

ALADIN DA basic kit Working Days
Lisbon 22-23 March 2017

Towards a DA system for AROME-PT2

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Sequence of ideas:

1. Motivation: **DA aspects**
2. Surface DA: **CANARI/OI_MAIN**
3. Upper-air DA: **local scripting system**
4. Availability of Iberian conv obs

1. Motivation: DA aspects

DA: filtering and propagating observations

$$[x^a - x^b] (i) = \rho(i,j) \frac{\sigma_b^2}{[\sigma_b^2 + \sigma_o^2]} (y^o(j) - Hx^b(j))$$

2 basic contributions (many simplifications !):

- + good quality (pseudo-)observations from the type able to reduce the representativeness error and a linearized projection from model to observations space
- + a good filter and propagation factor built from estimated observations and background errors

Necessary conditions to make it real using the local capabilities:

(communitary) source code + namelist settings + scripting system + data monitoring & verification/diagnostic tools + computer resources + time(/man) power resources



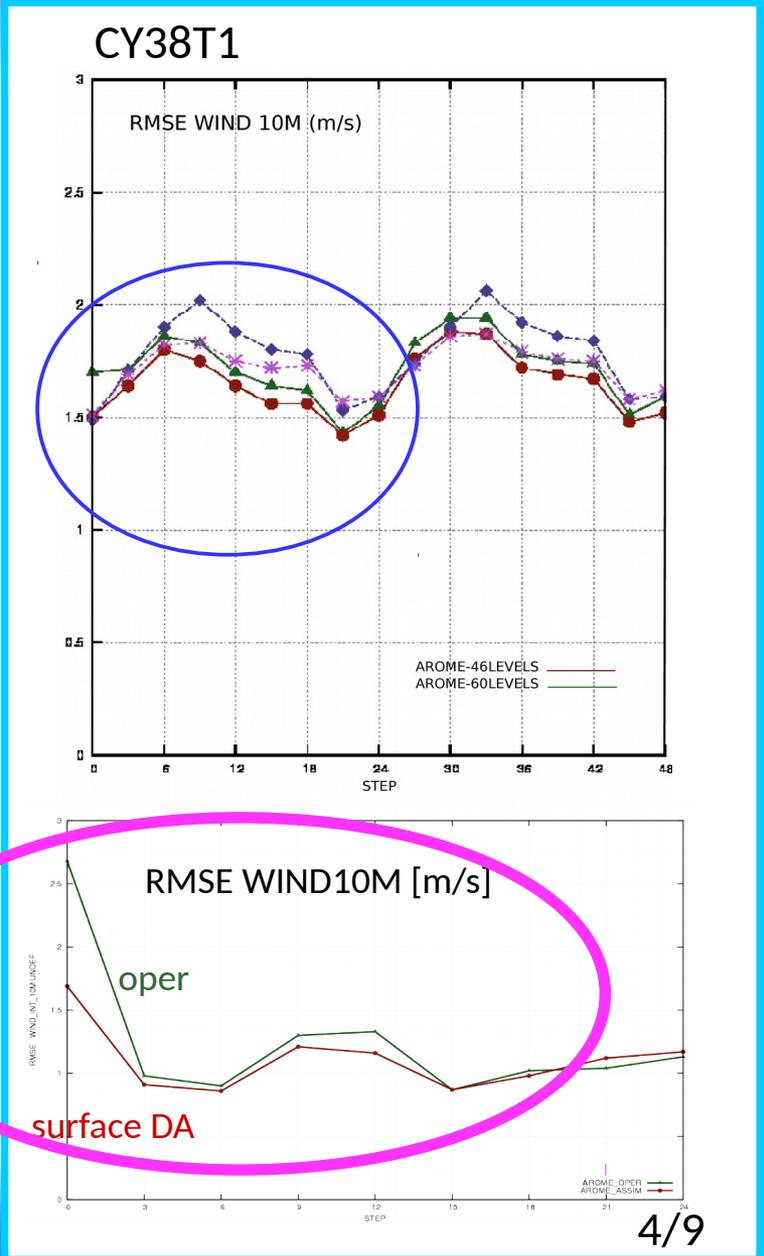
2. Surface DA: CANARI/OI_MAIN

2 ALADIN options (for operations):

- CANARI/OI_MAIN → computational efficiency (available since CY38T1)
- externalized OI_MAIN → historical



