IPMA Instituto Português do Mar e da Atmosfera

2017

Status report on DA for AROME-PT2

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IPMA

LACE Data Assimilation Working Days & ALADIN Data Assimilation basic KIT Working Days
Bucarest, 19 Sept 2018

Topics

1. Operational setup IPMA
2. Surface DA cycling with Iberian conv. data
3. Surface hourly analysis with Iberian conv. data
4. AROME-PT2 surface representation
5. Future outlook

Operational Setup IPMA

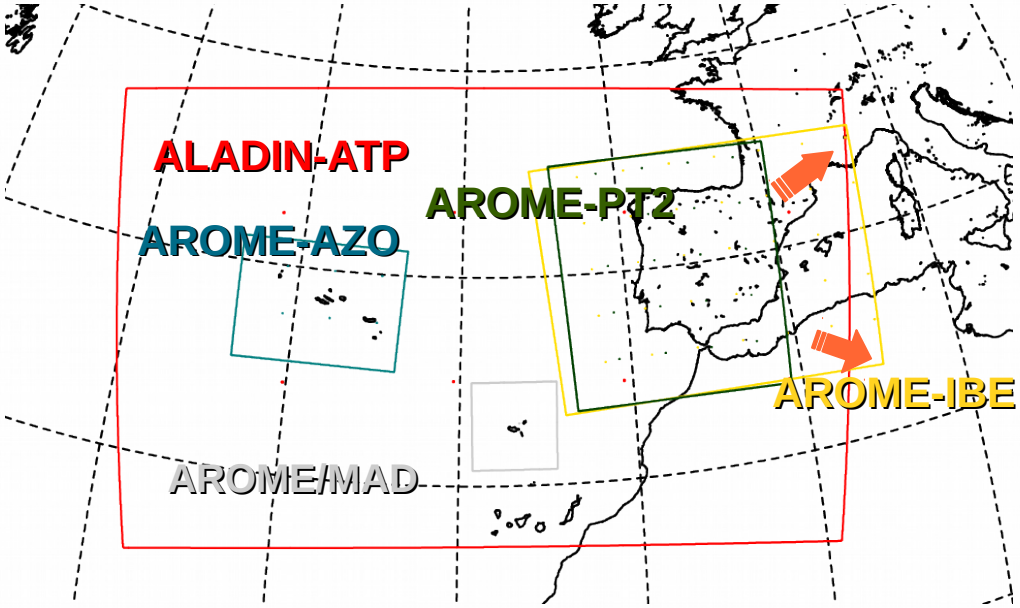
MODEL CONFIGURATIONS

ALADIN-ATP, CY38T1 (export)
- domain: Δx=9.0km, 288x450GP, 224x143lin.trunc.
- 46-levels
- time step: 360s
- forecasts up to +48h at 00, 12UTC
- 3h space consistency coupling ARPEGE
- initialization by dynamical adaptation (with DFI)

AROME-PT2, CY38T1 (export)
- domain: Δx=2.5km, 540x480GP, 239x269 lin.trunc.
- 60-levels
- time step: 60s
- forecasts up to +48h/+30h at 00, 06,12 and 18UTC
- 3h space consistency coupling ARPEGE
- initialization by dynamical adaptation (no DFI)

AROME-MAD, CY38T1 (export)
- domain: Δx=2.5km, 200x192GP, 95x99 lin.trunc.
- 60-levels
- time step: 60s
- forecasts up to +48h at 00, 12UTC
- 3h space consistency coupling ARPEGE
- initialization by dynamical adaptation (no DFI)

AROME-AZO, CY38T1 (export)
- domain: Δx=2.5km, 270x360GP, 179x134 lin.trunc.
- 60-levels
- time step: 60s
- forecasts up to +48h at 00, 12UTC
- 3h space consistency coupling ARPEGE
- initialization by dynamical adaptation (no DFI)



DATA ASSIMILATIONS SYSTEMS

AROME-PT2, CY38T1, 46-levels (export)

. Hourly surface analysis OI based on Iberian SYNOP (T2m, RH2m, V10m), with background provided by a Surface DA cycling

