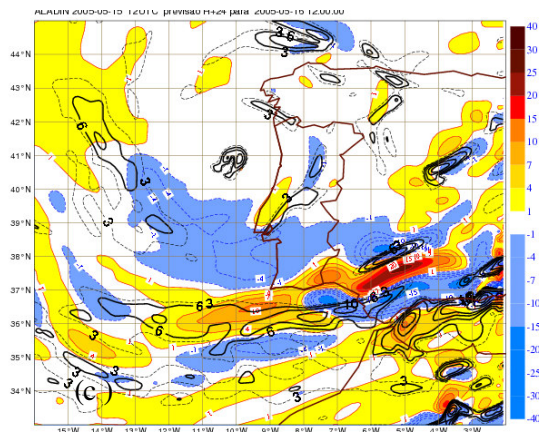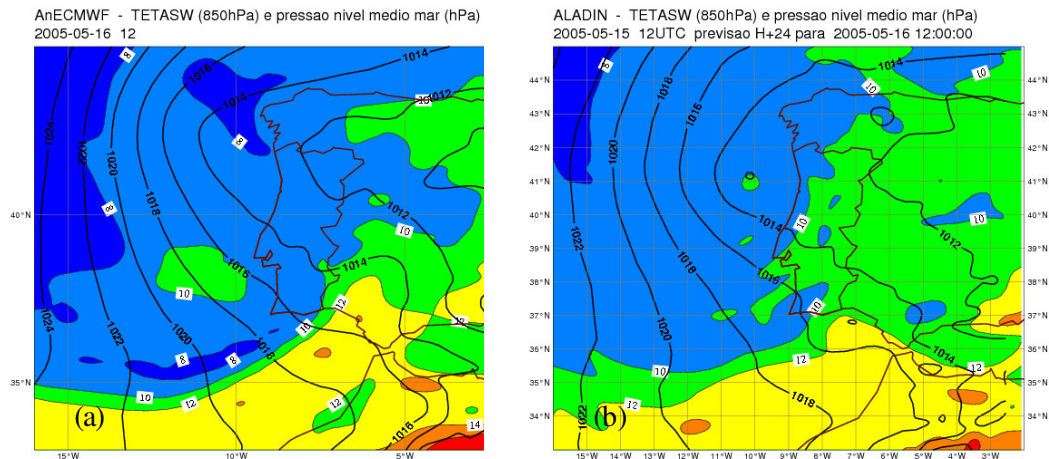

Figure 4 Result of the two diagnostic tools, the frontongenic function and Q vector divergence on a frontal system weather condition. (a)- ECMWF analysis; (b)- ALADIN/ Oper H+24; (c) frontongenic function and Q vector divergence from ALADIN/ S33