14 July 2013: An event over Portugal
Operational analyses.

Maria João Frada

2nd Aladin forecasters meeting,
21-23- October 2015,
Lisbon, Portugal

Nelas(lat:40.7º;long-7.8º)Viseu district(~25km NW)

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ECMWF analysis (00 UTC RUN 14th July).

Arome contribution (00UTC RUN 14th July).

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Operational Methodology Analysis:

ECMWF Downscale TOP/DOWN

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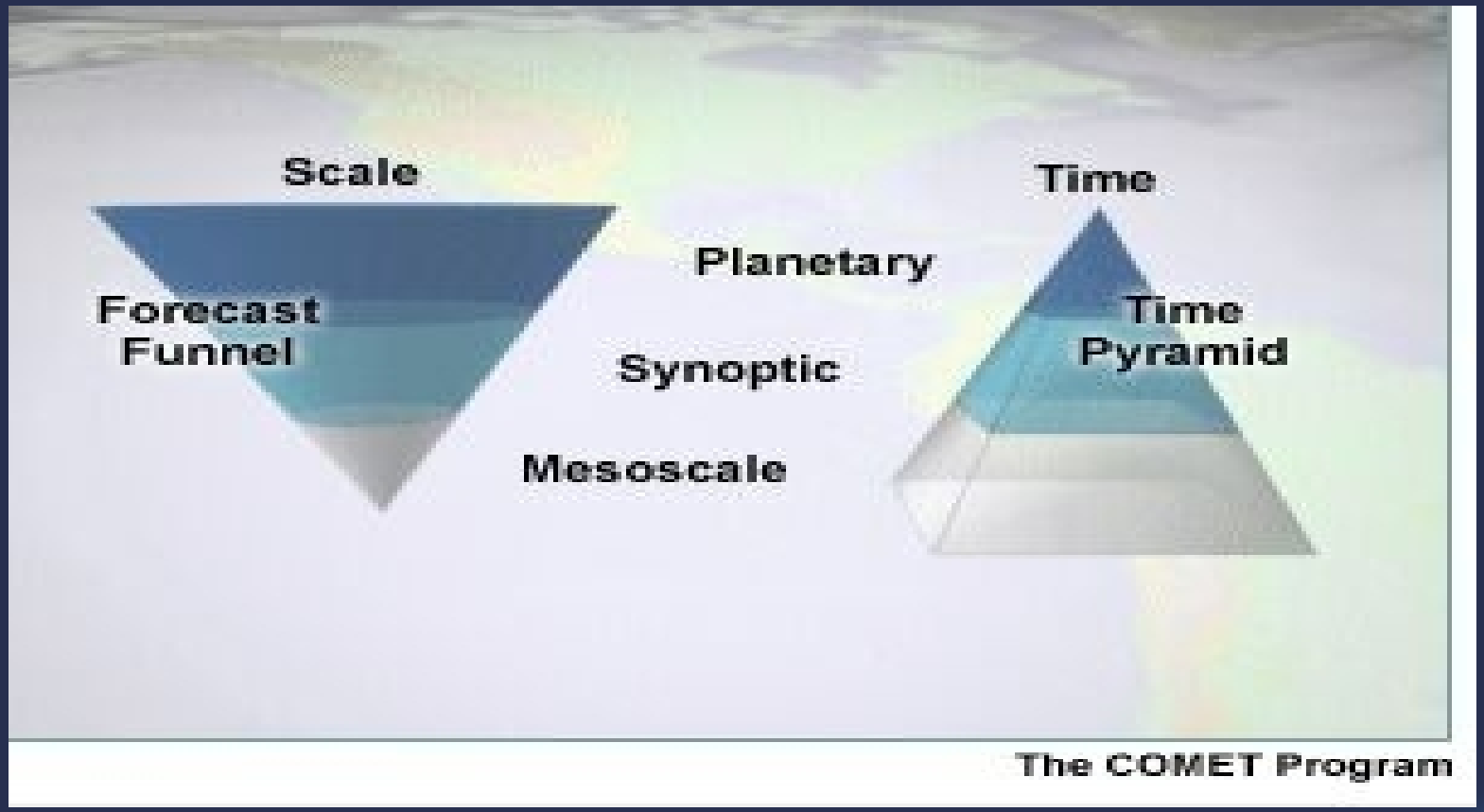
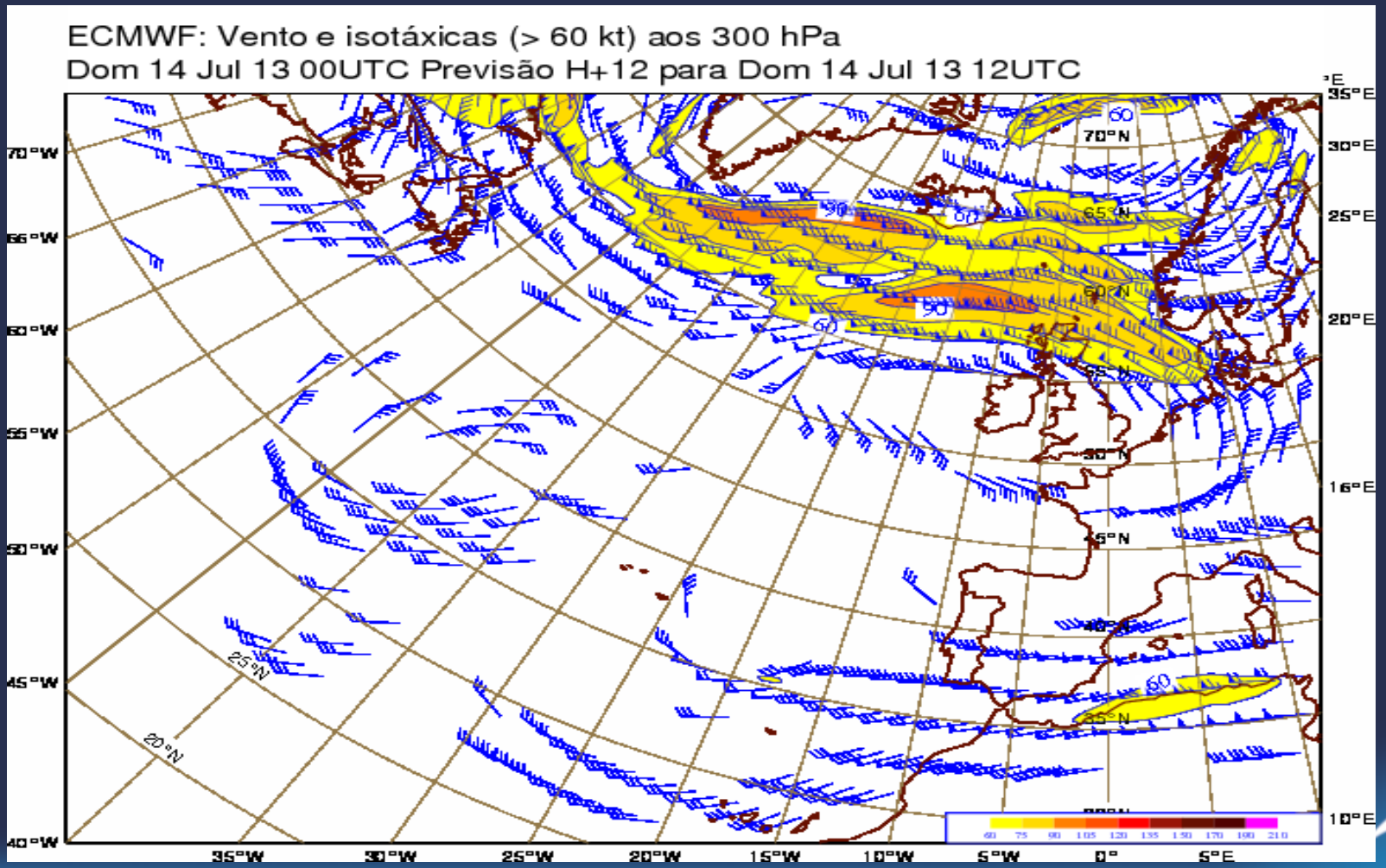
More time on smaller scales



Wind and isotachs>60kt 300hPa



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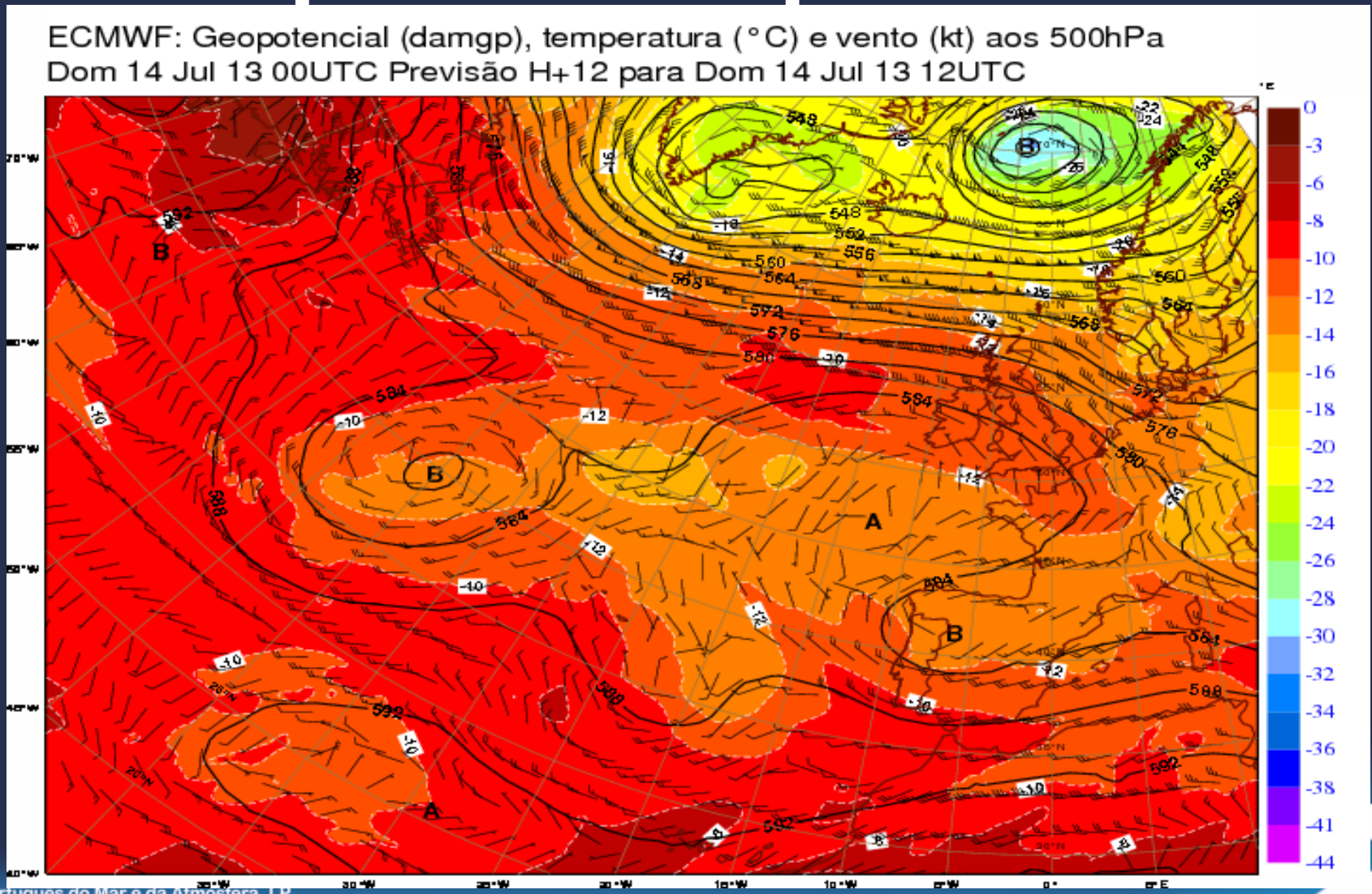
Geop. and Temp. 500hPa