. 3-hour Surface DA cycling by OI_MAIN method

ALADIN-ATP, CY38T1 (export)

. Hourly (except 4 hours of the day) surface analysis OI based on Iberian SYNOP (T2m, RH2m)

6-hour surface DA with Iberian conventional data (2016-2017)

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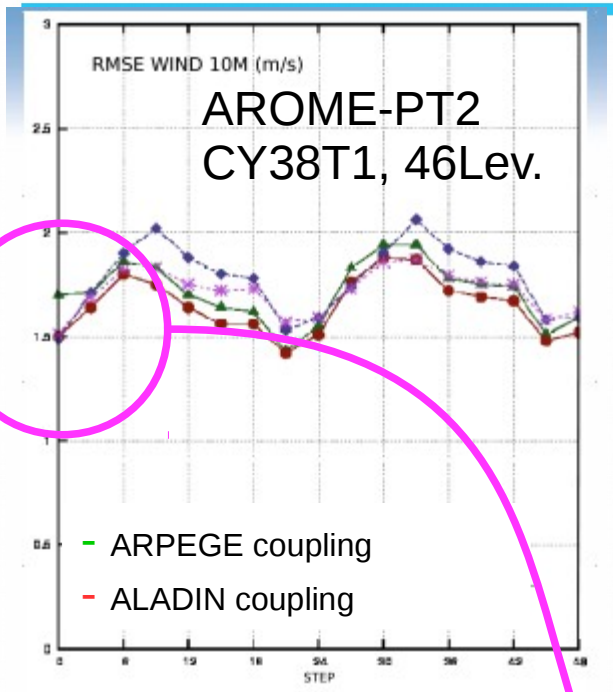
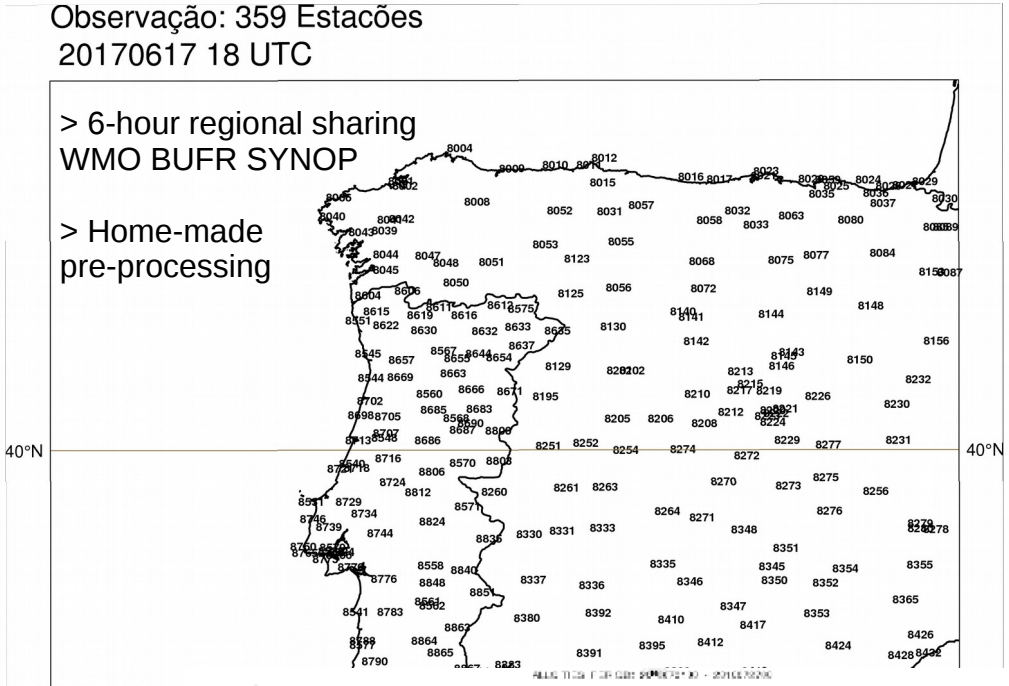
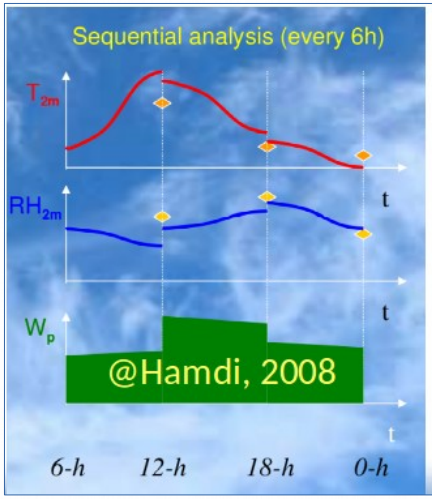


