

Summary of main activities

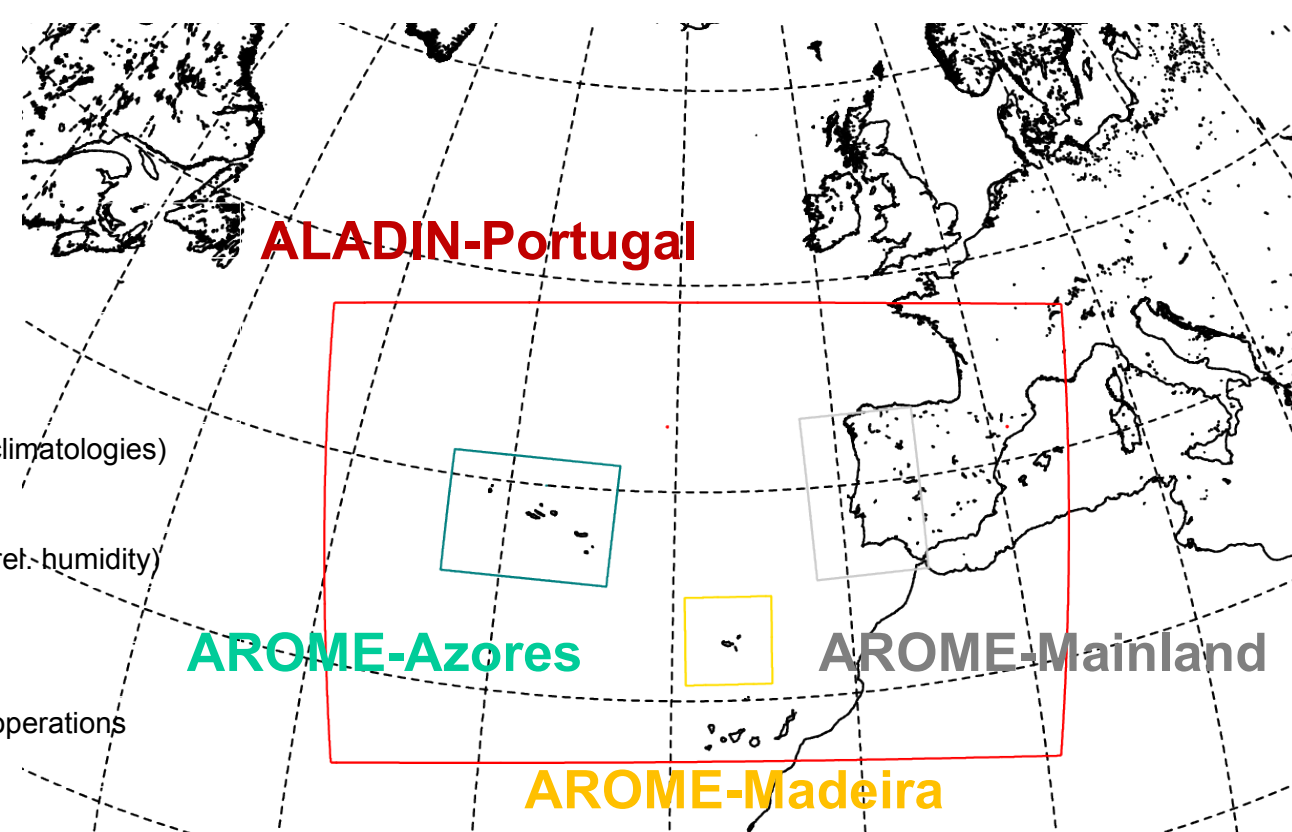
During the last year no changes have taken place on the Portuguese NWP operational system which is described below. However, a backup system is now running at ECMWF as a Time Critical Application for the domains: ALADIN/Portugal (Option 2), AROME-Mainland and AROME-Madeira. A new HPC machine, an IBM p7, has been acquired and is being installed. There is now a 3D-var HARMONIE setup running on ECMWF's platforms where AROME-Mainland is executed with the assimilation of Portuguese radar data. Besides, several other tasks have taken place in order to support downstream services of the regional NWP system at 2,5 km: the estimation of upper air gust forecasts from the wind output on extreme weather events; the post-processing of screen level parameters from the initial conditions for fire index calculations; and a SST sensitivity test performed under foggy conditions in support of aviation activity (see a second poster).