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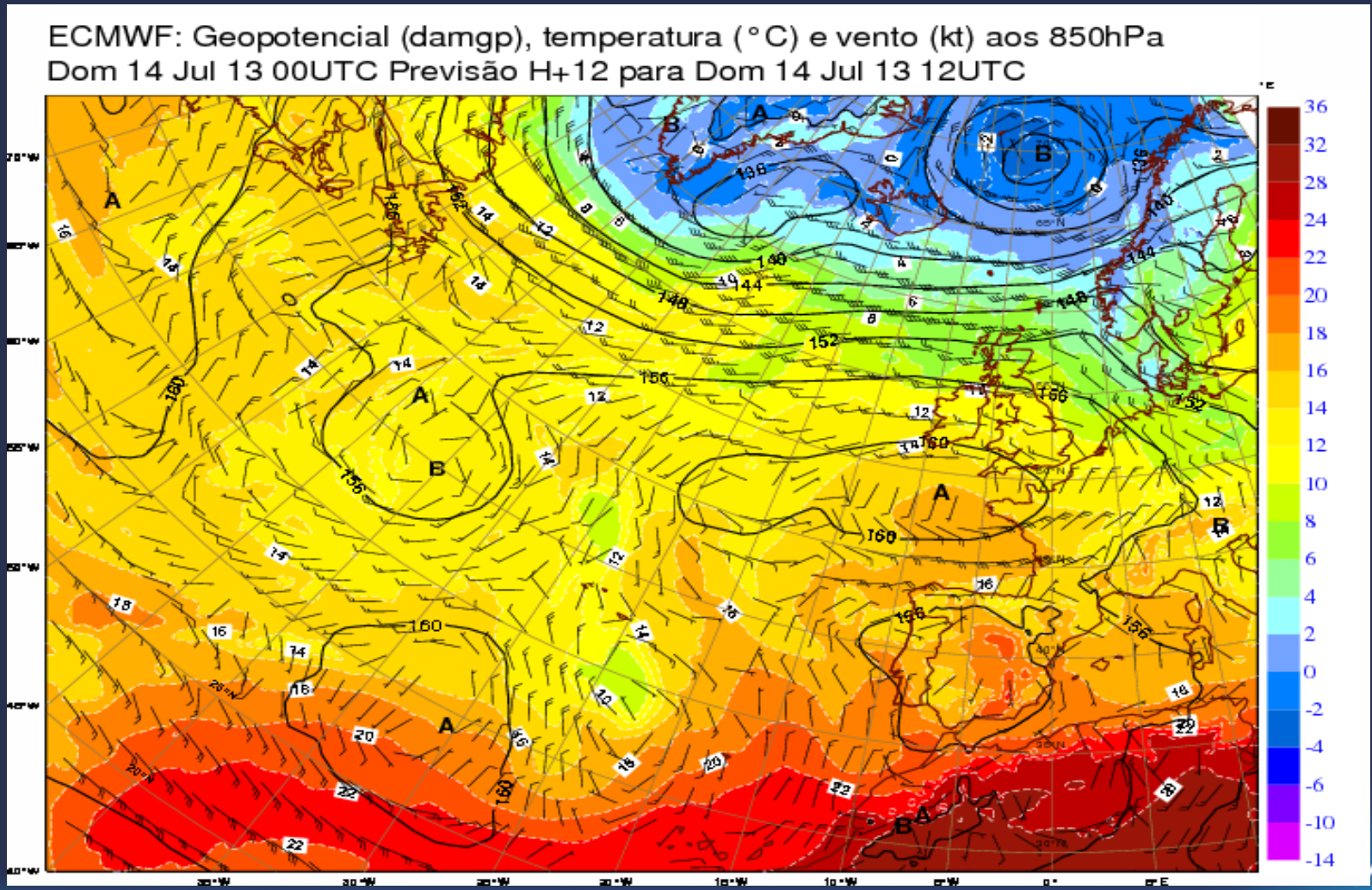
Geop. and Temp. 850hPa



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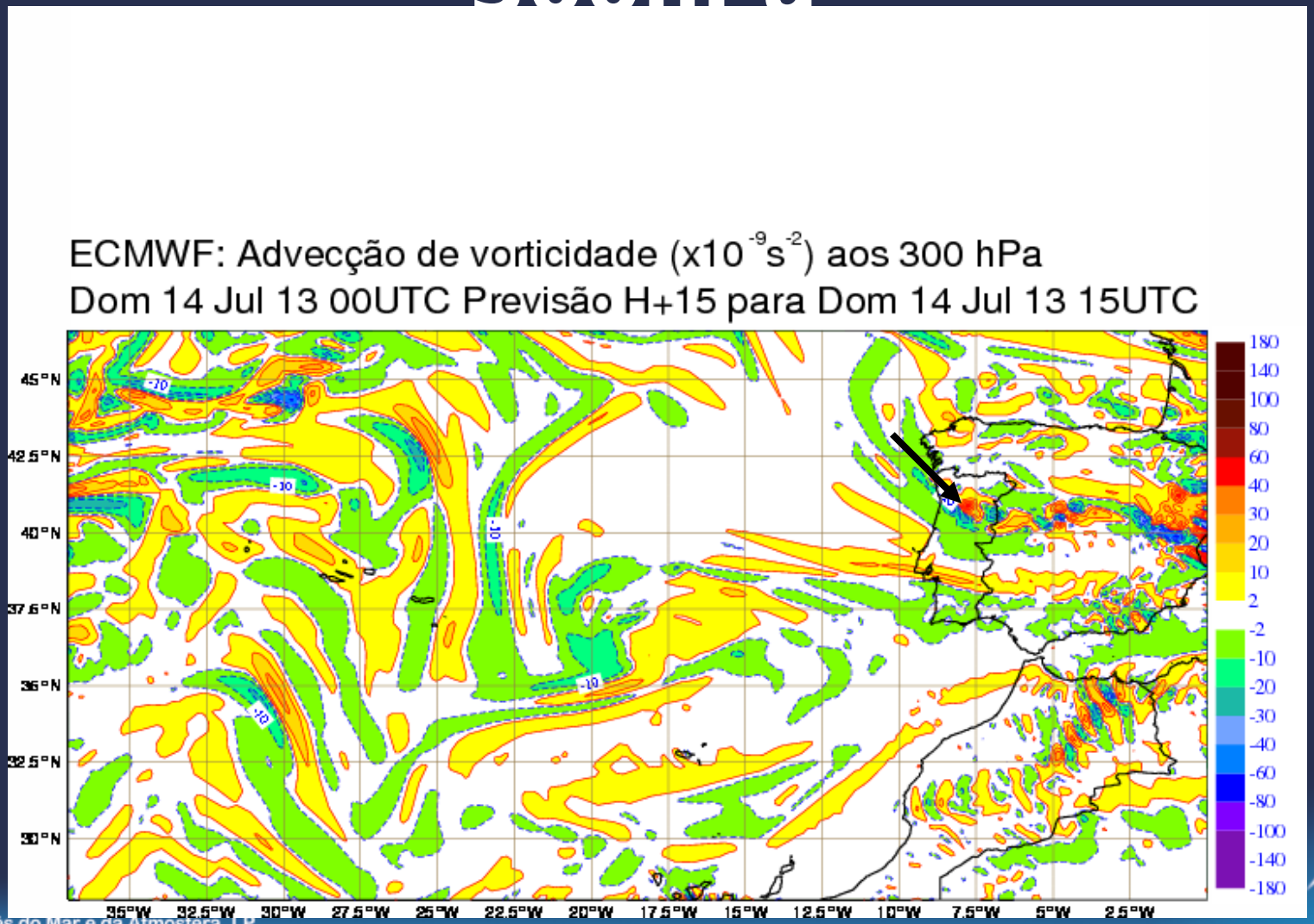
Vorticity advection at 300hPa



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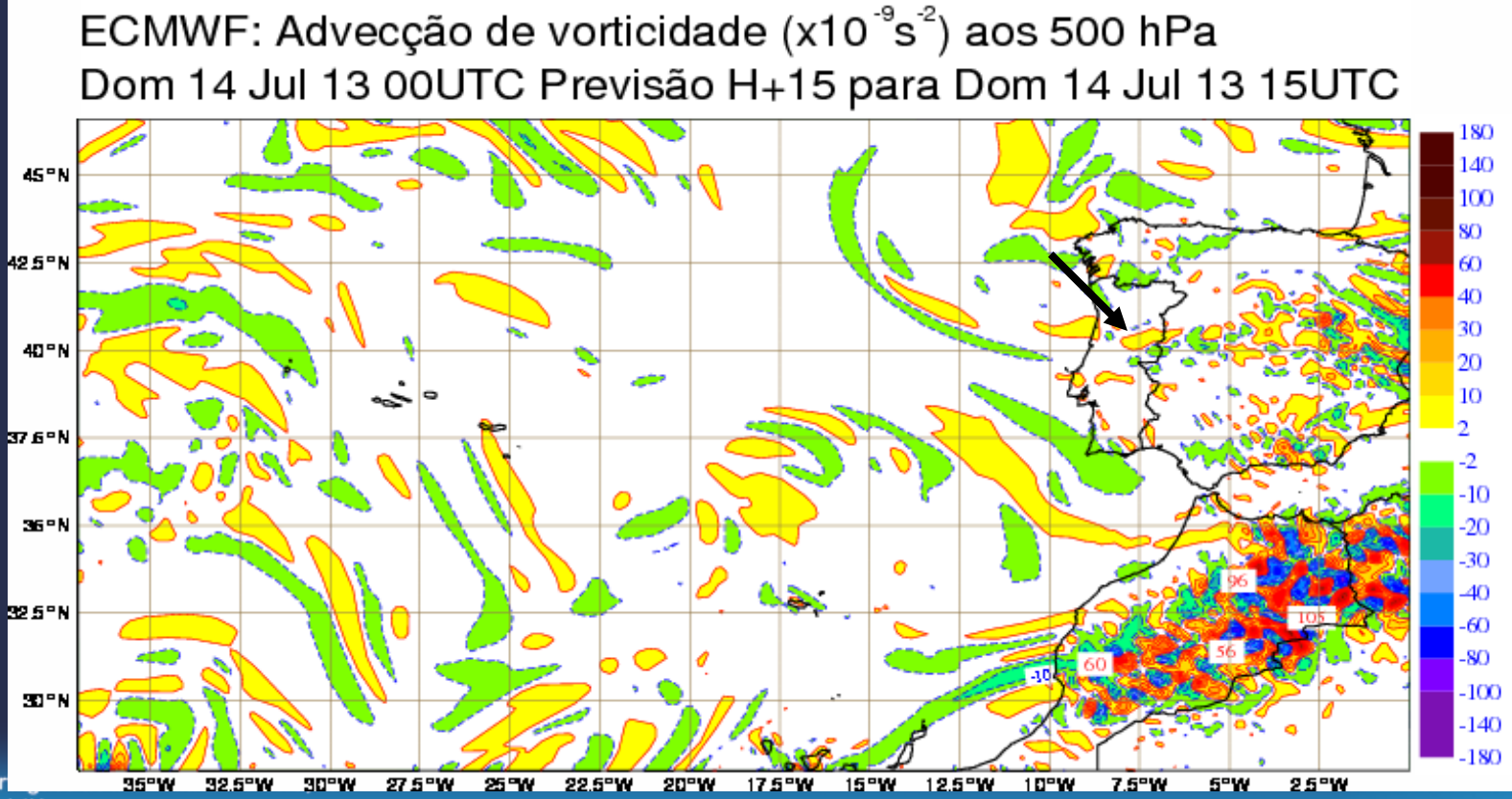
Vorticity advection at 500hPa



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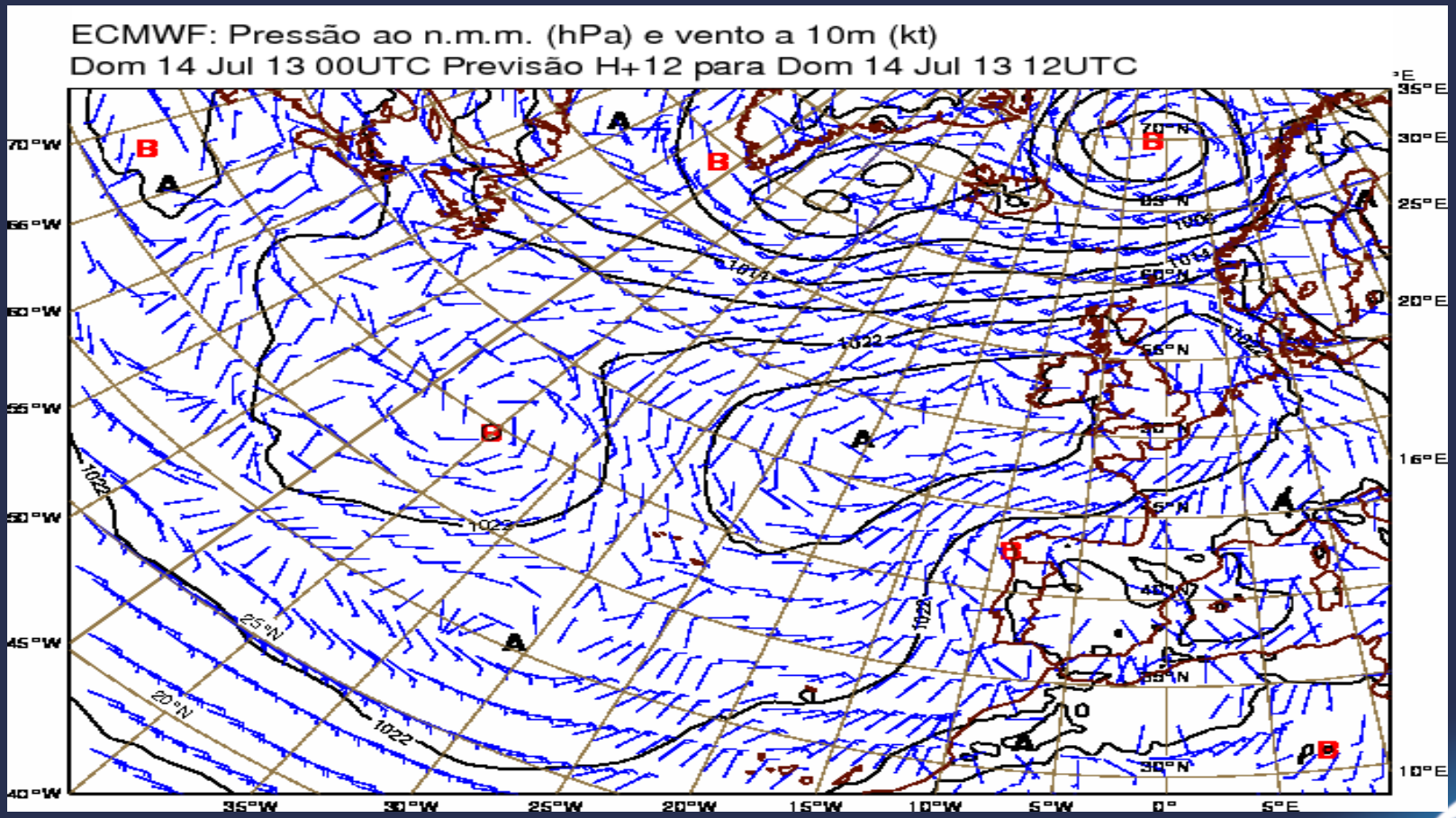
MSL Pressure