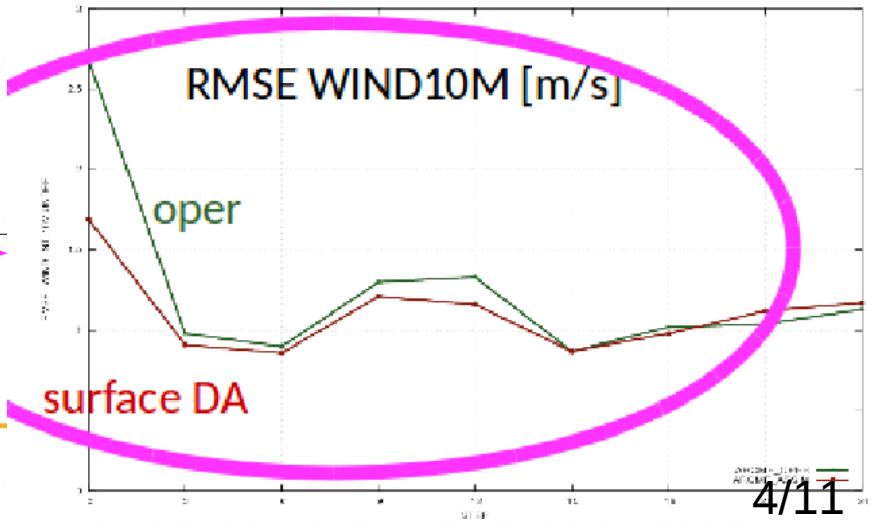




1) Optimum Interpolation of T 2m and RH 2m using 2m observations interpolated at the model gridpoint by a 2m analysis (2D CANARI OI)

2) Correction of 4 surface parameters (T s , T p , W s , W p) using 2m increments between analysed and forecasted values.

CANARI/OI_MAIN scheme
Giard and Bazile, 2000



3-hour surface DA with Iberian conventional data (2017-2018)