ALADIN and AROME operational versions

The Portuguese NWP operational system is based on a set of SMS/XCdp scripts which are submitted from a front-end DELL cluster to an IBM p575 platform. ALADIN-Portugal runs over a domain which covers the Portuguese mainland and the adjacent Atlantic Ocean including the Portuguese Islands, at 9km of horizontal resolution and 46 vertical levels. The ALADIN model provides initial and boundary conditions to the highest resolution model AROME. Operational runs with AROME model at 2.5 km resolution started in 2009, 2010 and 2011 respectively for three domains of Portuguese mainland, Madeira archipelago and Azores archipelago. Cycle 36T1 is being used in operations since December 2010.

Timeline of changes

Apr 2000	Cycle 09
Jun 2000	Cycle 11T2 (CYCORA included)
Jul 2001	Cycle 12_bf02 (CYCORA_bis included)
Apr 2002	Time step change (540s to 600s)
Jun 2006	Cycle 28T3 (new geographical area and climatologies)
Jun 2007	Wind dynamical adaptation for 3 domains
Apr 2008	CANARI surface analysis fields (temp. & rel.-humidity)
Dec 2008	Cycle 32T3 (new domain and resolution)
Out 2009	Cycle 35T1
Jan 2010	AROME-Mainland & AROME-Madeira in operations (35T1)
Dec 2010	Cycle 36T1 in ALADIN
Jun 2011	Cycle 36T1 in AROME-Madeira
Out 2011	Cycle 36T1 in AROME-Mainland
Dez 2011	AROME-Azores in operations (36T1)



Foreseen activities

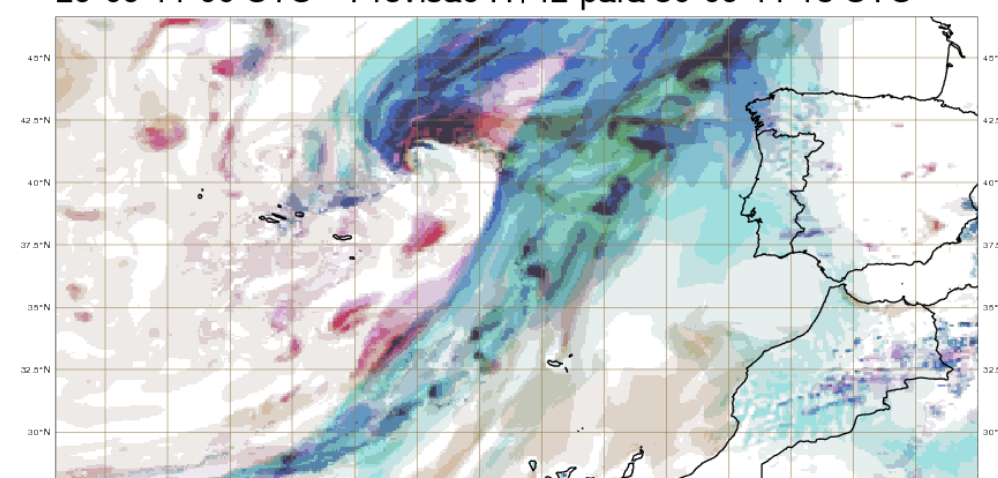
The upgrade of the operational system to a new cycle and the redesign of the actual operational system including the increase of the number of levels and the enlargement of the geographical domain.