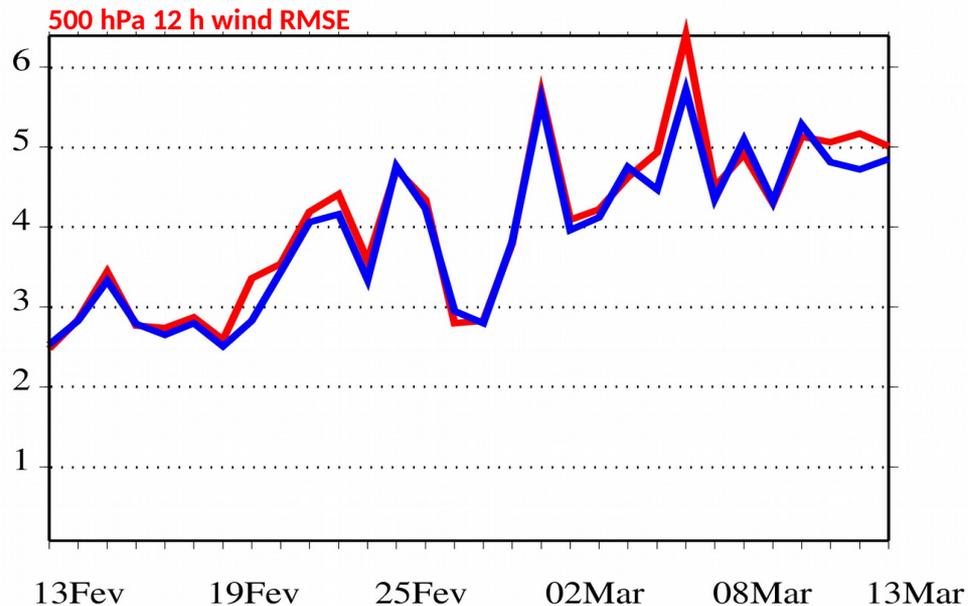
with the collaboration of M-F and CHMI



3. Upper-air DA: local scripting system

Studying the ALADIN/AROME 3D-Var formalism:

Modelling B matrix has an impact on the model scores !



The red line refers the model scores over one month period when B-matrix takes into account the weather conditions at play

An impact study of updating background error covariances in the ALADIN-France data assimilation system, Berre, L. et al, 2013



3. Upper-air DA: local scripting system

IPMA 3D-Var testbed (with the collaboration of OMSZ and CHMI)

2 options:

- install locally the HARMONIE (HIRLAM) scripting system (taking advantage from the work done with local radar DA) → too far from the ALADIN (~HIRLAM) philosophy to be run in to operations (at that time)
- extend the already existent scripting system, using the local facilities



The screenshot shows a configuration window for a job named 'exp_3dvar'. The top section lists various parameters: YMD=20161115, SUITE=exp_3dvar, YMD=20161115, DATE=16.12.2016, DAY=friday, DD=16, DOM=5, DOY=351, MM=12, MONTH=december, YYYY=2016, SMSDATE=20161216, SHSTIME=09:32, and SMSLOCK=friday;december;5;351. Below these are several job components: 'fc_init', 'analise_00', and 'analise_06'. The 'analise_06' component is expanded to show a tree structure of sub-jobs: 'prep_obs', 'surf_ana', and 'upper_ana'. Each sub-job has its own set of parameters, including FAMILY and FAMILY1. At the bottom, there are more job components: 'analise_12', 'analise_18', and 'misc'. A text box on the right side of the screenshot states: 'Minimization takes roughly the resources of a 6-hour forecast (1 proc)'. The interface includes various icons for editing and deleting components.