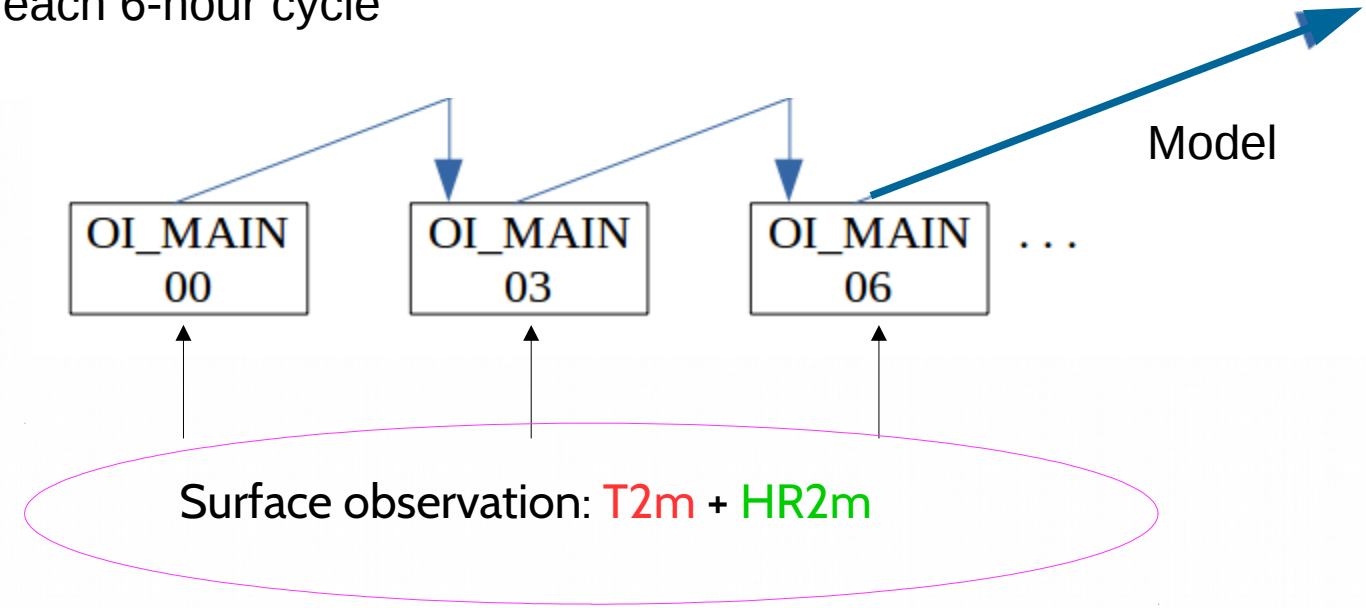
2018 upgrade

AROME-PT2 (CY38T1, 46Lev.)