Models characteristics

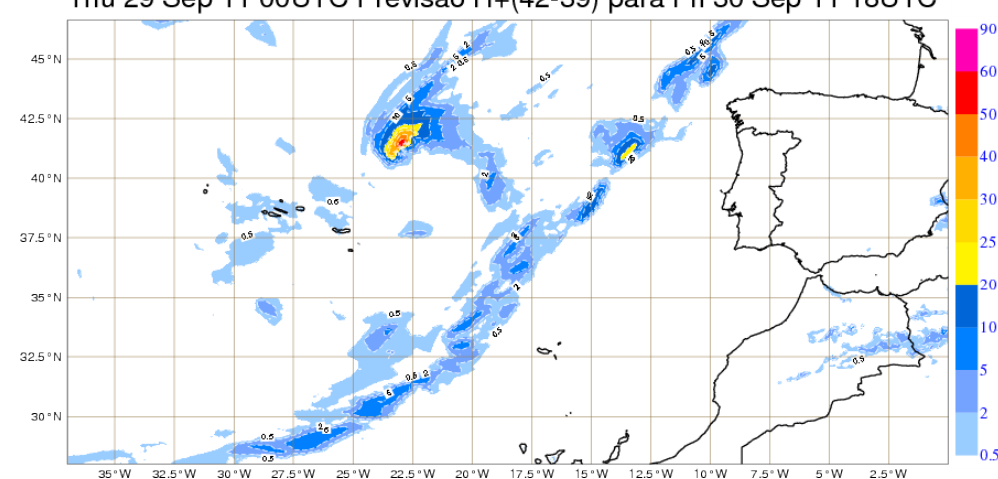
ALADIN-Portugal

- Spectral hydrostatic model
- Hybrid vertical coordinates
- Digital filter initialisation
- Semi-lagrangian advection scheme
- Two-time-level semi-implicit time scheme
- ISBA surface parameterisation scheme
- Initial and LBC from ARPEGE
- 3 hour coupling frequency
- Geometry:
 - Size (lon x lat): 439 x 277 points
 - Horizontal resolution: 9 km
 - Number of vertical levels: 46
 - Time step: 360 s
- Integration frequency: twice a day
- Forecast range: 72 hours
- Output frequency: 1 hour
- Cycle 36T1

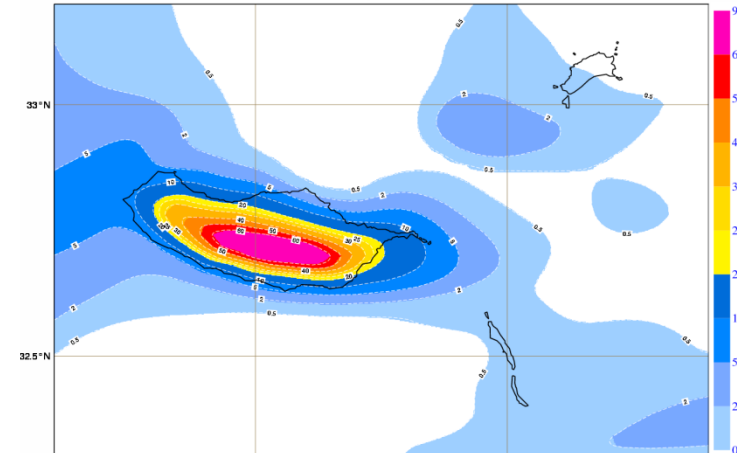
ALADIN: Nuvens Baixas B+M Medias M+A Altas A+B A+M+B
29-09-11 00 UTC Previsão H+42 para 30-09-11 18 UTC



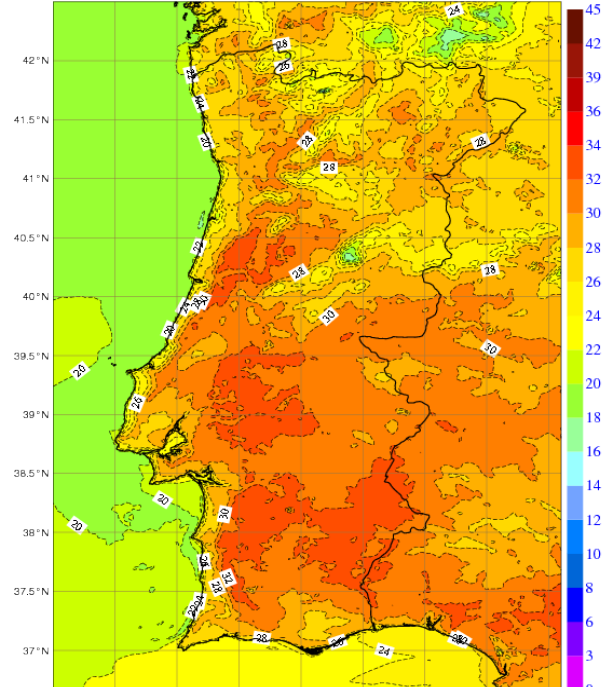
ALADIN: Precipitação total (mm) acumulada em 3 horas
Thu 29 Sep 11 00UTC Previsão H+(42-39) para Fri 30 Sep 11 18UTC