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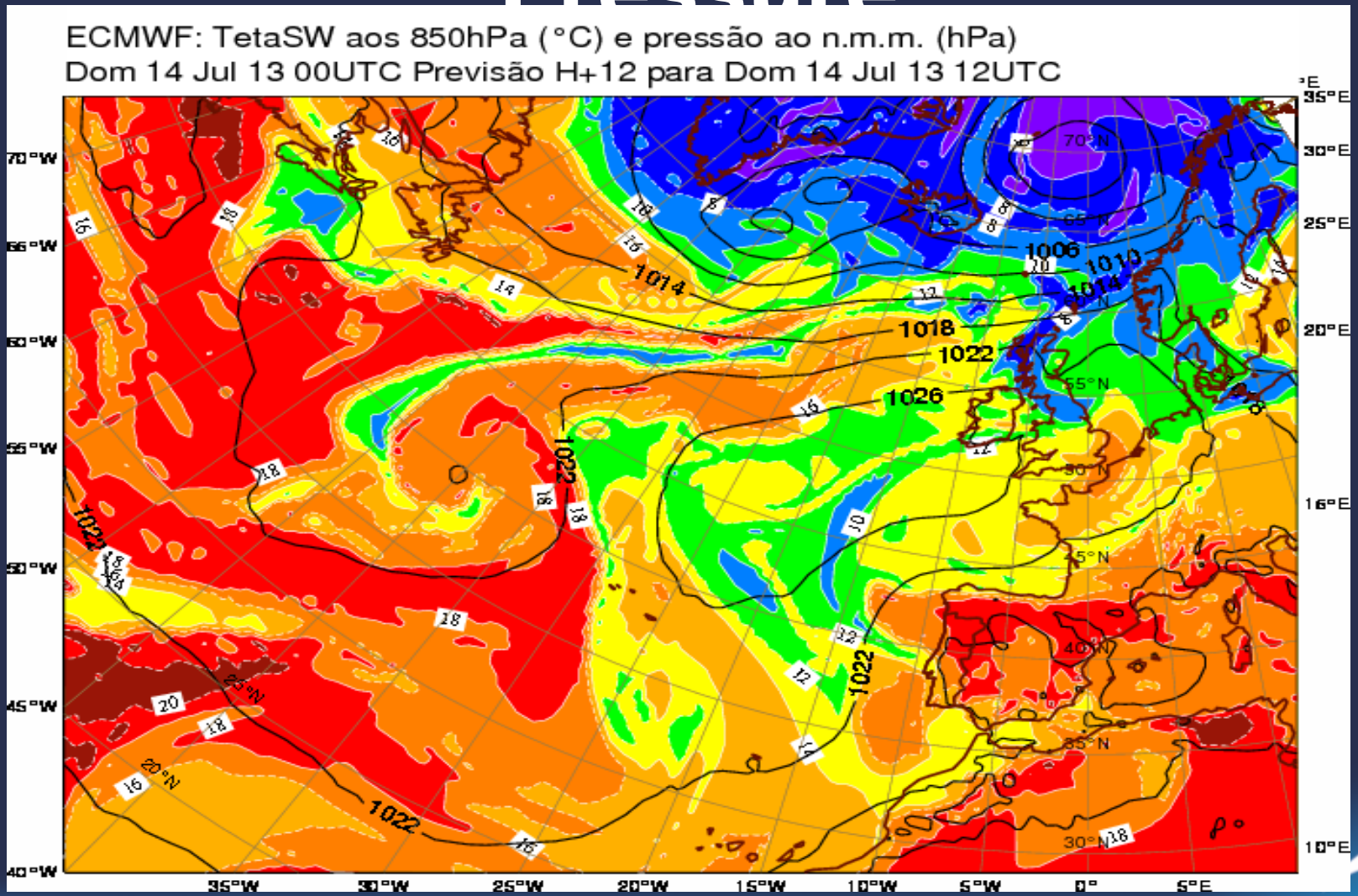
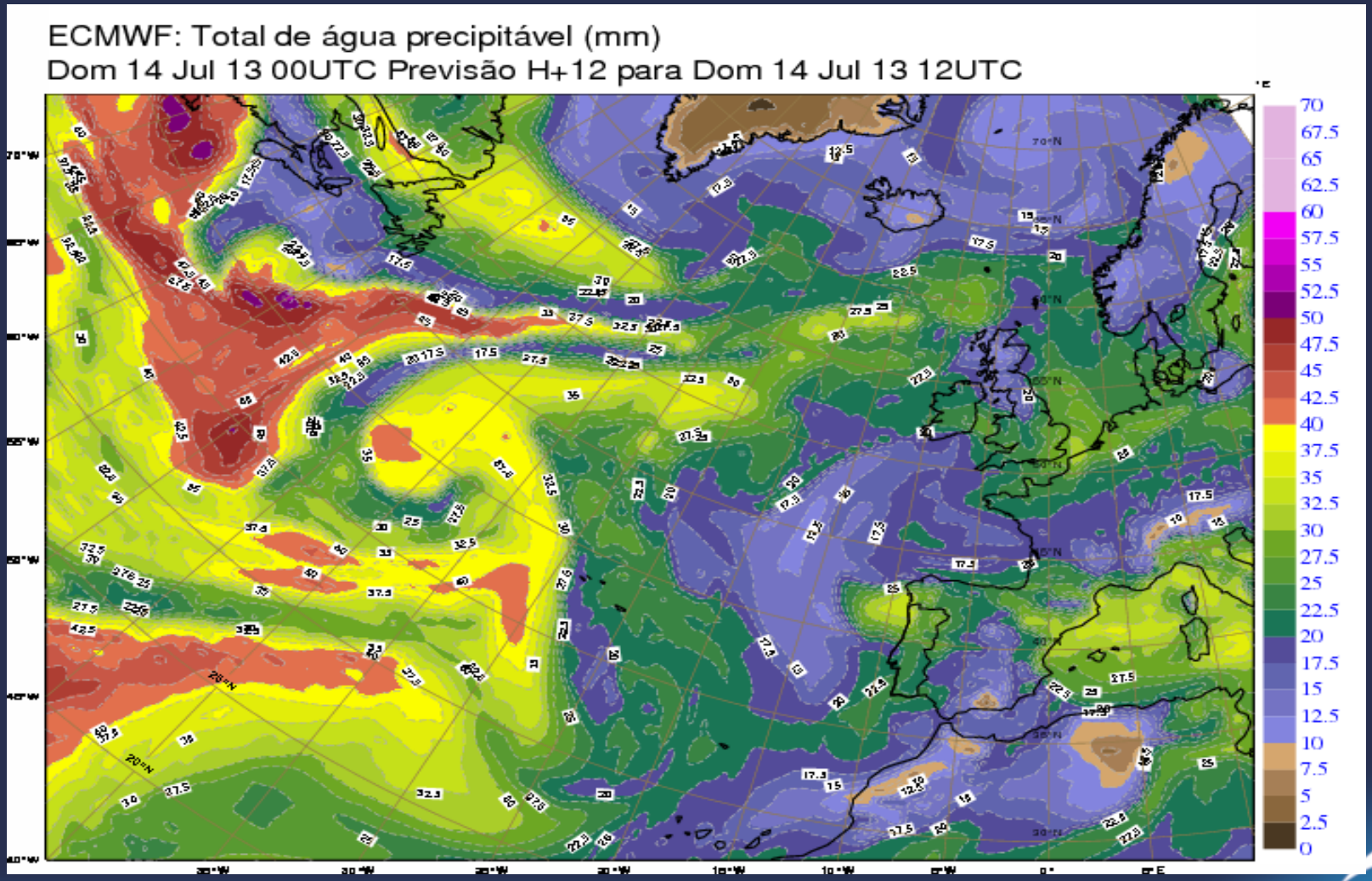
TetaSW 850hPa, and MSL Pressure



TPW (mm)



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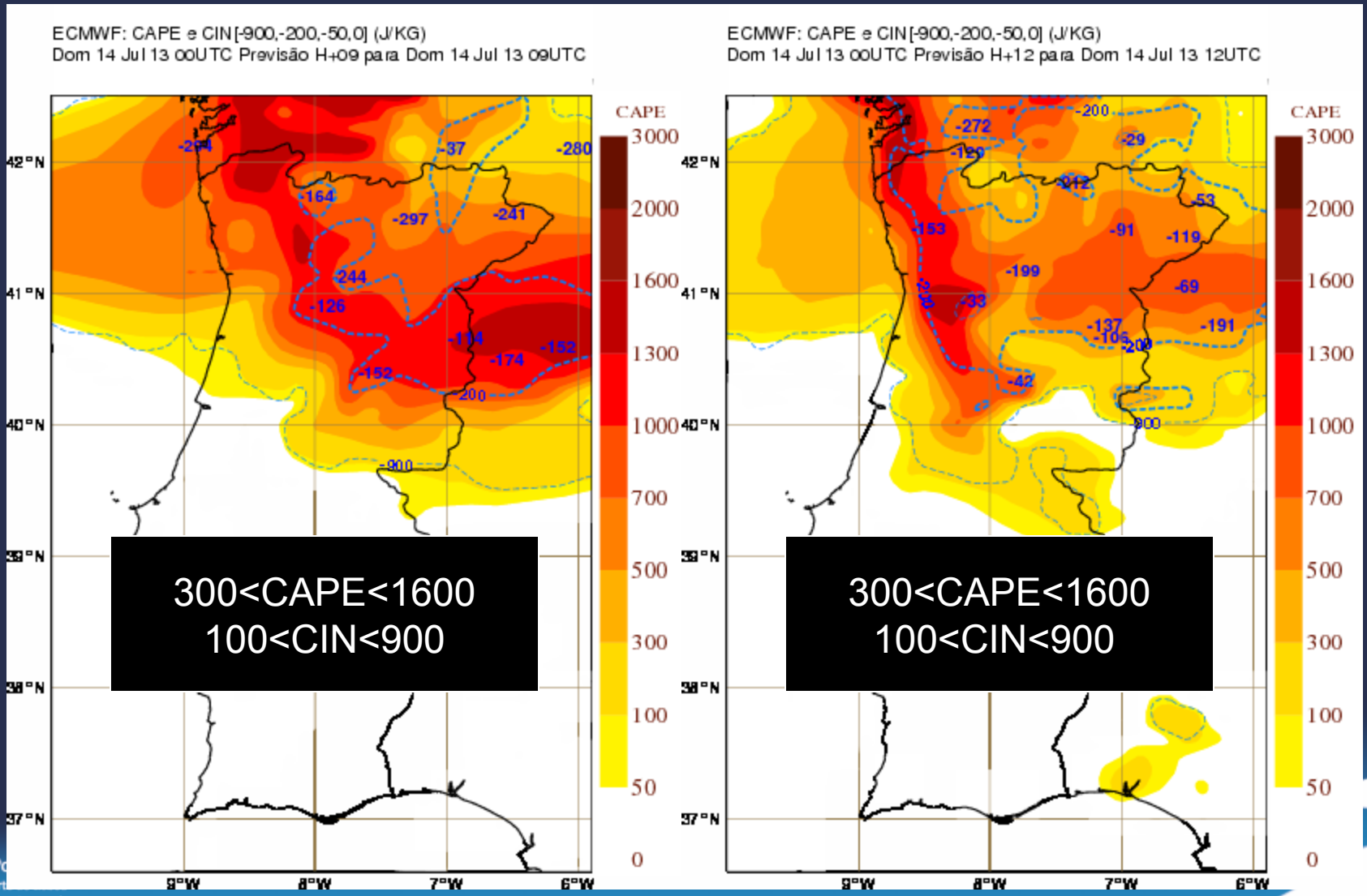
MUCAPE and MUCIN (J/Kg)