4. Availability of Iberian conv obs

with the collaboration of M-F and CHMI

54 Iberian surface observations
2015.08.02 12UTC

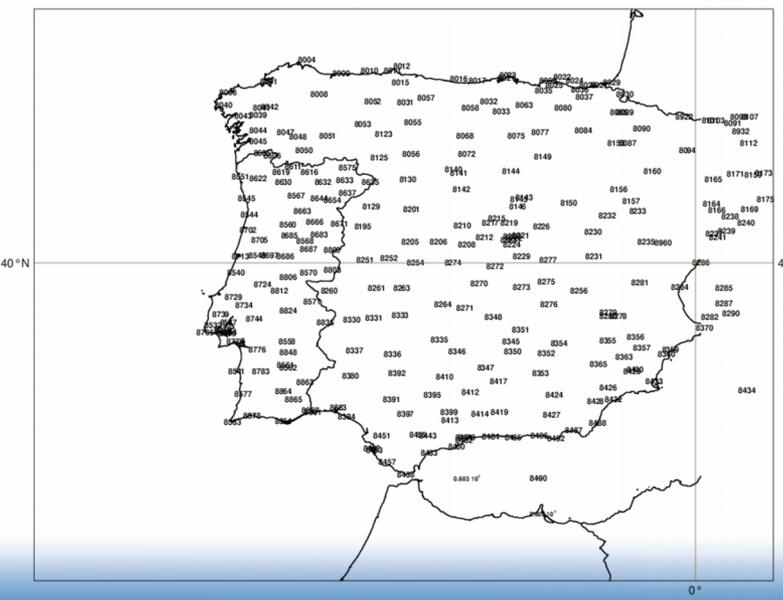


@ECMWF/MARS

2/3 ALADIN options (for operations):

- ECMWF temporary fetching
- OPLACE agreement (ODB data)
- Local processing (BATOR/BUFR) ✓

336 (3-hour) Iberian surface observations
2016.07.19 12UTC



@IPMA/BUFR WMO but not fully dissemination standards !!!

But reduced representativeness error, if a good local filtering is considered

4. Availability of Iberian conv obs



Conventional Observations (WMO BUFR) with the collaboration of Météo-France and LACE (<http://www.rclace.eu/?page=11>) by:

- back-phasing a recent version of BATOR code

SYNOP

TEMP

Maria Monteiro, 2016:

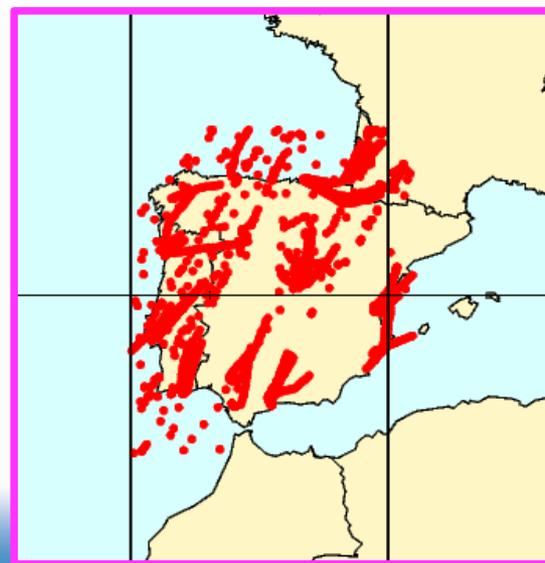
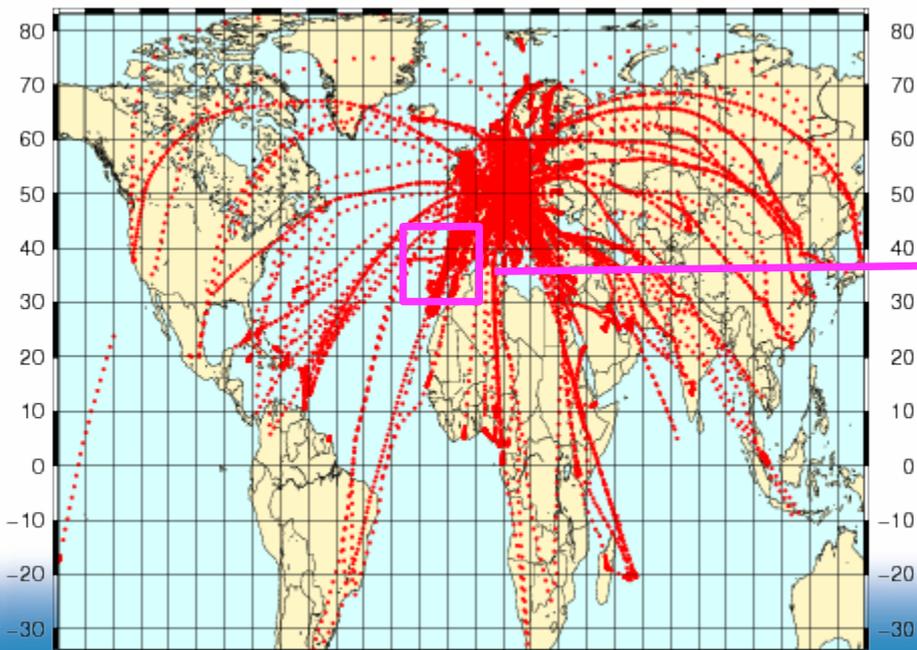
Validation of a back-phased version of source code BATOR