AROME: Precipitação total (mm) acumulada em 3 horas
Fri 19 Feb 10 12UTC Previsão H+(24-21) para Sat 20 Feb 10 12UTC



AROME: Temperatura a 2m (°C)
Thu 29 Sep 11 00UTC Previsão H+39 para Fri 30 Sep 11 15UTC



Domain	Mesh size (nlat x nlon)	Horizontal Resolution (km)	Vertical levels	Time step (s)
Mainland	360 x 250			
Madeira	200 x 192	2.5	46	60
Azores	270 x 360			

The new HPC platform

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A new HPC platform has been acquired and is being installed - the IBM Pure Flex system. It is composed by 8+1 IBM Power 7+ nodes with 24 cores each of 3.4 GHz, 128 GB (model p260). Moreover, a 1 IBM Total Storage DCS3700 with 50 discs SAS of 300GB (15TB) at 15 Krpm is available. AIX (7.1) will be used as OS. As a surplus, it includes 3 Intel (x240) X86 nodes.

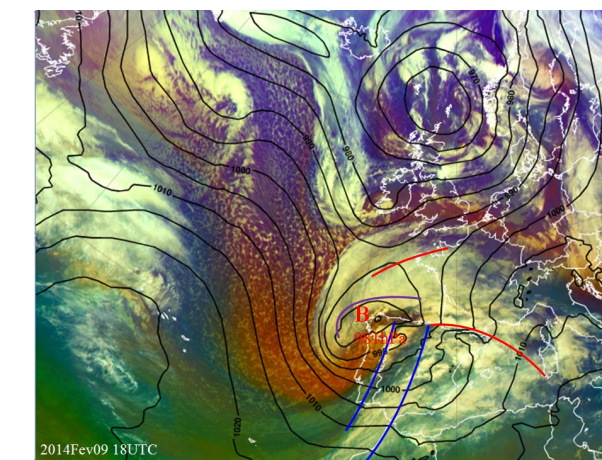


As a front-end to the HPC machine, a high-availability virtualization system will be used, the IBM Blade Center. Each node is a Xeon X5650 with 6 cores at 2,67 GHz; 36 GB of RAM is also available. Linux (Ubuntu) and Windows will be used as OS. The system is also suitable for visualization, pre- and post-processing.



Estimation of upper-air gust forecast

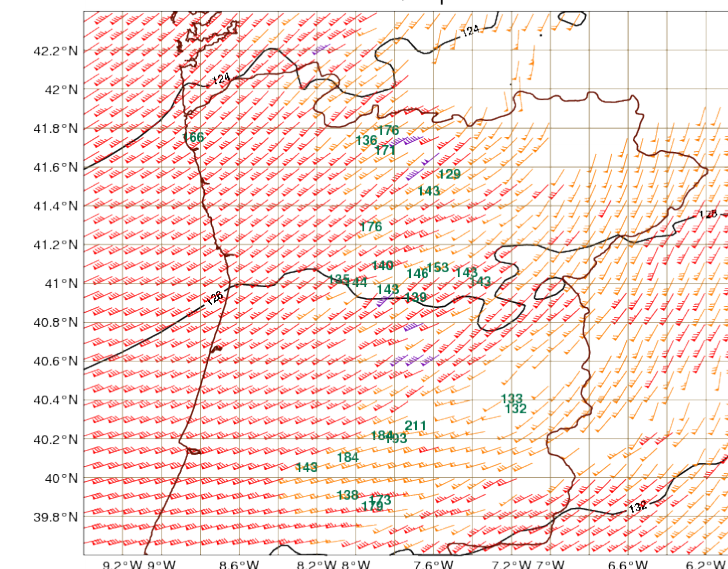
(joao.rio@ipma.pt, ilda.novo@ipma.pt)