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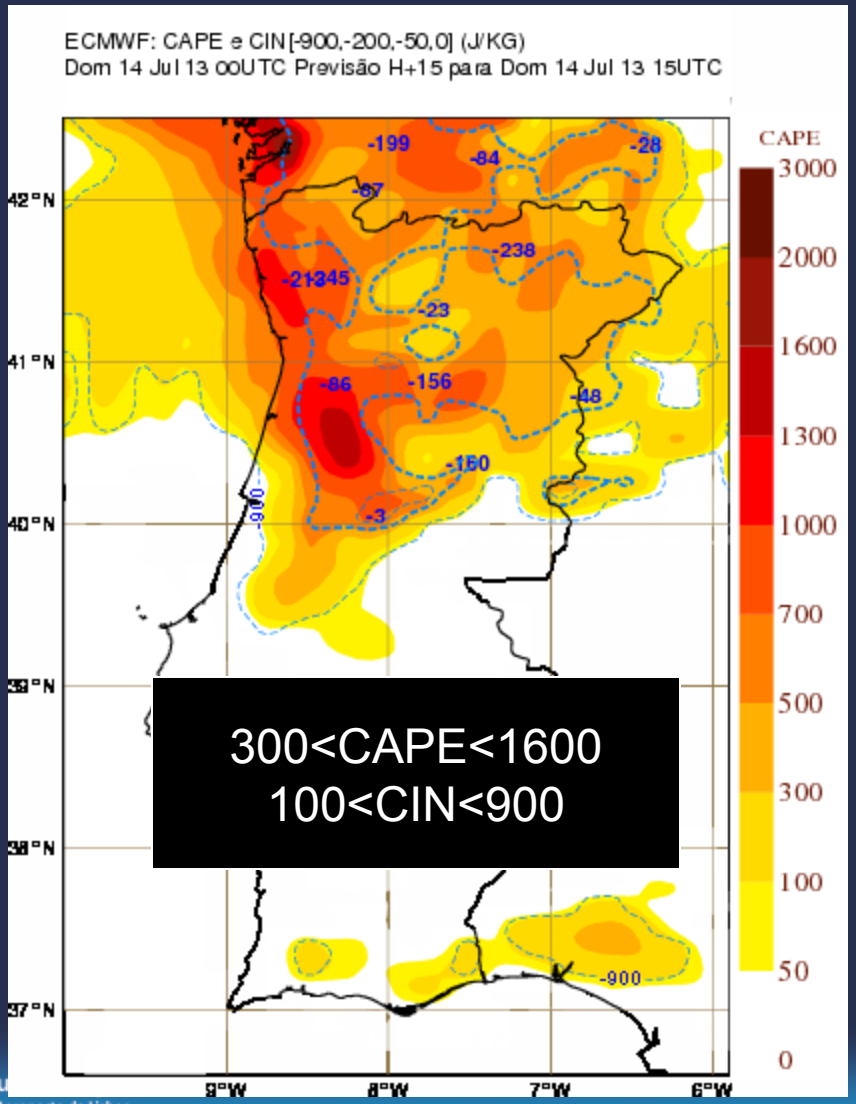
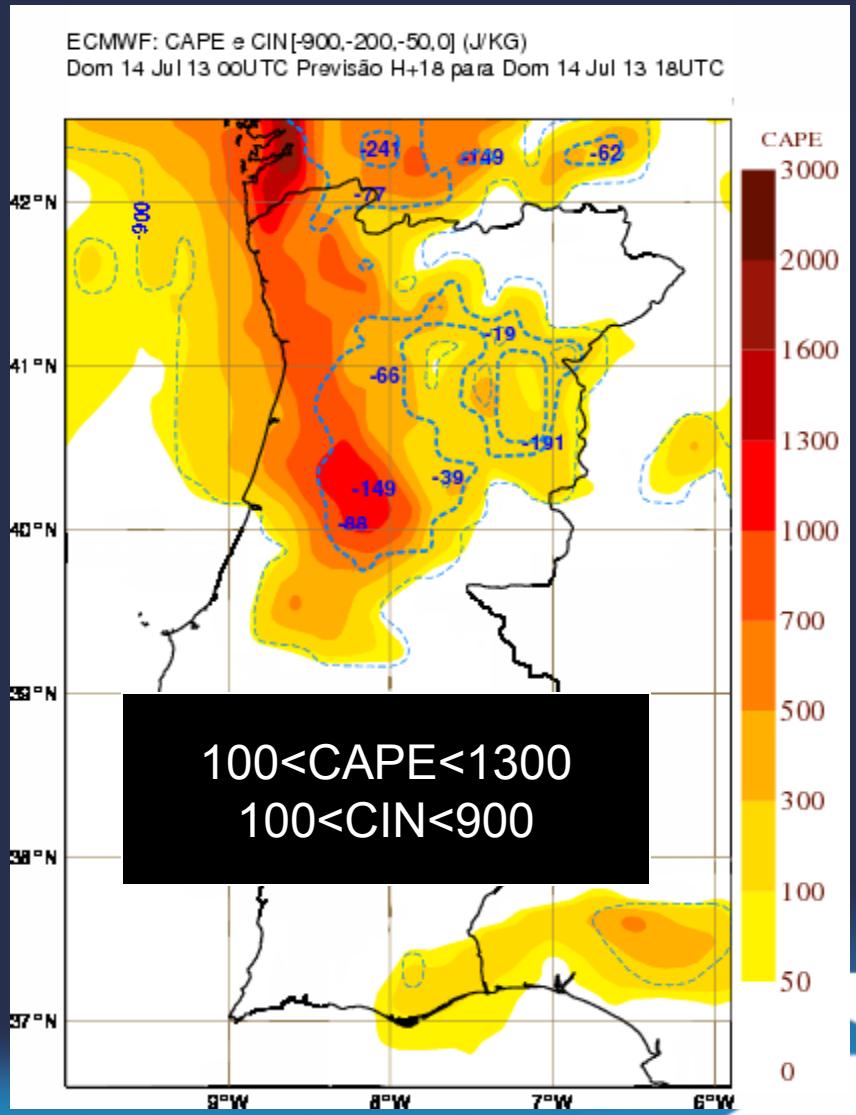
MUCAPE and MUCIN (J/Kg)





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CAPE overlap with CIN over Northern and Central parts of Portugal.

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Large scale main forcing ?

- Barotropic trough associated with a long wave between Atlantic and ocidental Mediterranean; Positive vorticity advection

- Decreasing thickness around 500hPa.

-DVA between 300 hPa and 500 hPa.

Omega equation

$$\left(\nabla^2 + \frac{f_0^2}{\sigma}\frac{\partial^2}{\partial p^2}\right)\omega = \frac{f_0}{\sigma}\frac{\partial}{\partial p}\left[\mathbf{v}_g \bullet \nabla\left(\frac{1}{f_0}\nabla^2\Phi + f\right)\right] + \frac{1}{\sigma}\nabla^2\left[\mathbf{v}_g \bullet \nabla\left(-\frac{\partial\Phi}{\partial p}\right)\right] - \frac{k}{\sigma p}\nabla^2 J$$

A B C D

A – proportional a -ω.

B - DVA.

C – Laplacian of thickness advection, i.e, mean temperature advection

D- Laplacian of diabatic heating.

Problems of using omega equation:

- ω is purely dinamic.
- B and C terms, partly cancel.
- Introduction of noise, errors.
- But: it works quite well operationally.

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Vector Q

$$\underbrace{\left(\sigma\nabla^2 + f_0^2\frac{\partial^2}{\partial p^2}\right)\omega}_{A} = \underbrace{-2\nabla\cdot\mathbf{Q}}_{B} + \underbrace{f_0\beta\frac{\partial v_g}{\partial p}}_{C} - \underbrace{\frac{k}{p}\nabla^2 J}_{D}$$

A – proportional -ω.

B – Divergence of Q vector.

C – Advection of planetary vorticity by the thermal wind.

D – Laplacian of diabatic heating.

Vector Q

$$\mathbf{Q} = -\frac{R}{p}\left|\frac{\partial T}{\partial y}\right|\left(\mathbf{k} \otimes \frac{\partial \mathbf{v}_{\mathbf{g}}}{\partial x}\right)$$

Advantages of using Q vector:

- ω as dinamic and thermodynamic components.
- No cancelations between terms.

- But: I don`t use it quite often operationally; I`m starting to do it.

Mesoscale/local scale forcing ?

- Baroclinic zone associated with sea breeze front; Strong horizontal gradients of temp. and hum. at surface and BL.

-Low level vertical transport of enthalpy, imposed by diferential heating on BL.

-Diferential topography in the area; Caramulo mountain(1071m) W of Nelas.

Not less important

In general: weak winds; small air advections.

Small contribution of windshear for the hodograph areas.

First: What, and Why?

- Showers (10 to 20mm/h) and thunderstorms; maybe wind gusts and decreasing temp associated with downdrafts in unicellular deep convection; Precipitation warning issued

Second: Where, and Why?

- Over interior N and C parts

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What would we expect to hapen?

- LCL heigths
- LFC heigths
- Deep convection

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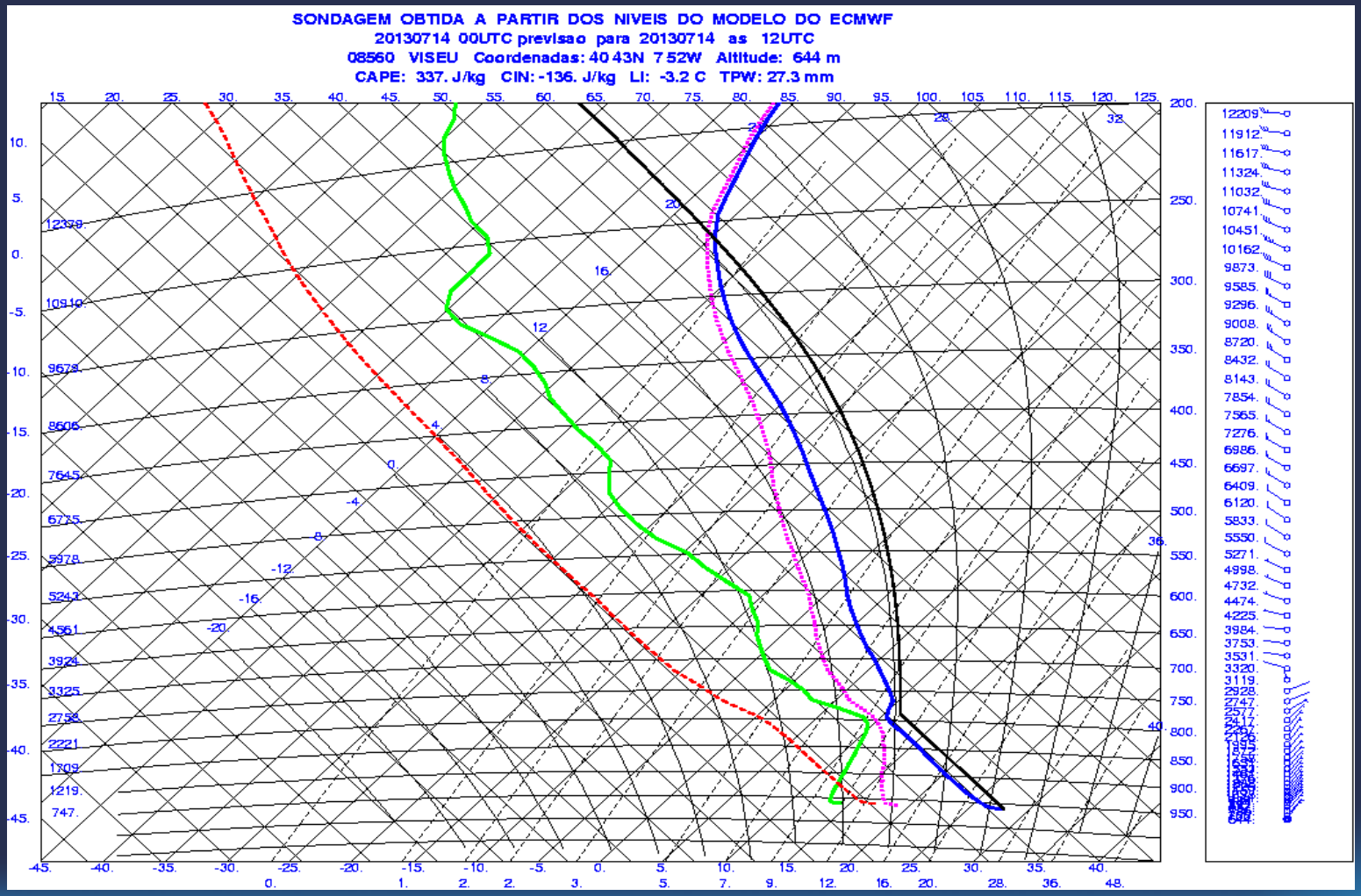
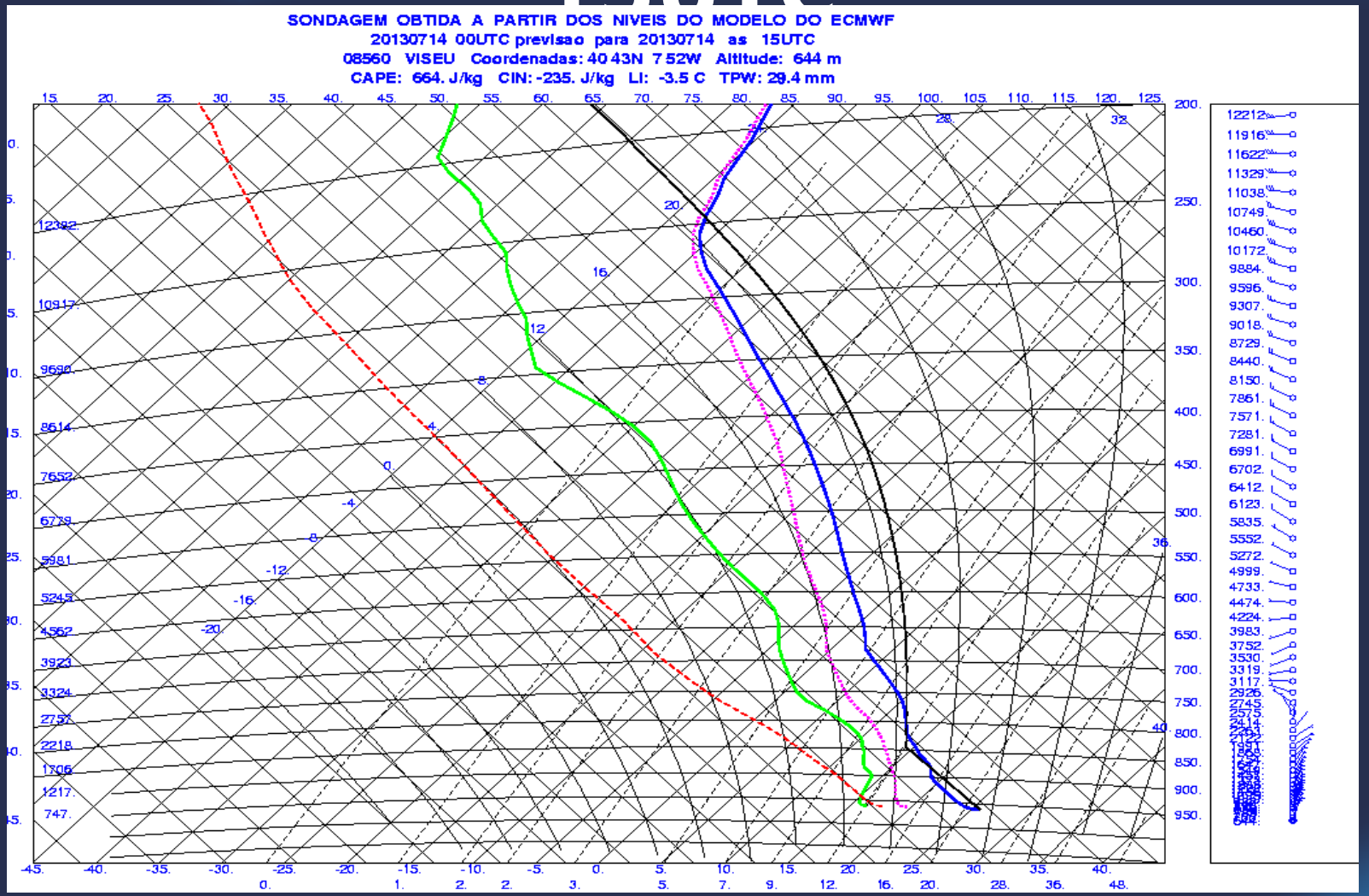
Viseu tephigram valid 14 12UTC