- creating a new subroutine 'amdarWMO' (using HIRLAM Guessparamcfg utility !)

AMDAR

Maria Monteiro, 2017:

Upgrade of the source code BATOR to WMO AMDAR template 311010v7



Typical
daily
coverage

8. Some conclusions



- IPMA has a local Surface Data Assimilation system with the potential to improve AROME forecasts; screen-level analysis (and the update of the climatologies, not shown here) is a starting point to improve near surface parameters and products
- IPMA started to prepare the framework for Upper-air DA (radar DA feasibility study, local conv observation processing) and has some plans to revitalize some research on background errors modelling

Thank you !

3. Upper-air DA: local scripting system

Feasibility test with HARMONIE-AROME/PTG (ECMWF)

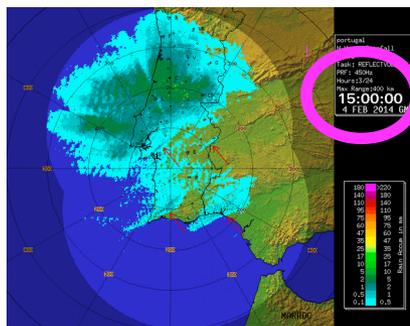
Ideal (!) weather conditions for the experiment : 4 feb 2014

Locally pre-processed (BUFR M-F) volumetric data

Input observation



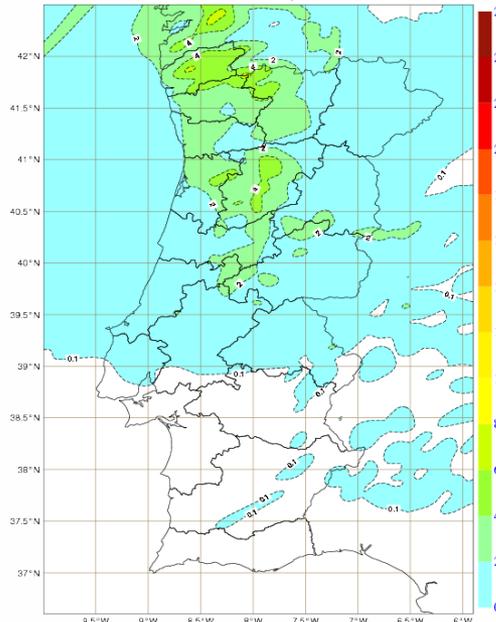
Verification time



15UTC simulated reflectivity (H+03): 4 feb 2014

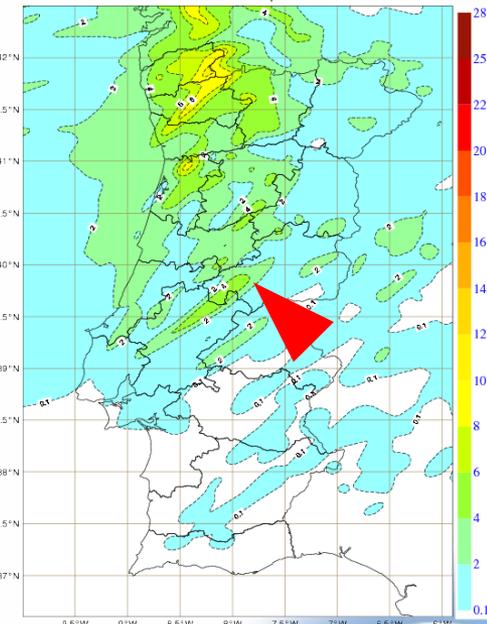
OPER (CY36T1)