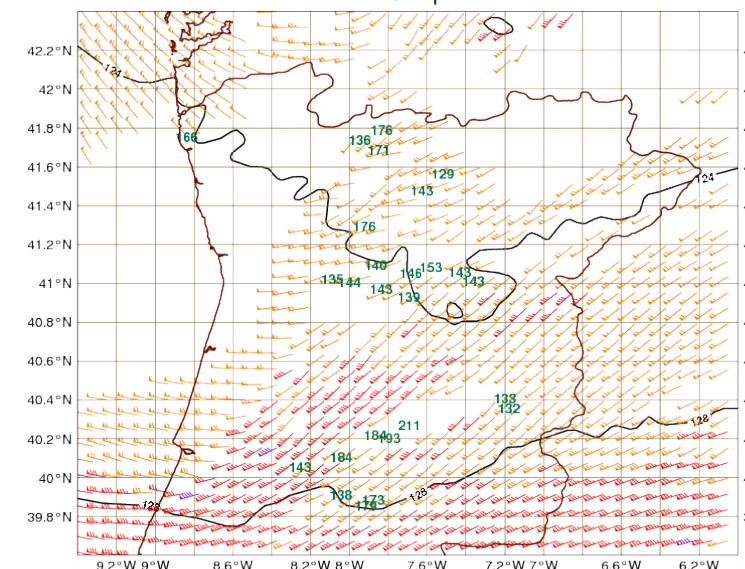
Atlantic thunderstorms like "Stephanie" are usually the cause of severe damages to the civil property. Very often the information post-mortem on wind gust is required in order to re-build the actual weather conditions causing such property damages. The wind observation network not always covers the really pertinent locations. Therefore, a study/methodology on how to estimate upper air wind gust from the AROME-Mainland pressure level wind forecasts has taken part and is being used post-mortem for thunderstorms studies as well as for summer fire events analysis.

The local implementation uses a series of observed mean wind and wind gust information above a typical threshold of 100km/h (on a thunderstorm day) coming from the Portuguese wind power mills. A wind gust factor of 1.3 is being used and applied to AROME-Mainland wind forecasts at the levels of 925 hPa, 900 hPa and 850 hPa. In the panels below, the wind gust fields obtained during the Stephanie thunderstorm at 850 hPa at the ranges: (a) H+16; (b) H+21; (c) H+26; (d) H+27 are shown. The different colours illustrate different intervals of the wind gust: yellow for [50,70[knots; red for [70,90[knots; purple for [90,...]. The wind gust observed on the wind mills is represented in green.

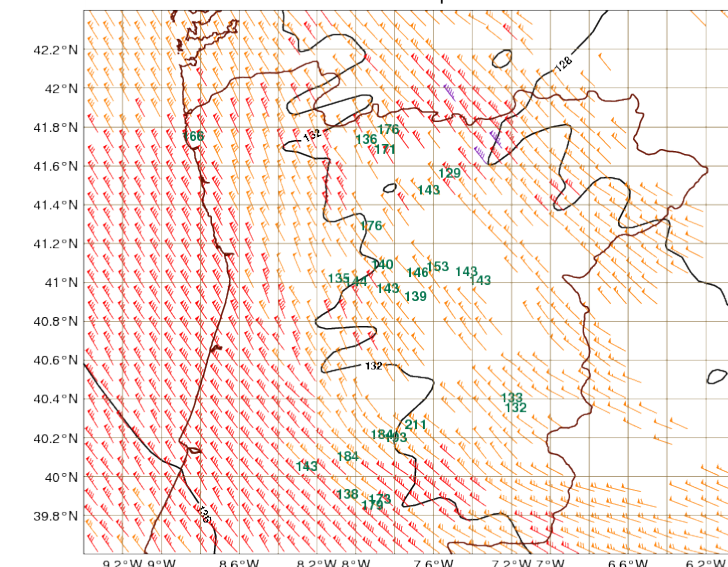
AROME Estimativa da Intensidade da Rajada ao nível dos 850hPa
2014-02-09 00UTC Previsão H+16 para 2014-02-09 16:00:00