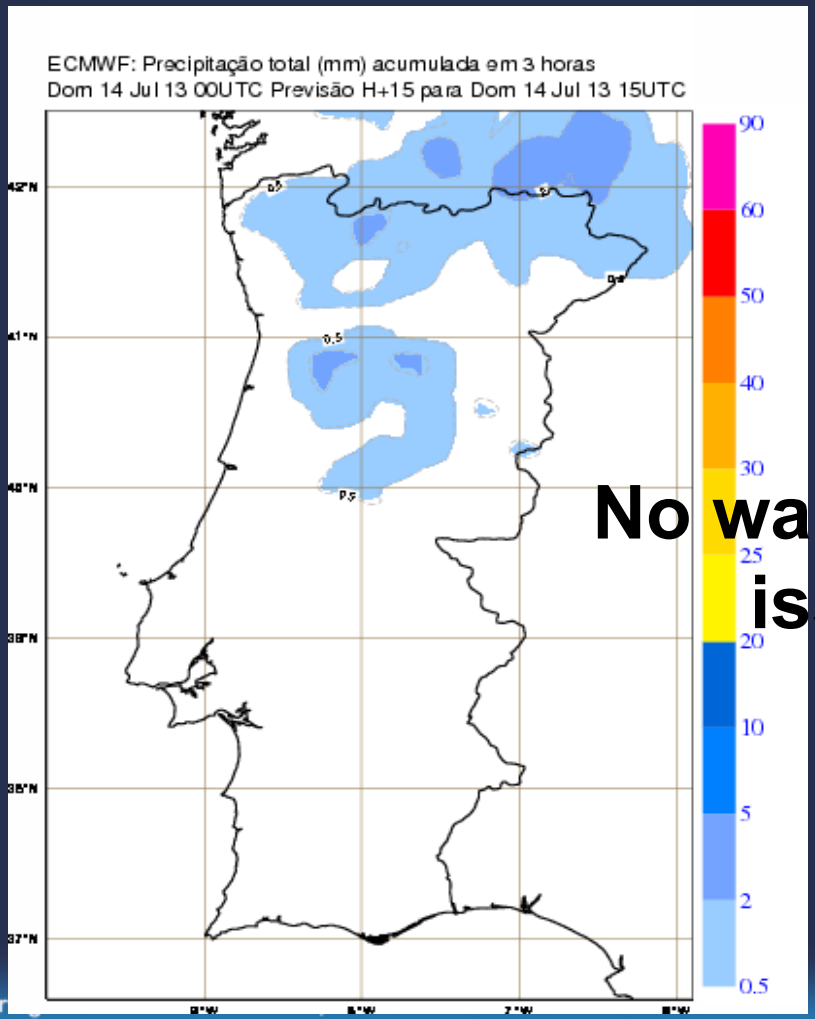
Viseu tephigram valid 14 15UTC



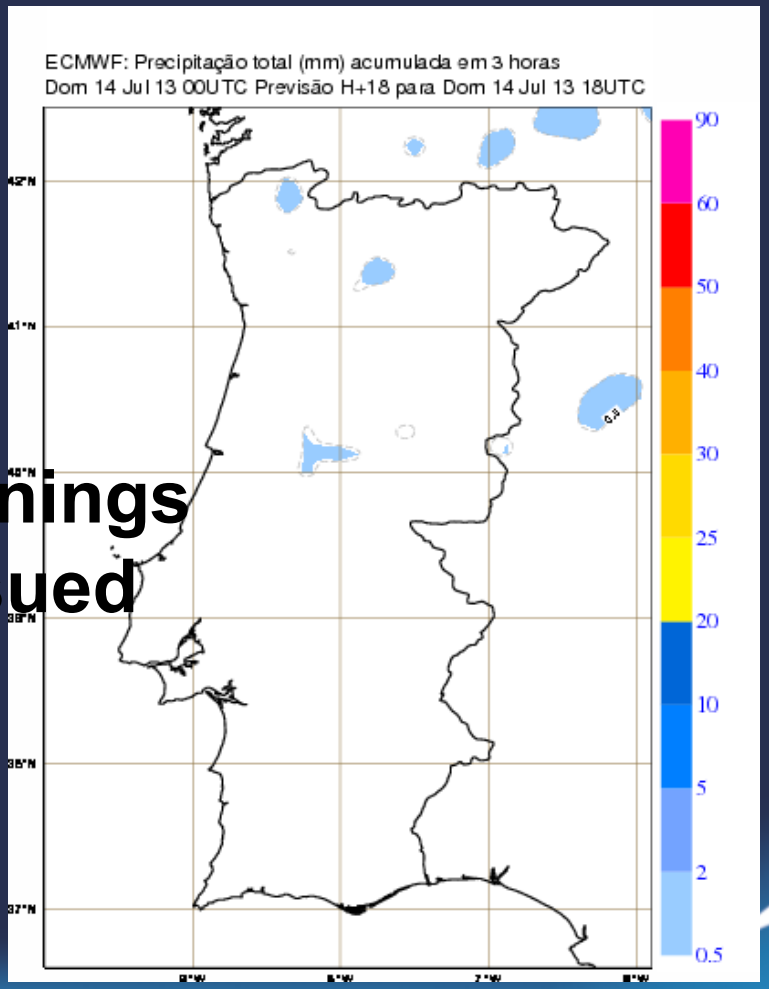
-Almost barotropic atmosfere
-Weak winds
- Almost no windshear

-Most common form of convection: Single cells

Precipitation 3hrs(mm)



No warnings issued



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Arome contribution.

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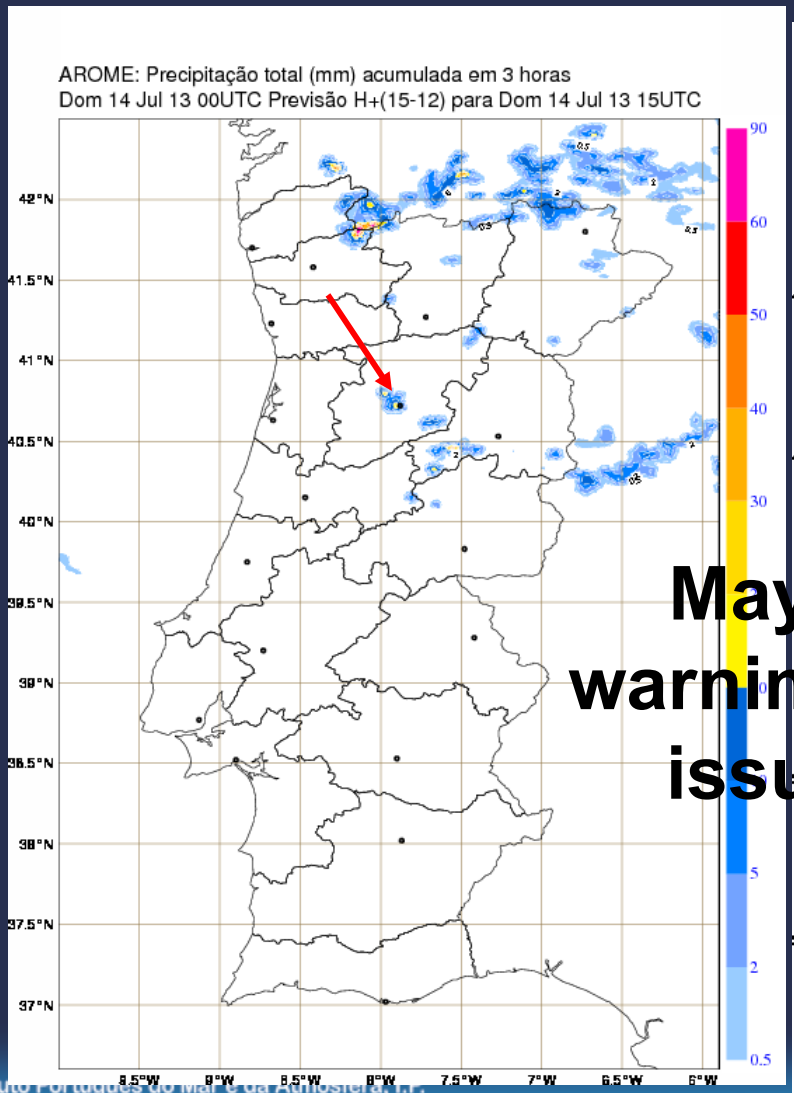
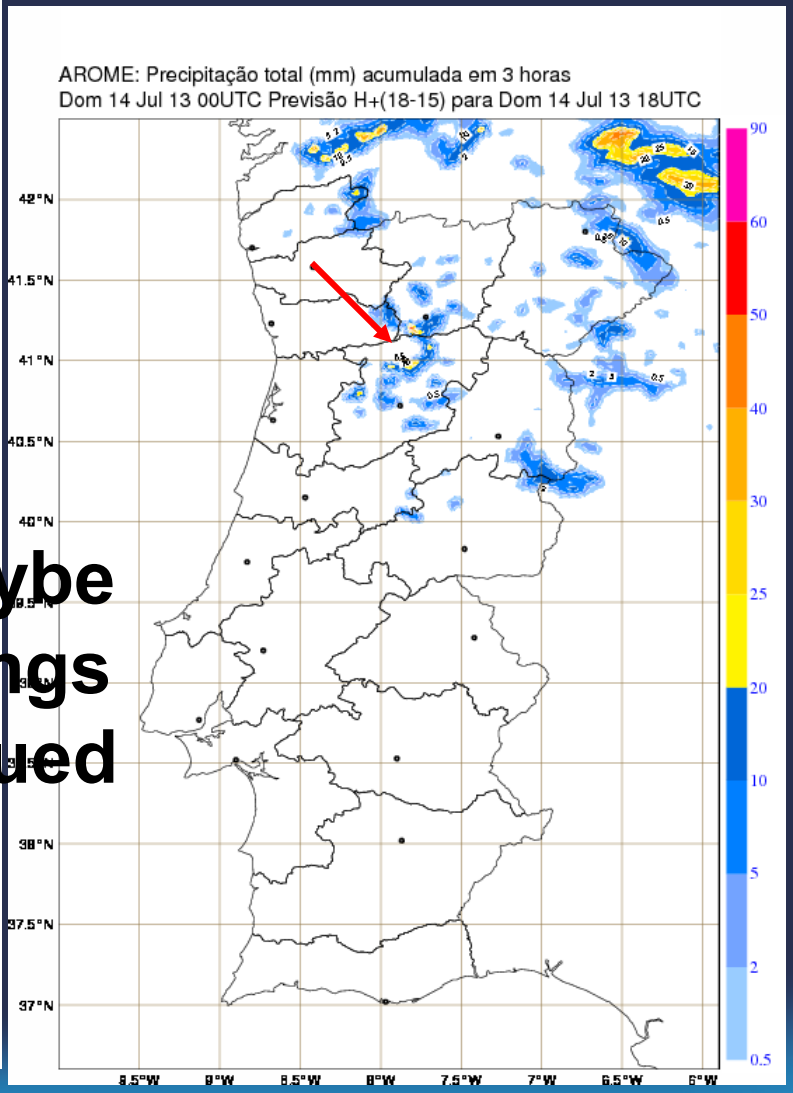
Precipitation AROME 3hrs