> 3-hour regional sharing WMO BUFR SYNOP

> home-made pre-processing

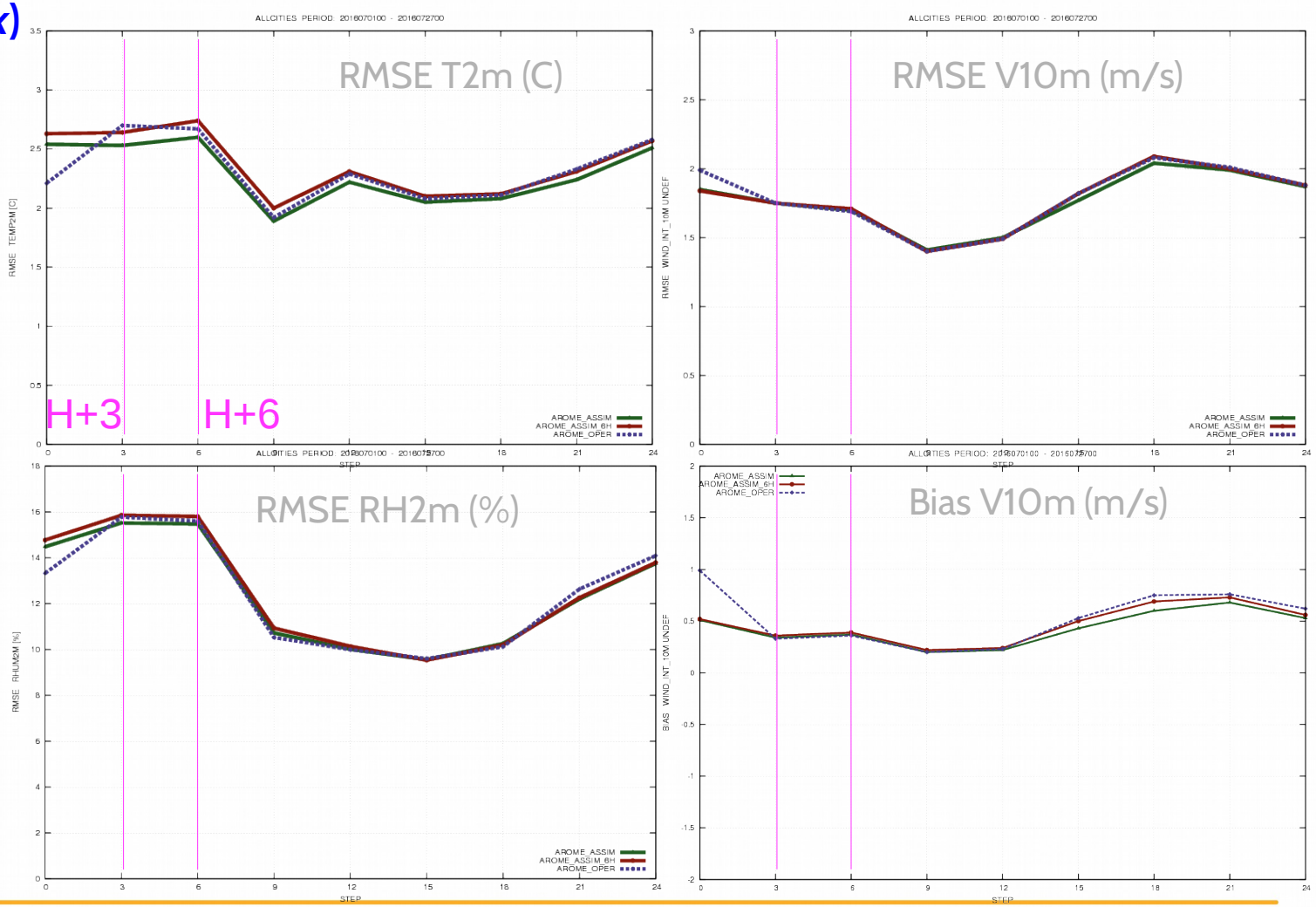
> SST update each 6-hour cycle



3-hour surface DA with Iberian conventional data (2017-2018)

24-hour forecast OI_MAIN validation for a Summer