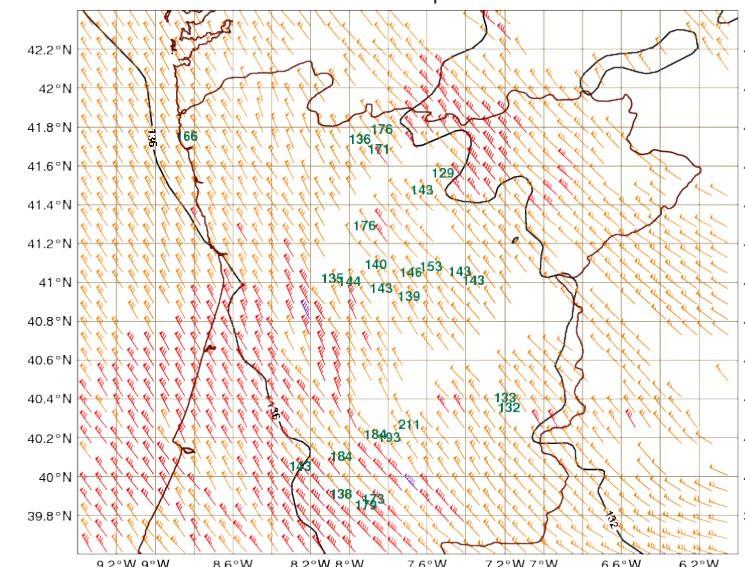
AROME Estimativa da Intensidade da Rajada ao nível dos 850hPa
2014-02-09 00UTC Previsão H+21 para 2014-02-09 21:00:00



AROME Estimativa da Intensidade da Rajada ao nível dos 850hPa
2014-02-09 00UTC Previsão H+26 para 2014-02-10 02:00:00



AROME Estimativa da Intensidade da Rajada ao nível dos 850hPa
2014-02-09 00UTC Previsão H+27 para 2014-02-09 03:00:00



Radar data assimilation activities

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AROME-Mainland (locally, AROME/PTG) at ECMWF is being run under the HARMONIE system in order to evaluate the impact of the assimilation of Portuguese radar observation. A new pre-processing interface to CONRAD - the CONRAD_RC developed by the LACE sub-consorcium - is being used to convert local IRIS raw data into M-F BUFR format. The Portuguese radar data has been successfully ingested when a reverted version of the BATOR application (cy3711_bf.04, according to M-F standards) was used. In the illustration below, a successful minimization is achieved when 20% of Lisbon's 3D radar data at 12UTC remains active after screening.