Maybe warnings issued



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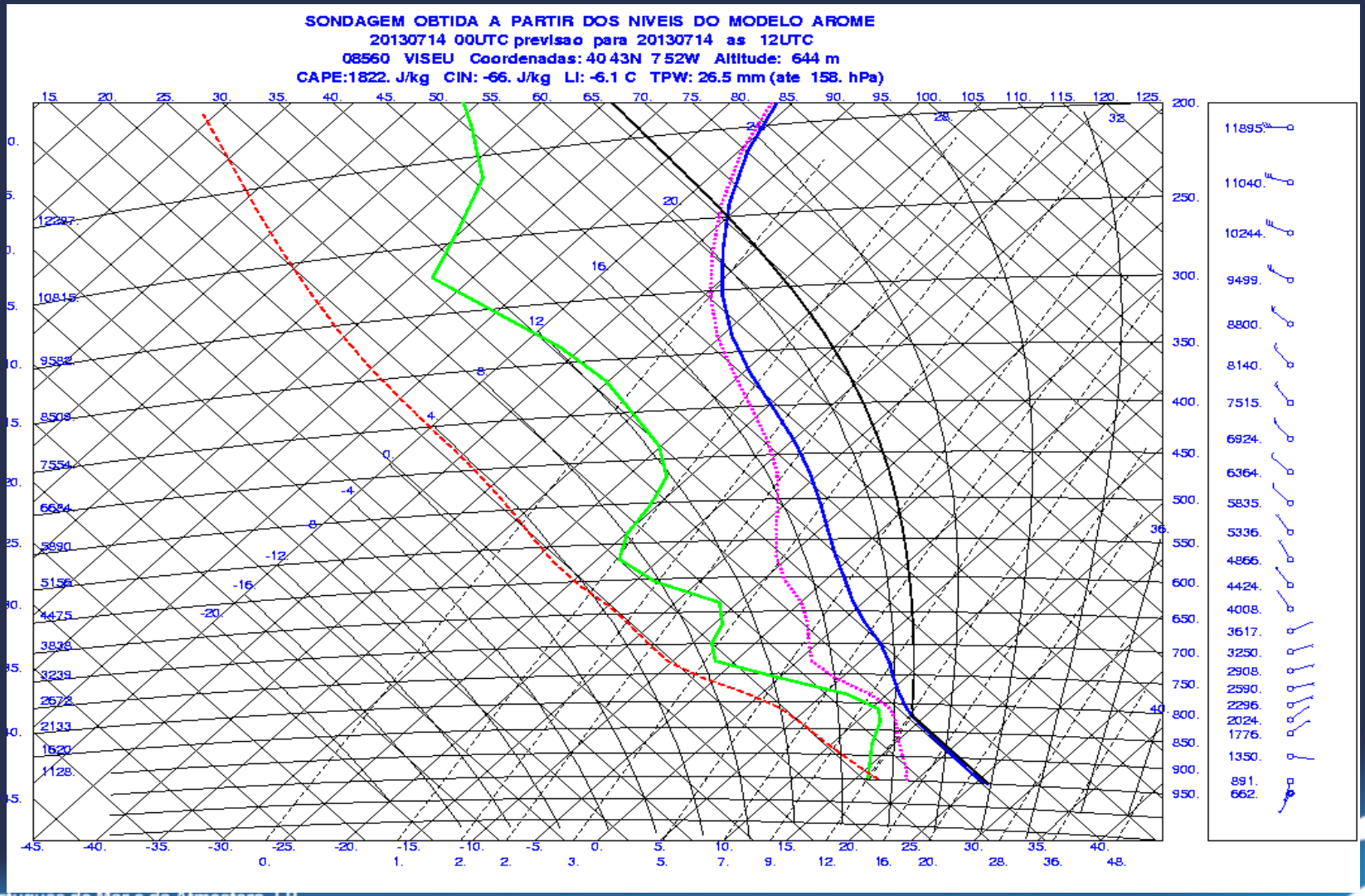
viseu tephigram valid 14 12UTC



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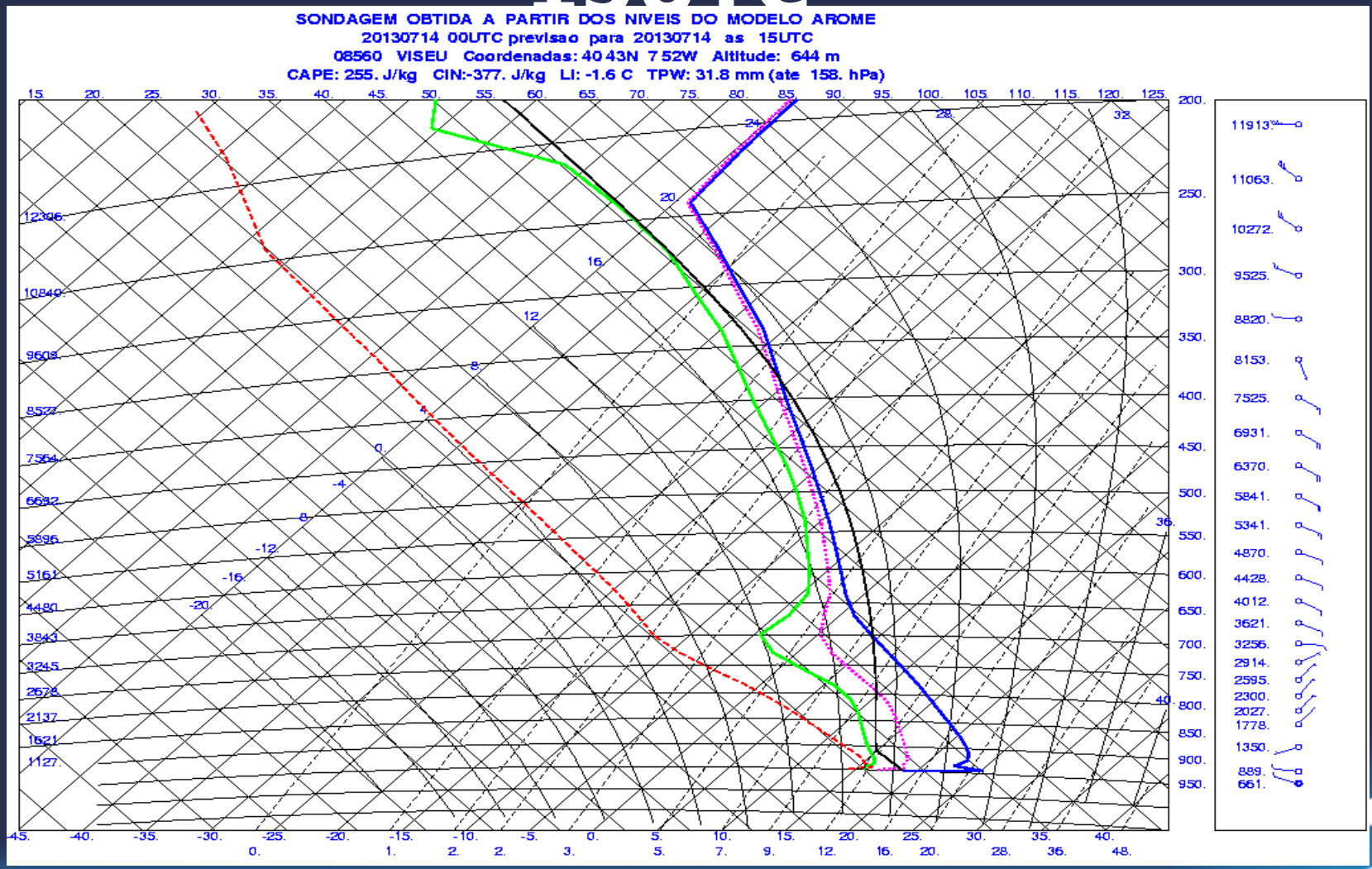
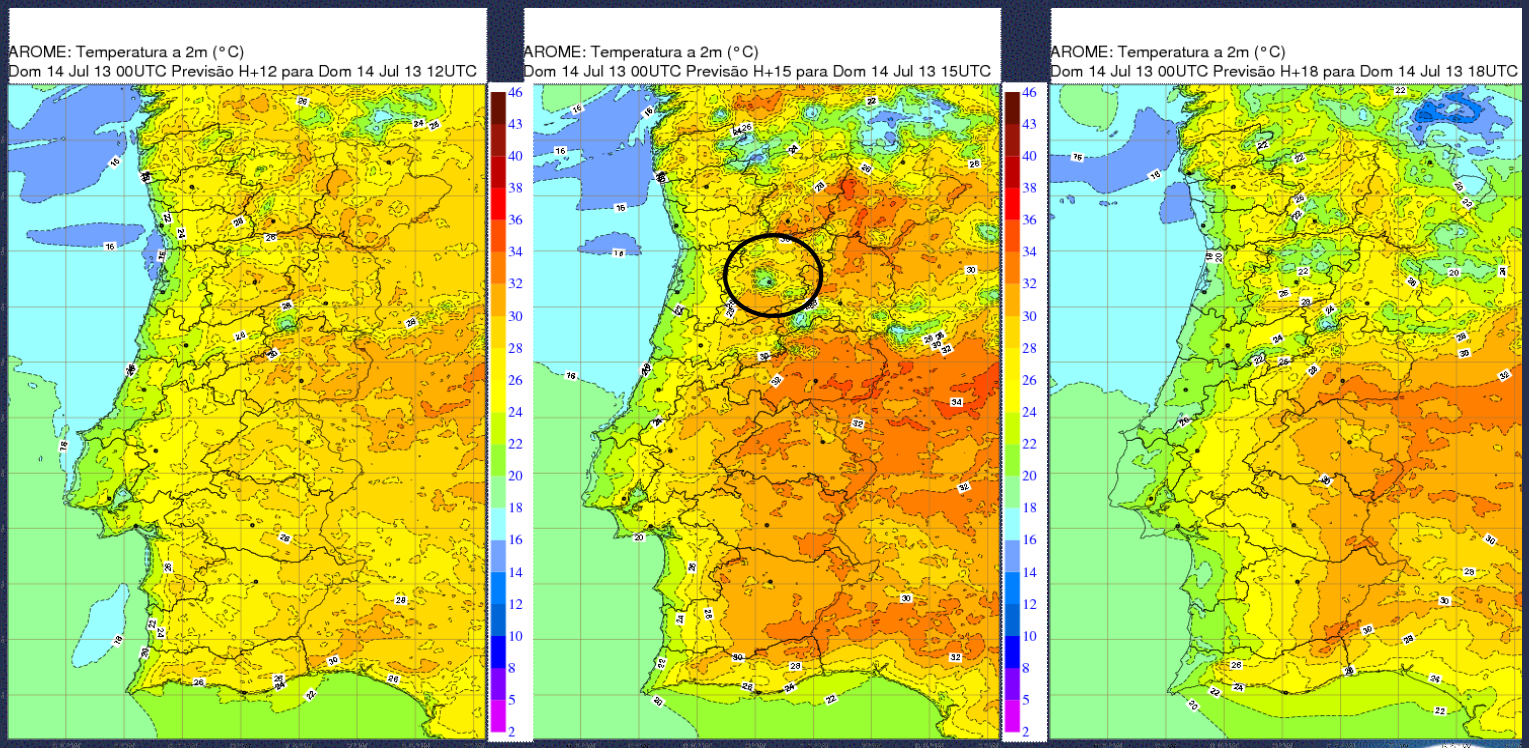
Viseu tephigram valid 14 15UTC



2 mTemperature



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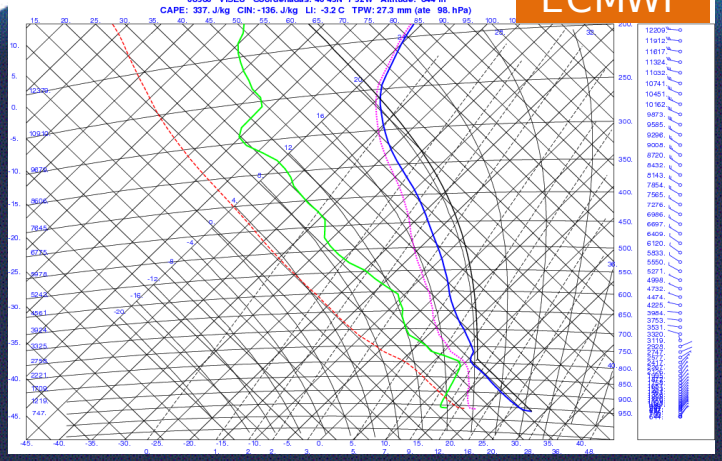
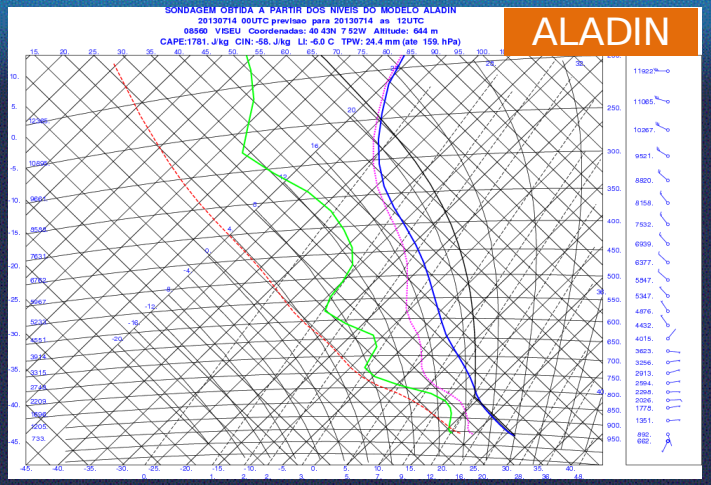
Viseu tephigram valid 14 12UTC

Forecasting Convection

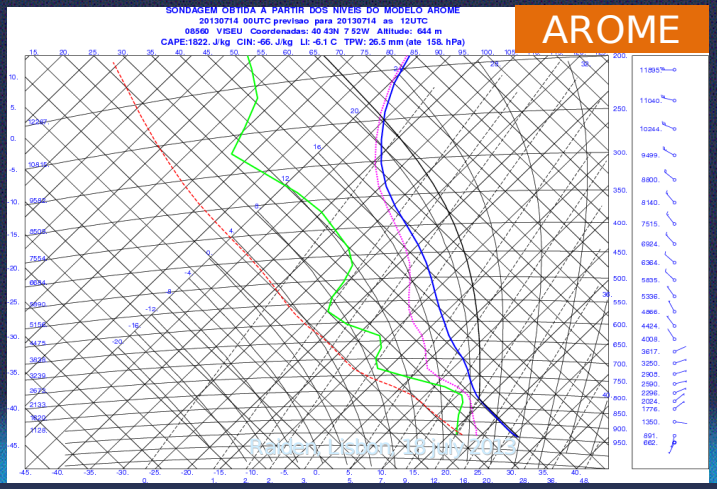
ECMWF



ALADIN



AROME



"Viseu"