period: 20160701 – 20160727 (00UTC *network*)

- oper
- 6-hour cycling
- 3-hour cycling



1-hour surf. analysis with Iberian conventional data (2017-2018)

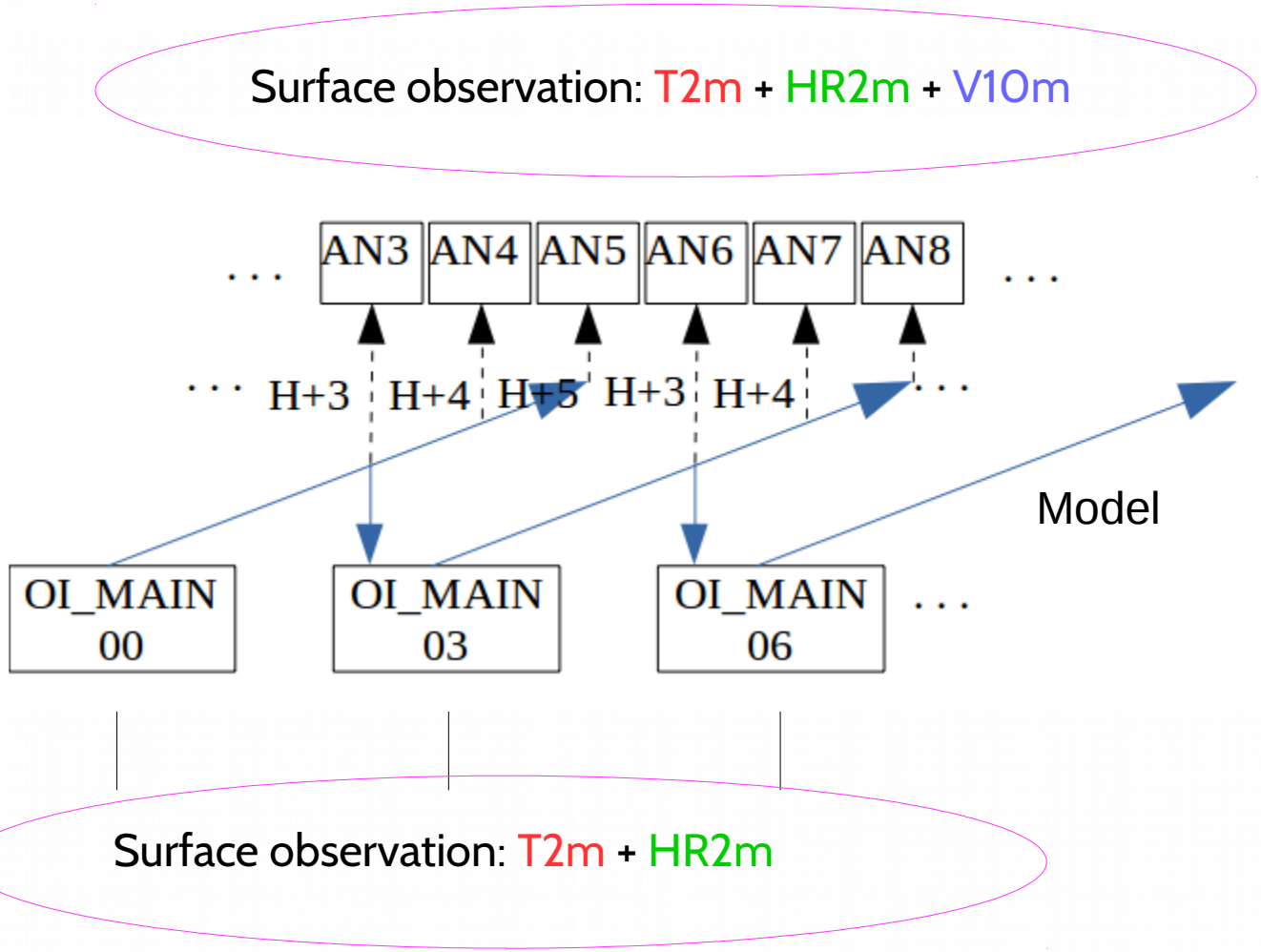
Hourly analysis by OI (CANARI standalone, Taillefeur, 2000)