AROME/PTG oper

2,5 km x 2,5 km, 46 levels

HARMONIE-AROME/PTG test

2,5 km x 2,5 km, 60 levels

Radar observation

Mosaic at 1000m

CI + CF: ALADIN/Portugal

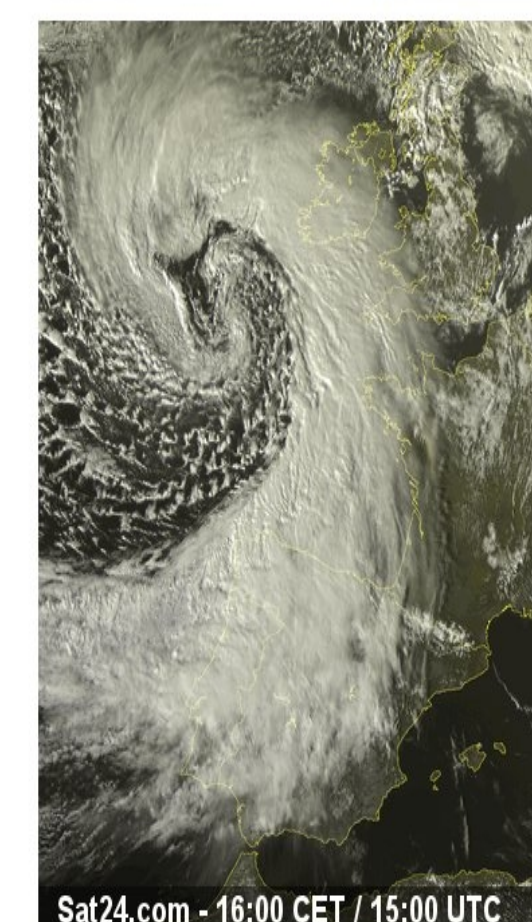
CI: SURFEX analysis + 3D_var

LISBON + FARO

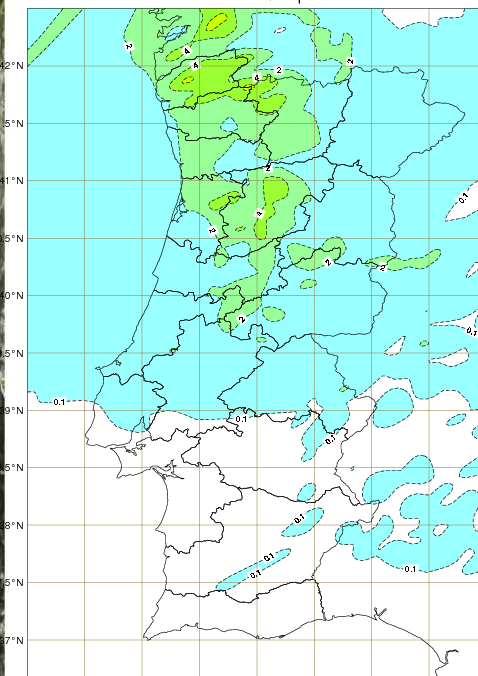
CF: ECMWF

with obs conv + LISBON radar

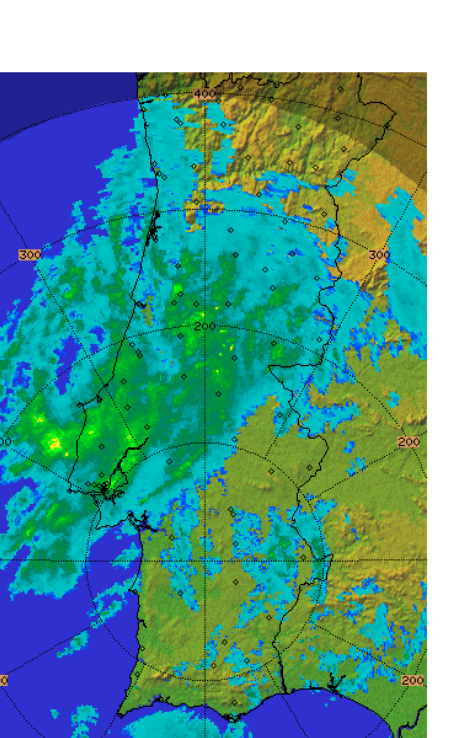
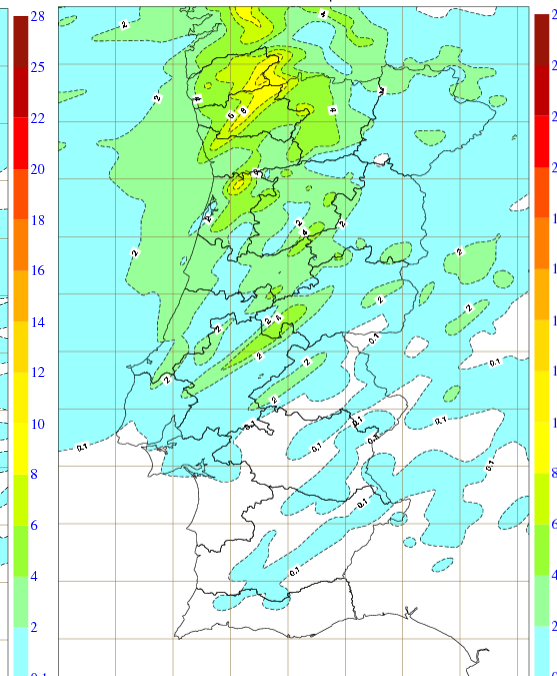
15UTC



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



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



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