12H forecast

14/07/2013
at 12UTC

	CAPE (J/Kg)	LI (ºC)
EC:	337	-3.2
AL:	1781	-6.0
AR:	1822	-6.1

Julho de 2013

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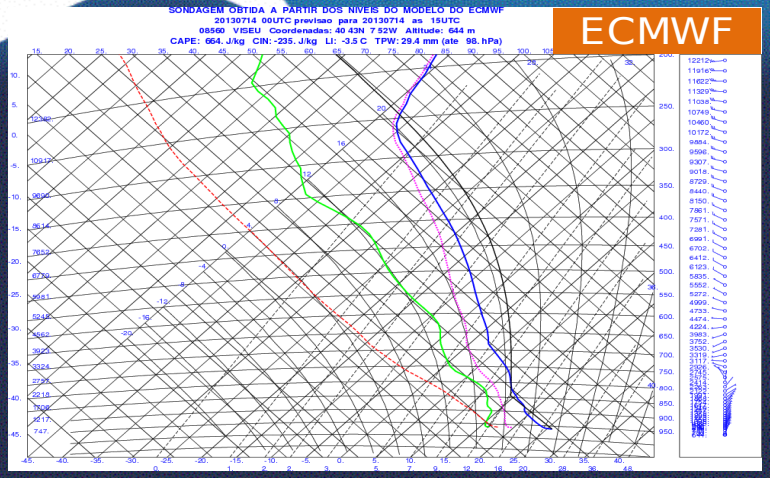
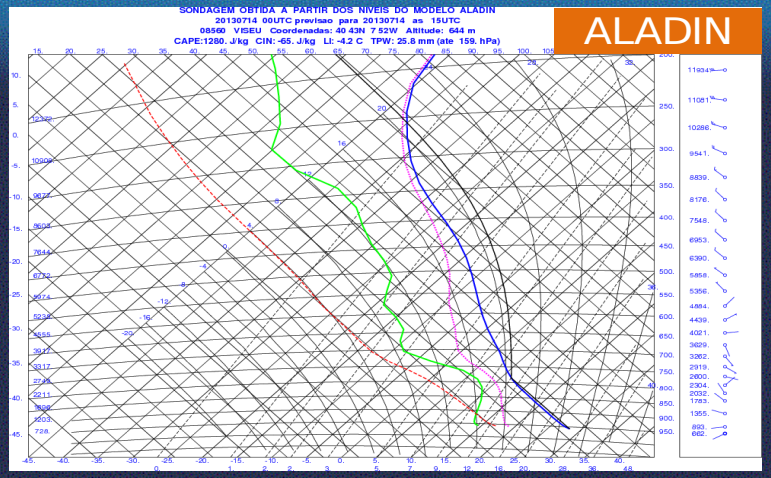
Viseu tephigram valid 14 15UTC

Forecasting Convection

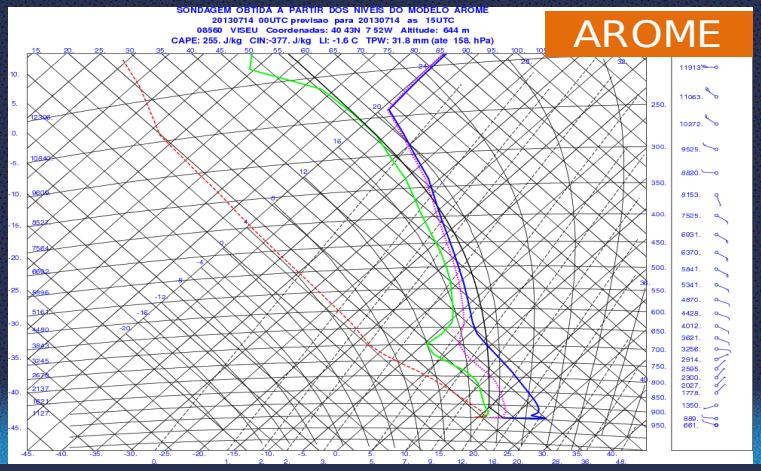




"Viseu"

15H forecast

14/07/2013
at 15UTC



"Nelas" station

2h Precipitation
17 mm (15-17UTC)

1h Temperature drop
15 C (15-16UTC)

junho de 2013

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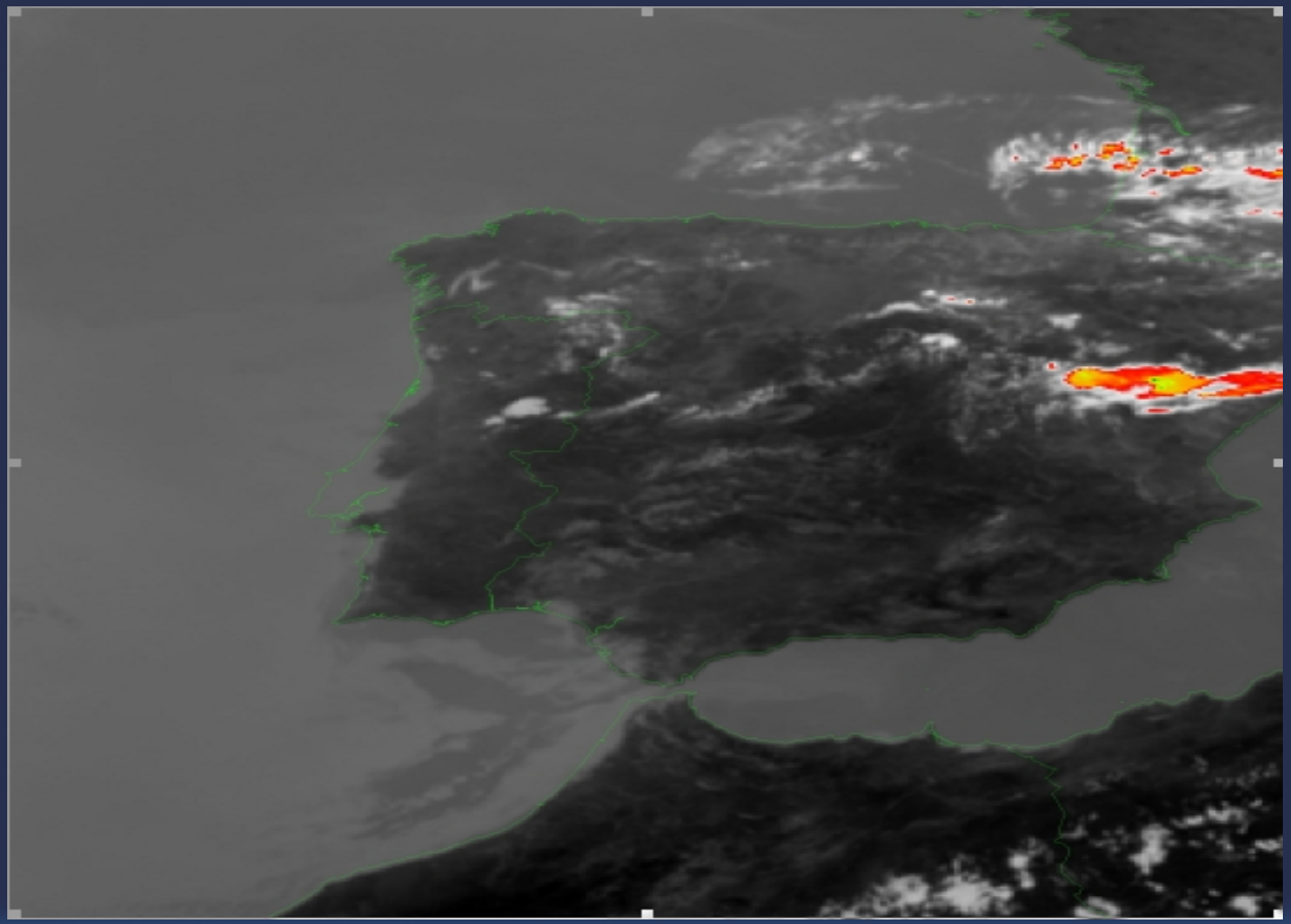
Observations

IR 10.8 at 12UTC



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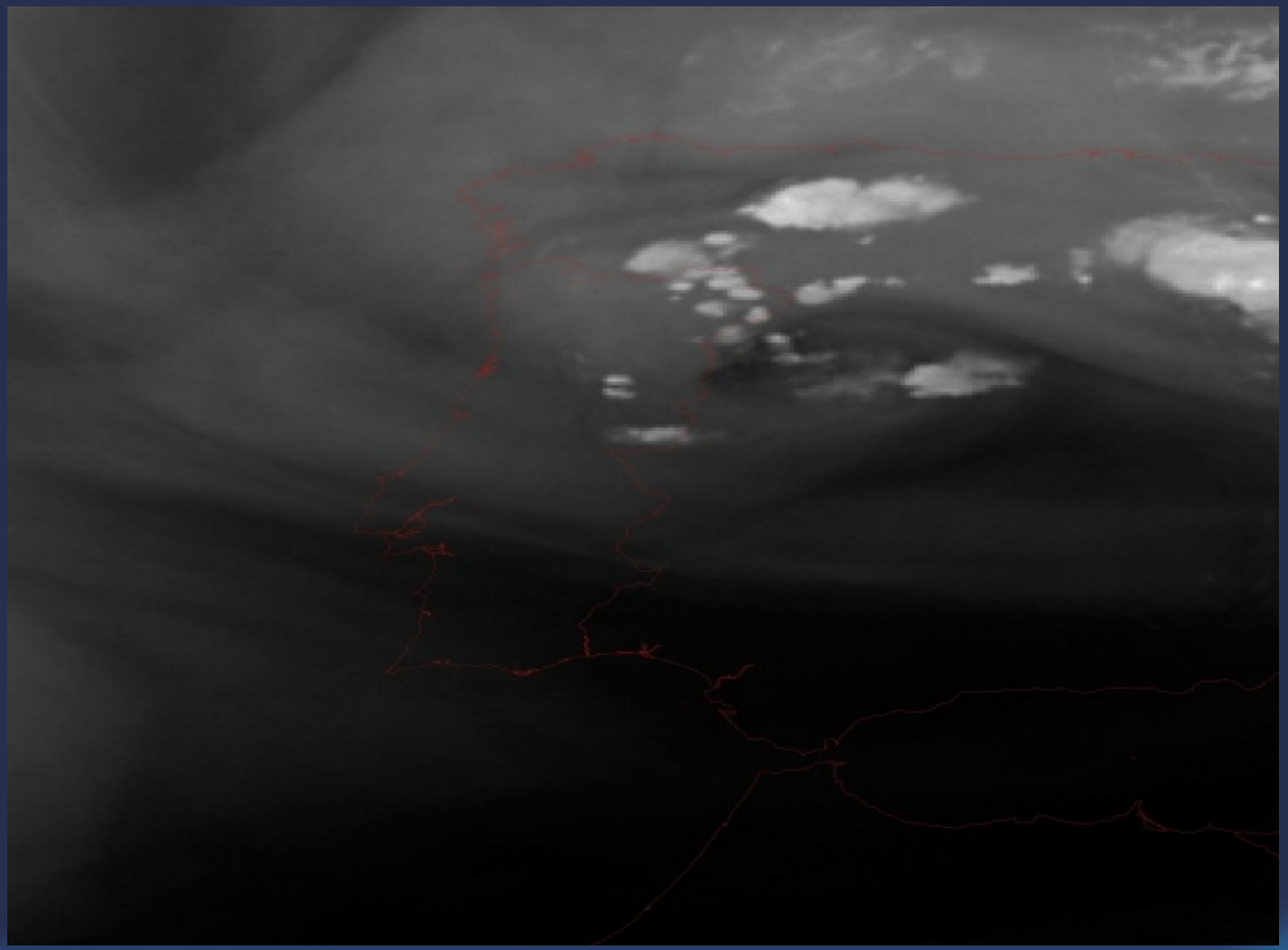
WV 6.2 at 15UTC



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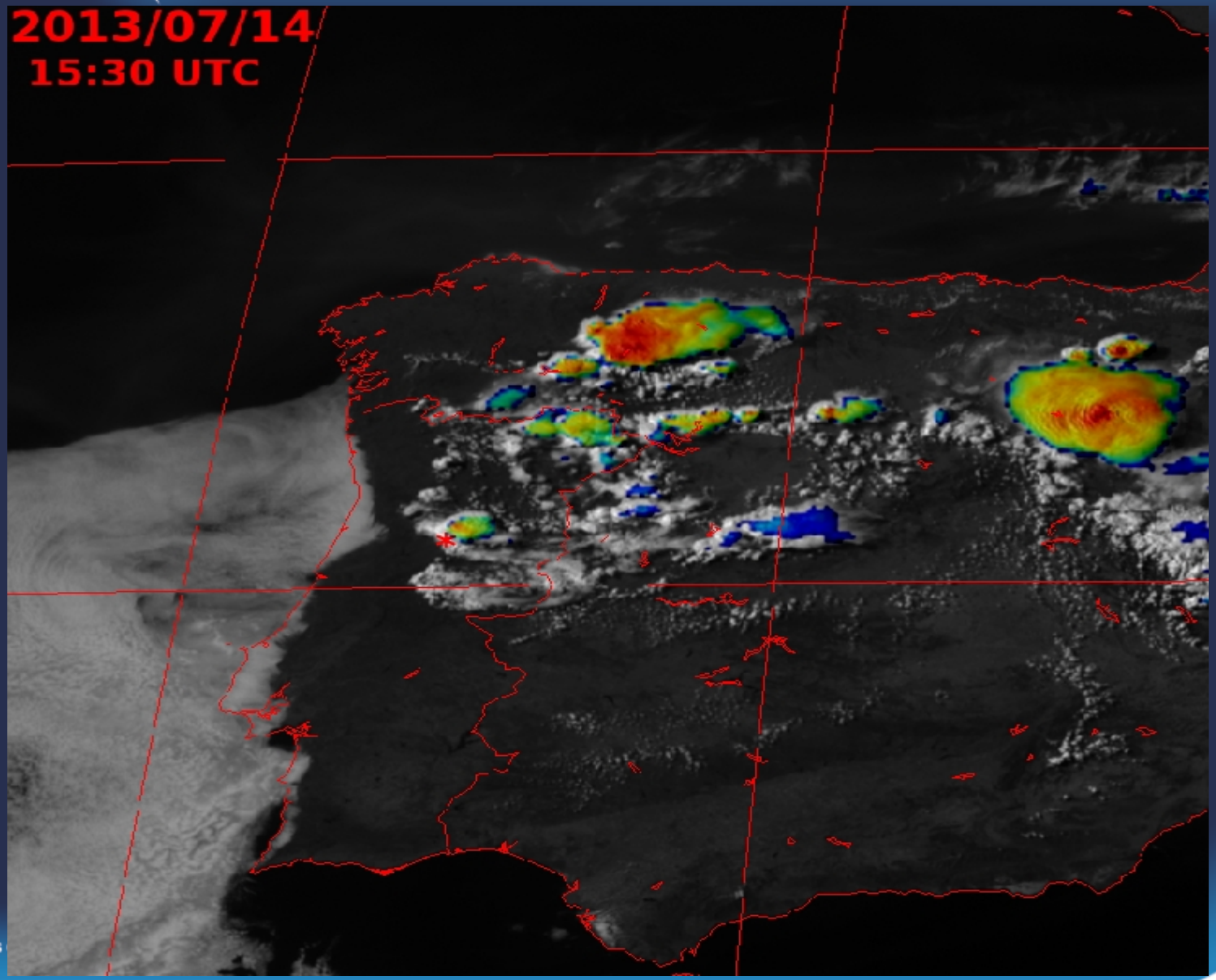
SANDWICH HRV 10.8