AROME-PT2 (CY38T1, 46Lev.)

> 1-hour regional sharing WMO BUFR SYNOP

> home-made pre-processing (emoslib, ECMWF):

. retards & ammends,
. duplicates,
. choose WMO IDs overlaps between Portugal and Spain (922, 912, 927, 960 at least)
. Rem. obs records with ambiguos metadata.



1-hour surf. analysis with Iberian conventional data (2017-2018)

Hourly CANARI-AROME validation (00UTC *network*):

Summer (20170801 – 20170815)
Winter (20170110 - 20170207)

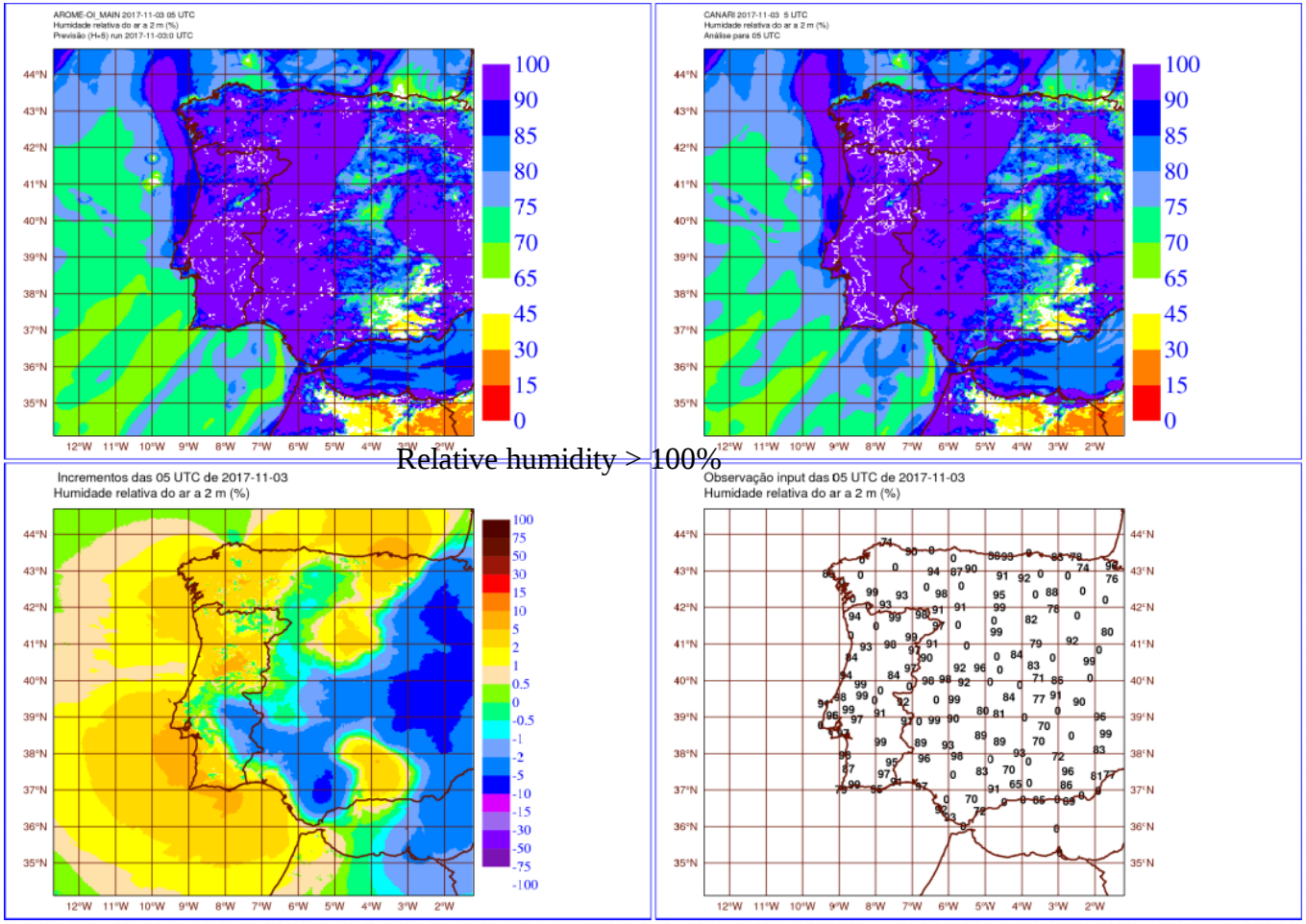
Table - RMSE and BIAS of screen level parameters analysis over Mainland for Portugal CAN-ARO and CAN-ALA *vs*. ARO-OP initial fields

	T2M		H2M		V10M	
EXP	RMSE (C)	BIAS (C)	RMSE (%)	BIAS (%)	RMSE (m/s)	BIAS (m/s)
CAN-ARO(Summer)	1.52	0.18	8.86	-0.70	1.37	0.18
CAN-ARO(Winter)	1.63	-0.01	8.58	-1.36	1.35	0.03
CAN-ALA(Summer)	1.78	0.43	10.95	-0.76	2.18	0.92
CAN-ALA(Winter)	1.85	-0.09	10.66	-0.72	2.25	0.82
ARO-OP (Summer)	2.07	0.90	11.79	-4.69	2.50	1.63
ARO-OP (Winter)	2.06	0.27	12.69	-5.26	2.16	1.24

. CAN-ARO is closer to observations than any other product at 00UTC and 12UTC;
. daily analysis monitoring shows the results are consistent at any hour of the day.

1-hour surf. analysis with Iberian conventional data (2017-2018)

Hourly CANARI-AROME issues:



Relative humidity > 100%

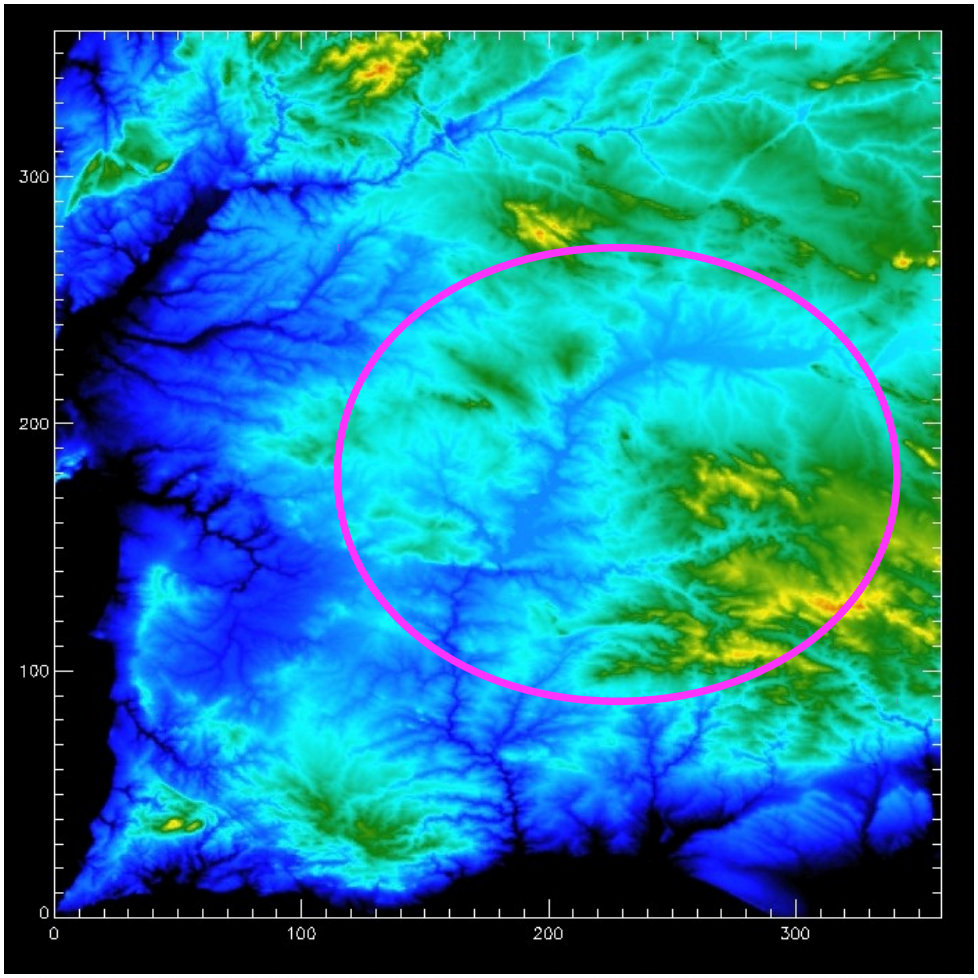
Relative humidity > 100%

1. At the first place, we have tried to check if the original AROME field (from the operational AROME model) for relative humidity contains values above 100%.

2. Secondly, we have checked the log file from conf 701. We saw that the statistics never show a figure superior to 100, although there are values above 100%.

3. Direct CANARI output (just by the statistics for GUESS and ANALYSIS) shows that HR2M is never > 100%.

Implementing Alqueva Lake physiography



. Alqueva is the largest artificial Lake in Europe

. The Lake physiography was implemented in AROME-PT2 surface representation through an upgrade on:

ECOCLIMAP_II_v2.3
GMTED2010_30

Case-studies:

. Alqueva Lake-breeze

. Advected low cloudiness over the Lake

There is a positive impact when introducing the Alqueva Lake physiography, on the forecasts of temperature, relative humidity, wind and cloudiness !

Assunção, S. et al. (2017) IMPACT OF THE INTRODUCTION OF ALBUFEIRA ALQUEVA IN AROME FORECASTING MODEL, APMG

Future outlook

* The hourly CANARI-AROME having as background the forcasts initialised from a surface DA system have just entered into operations, where WMO BUFR SYNOP Iberian regionally shared observations are used.

* First steps onto 3D-var wil re-start...

Further developments of CANARI-AROME will include:

* the introduction of CY40T1 and of the new surface DA scheme from these WD as well as a better surface representation over Mainland Portugal and for that local ECOCLIMAP_v1.6 has been already updated with Alqueva Lake physiography;

* understanding of the interannual analysis error variability (which depends strongly on the stability conditions of surface layer forecasts);

* test and impact of using MESCAN structure function fot T2M and RH2M (available from CY43T2?);

Thank you !