AROME: Refletividade radar (mm/h) ao nível 1000hPa
Ter 04 Feb 14 12UTC Previsão H+03 para Ter 04 Feb 14 15UTC



EXP (CY37H1)

AROME: Refletividade radar (mm/h) ao nível 1000hPa
Tue 04 Feb 14 12UTC Previsão H+03 para Tue 04 Feb 14 15UTC



Assimilação de dados radar no HARMONIE-AROME/Portugal: ensaio numa situação frontal, Monteiro M. et al., 9º Simpósio APMG – 16 March 2015, Tavira, Portugal

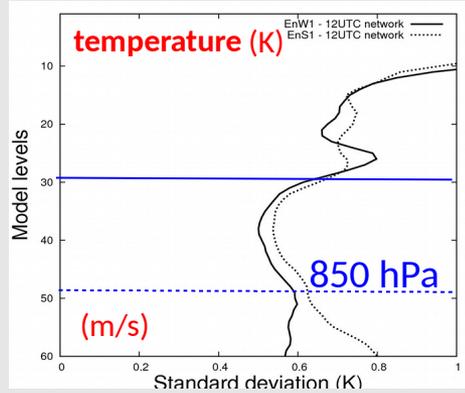
1. Motivation: DA aspects



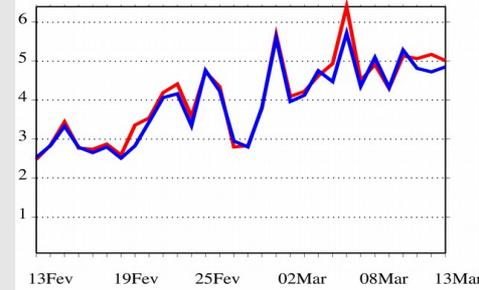
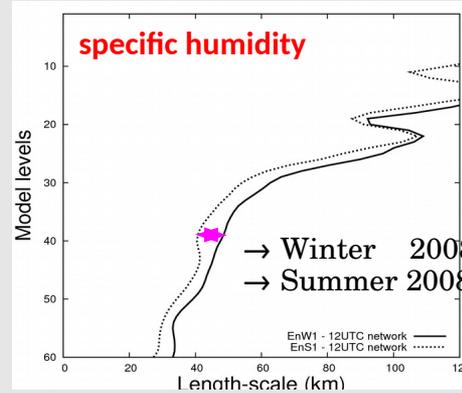
instituto português do mar e da atmosfera

Seasonal average

Vertical profiles of STANDARD DEVIATIONS

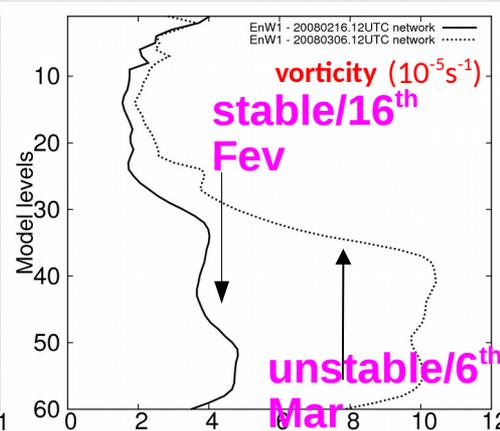
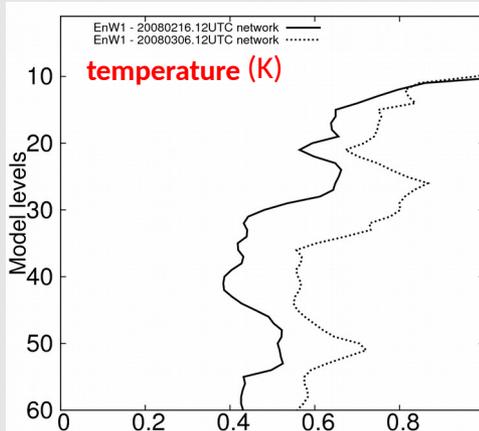


Vertical profiles of horizontal LENGTH SCALES



→ Winter 2008 (full line)
→ Summer 2008 (dotted line)

STANDARD DEVIATIONS



Modelling B matrix has an impact on the model scores !



Daily average

An impact study of updating background error covariances in the ALADIN-France data assimilation system, Berre, L. et al, 2013