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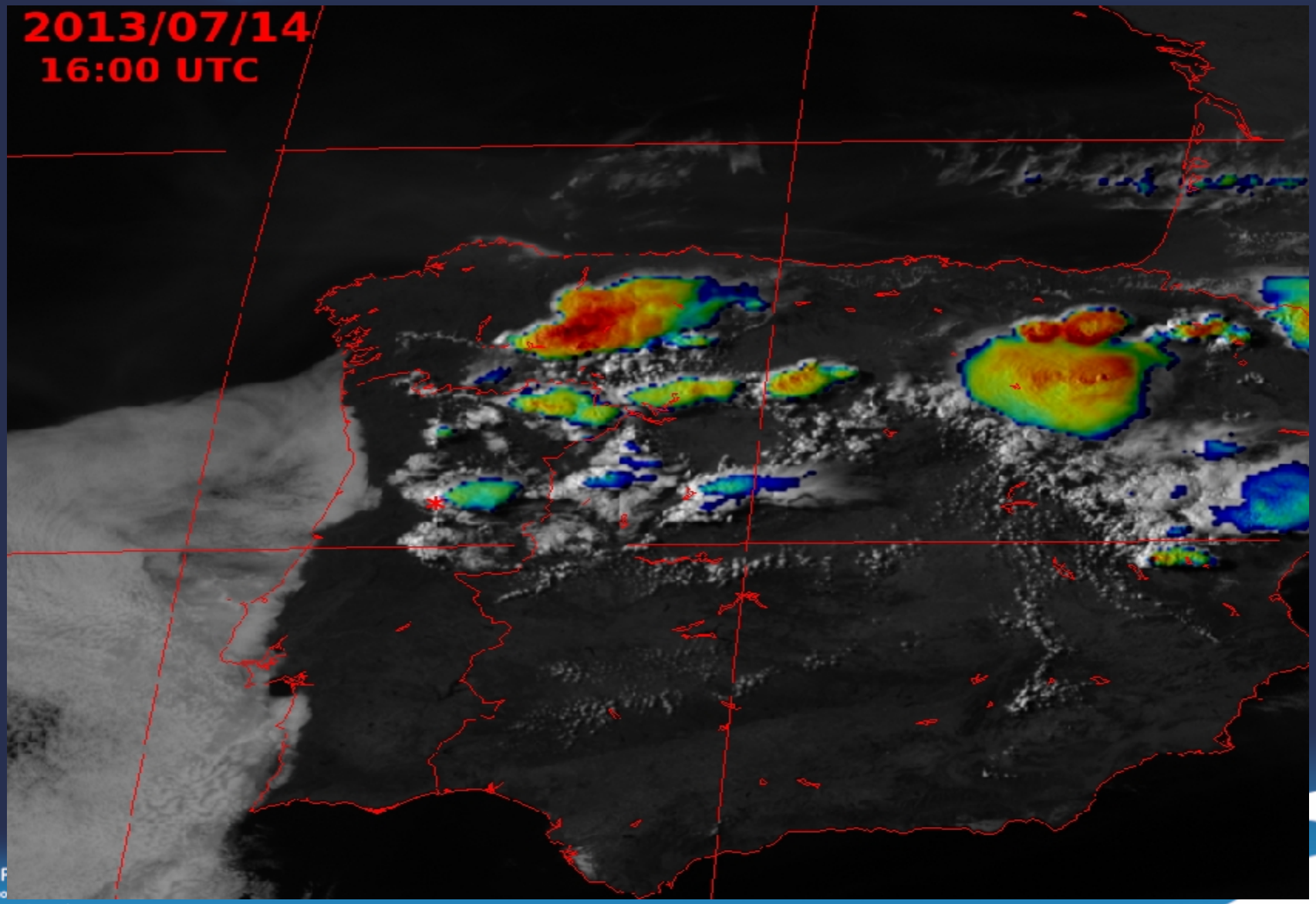
SANDWICH HRV 10.8



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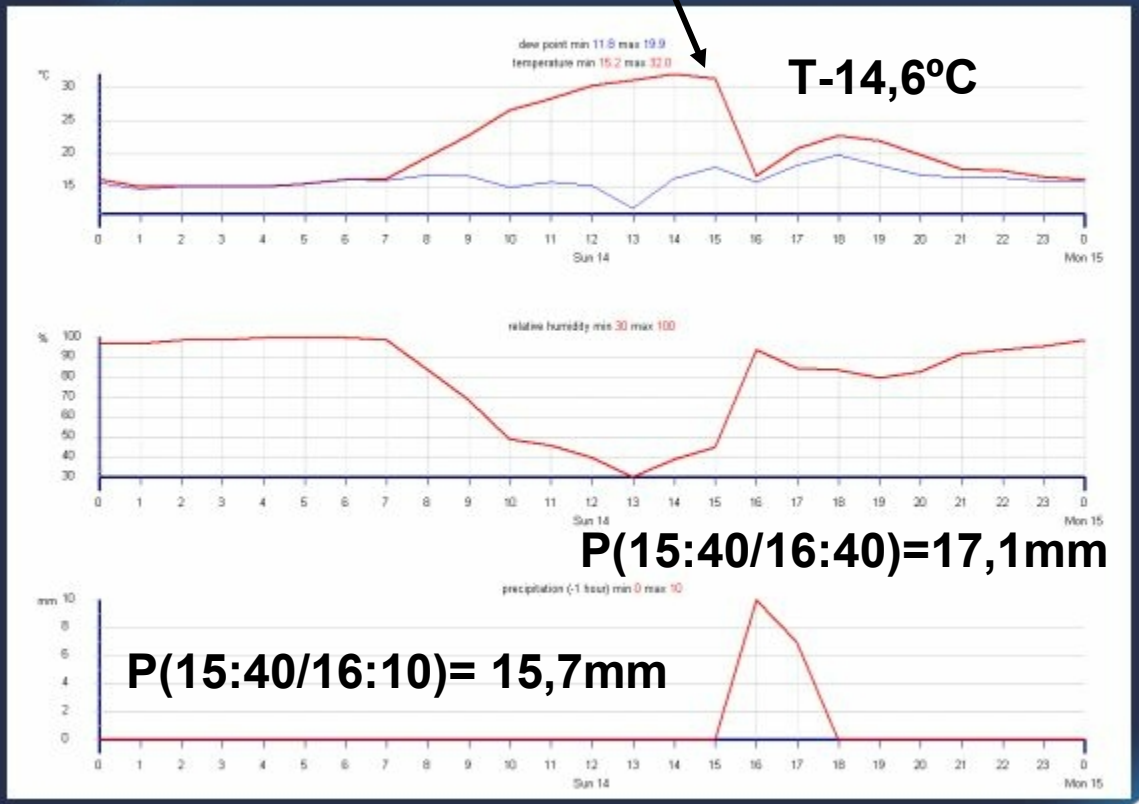
Nelas, 14/07/2013



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Nelas observations

NELAS-685				Altitude = 425m			Lat. 40º 52' Long. 07º 86'			
LISTAGEM DE INFORMAÇÃO DO ARQ. 61 (dados horários) DO DAPT NA ESTAÇÃO 685 DE DIA 14-07-2013										
						VENTO MED.Km/h		VENTO MAX. Km/h		
MES	DIA	HORA	P-EST.	TS	TD	D1	F1	D2	F2	VV
7	14	6		161	161	32	3			
7	14	7		163	161	99	3			
7	14	8		196	169	99	3			
7	14	9		228	168	99	3			
7	14	10		266	150	99	3			
7	14	11		284	158	99	7			
7	14	12		303	153	99	3		18	
7	14	13		311	118	99	7		18	
7	14	14		320	163	25	14		25	
7	14	15		314	180	22	18		28	
7	14	16		168	158	35	32		54	
7	14	17		209	183	26	10		28	
7	14	18		228	199	22	7			
7	14	19		220	183	24	10		18	
7	14	20		199	169	22	7		21	
7	14	21		178	165	99	3		18	
7	14	22		175	165	0	0			
7	14	23		166	160	99	3			
Observei:										
PRECIPITAÇÃO 09/09h de dia 14/15 foi de (17.1mm) ocorrida no espaço de uma hora (15:40-16:40) dia 14										
MAIOR VALOR DE VARIAÇÃO DA TEMPERATURA/hora foi de (14.6º) das 15h para as 16h										
MÍNIMOS DE TEMPERATURAS, MÁXIMOS DE HUMIDADE E DE VENTO coincidentes nas 16h , de **Norte**										

SW 18km/h
N 32Km/h

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Descargas elétricas

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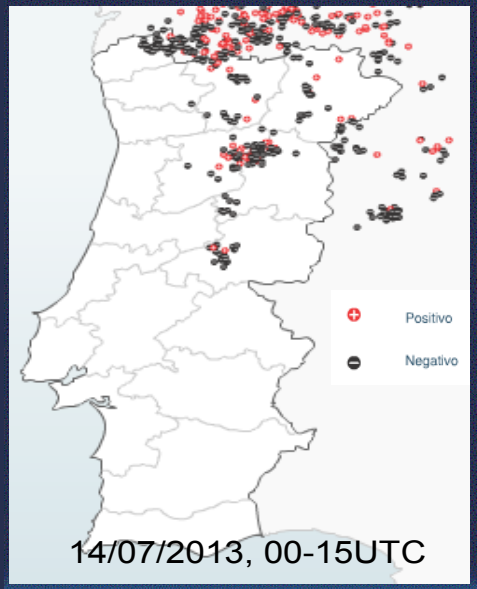
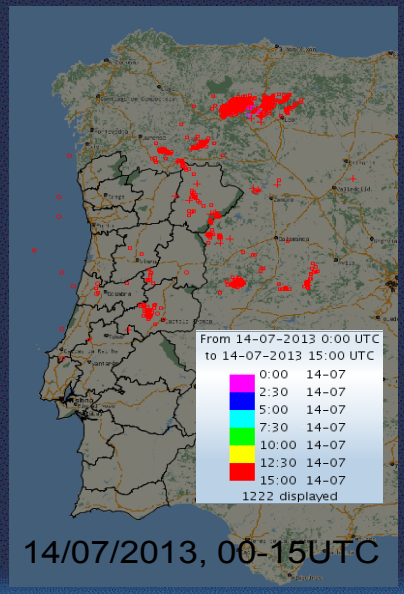
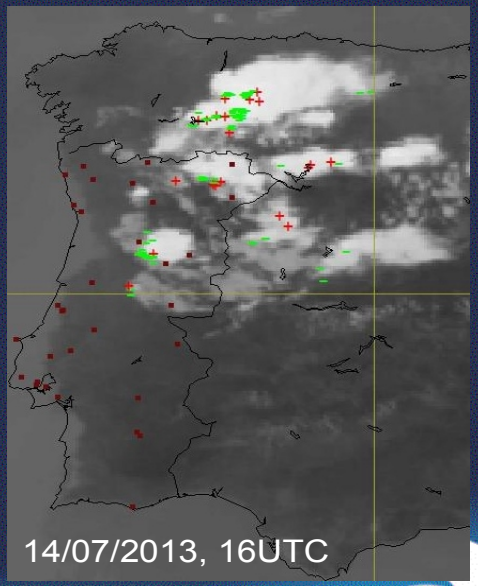


Meteorage system



Messir-Vision system



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What I would like to have from ECMWF

- Most unstable level on tephigram
- Interactive tephigrams and hodographs on each map point
- 0-6km; 0-3km; 0-1km windshear and MLCAPE(30hPa AGL) and MUCAPE/MUCIN
- 0-3km;0-1km Storm Relative Helicity
- Lapse rate 900-600hPa and mixing ratio 500m AGL.

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What I would like to have from Arome

- Maybe - unsemble
- MUCAPE/MUCIN; Most unstable level on tephigram
- Hodographs on each tephigram
- 0-6km; 0-1km windshear

But I`m not really sure.

Thank you all

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