

# A Couple of Key Studies 2015 ECMWF Numerical Forecasts Model

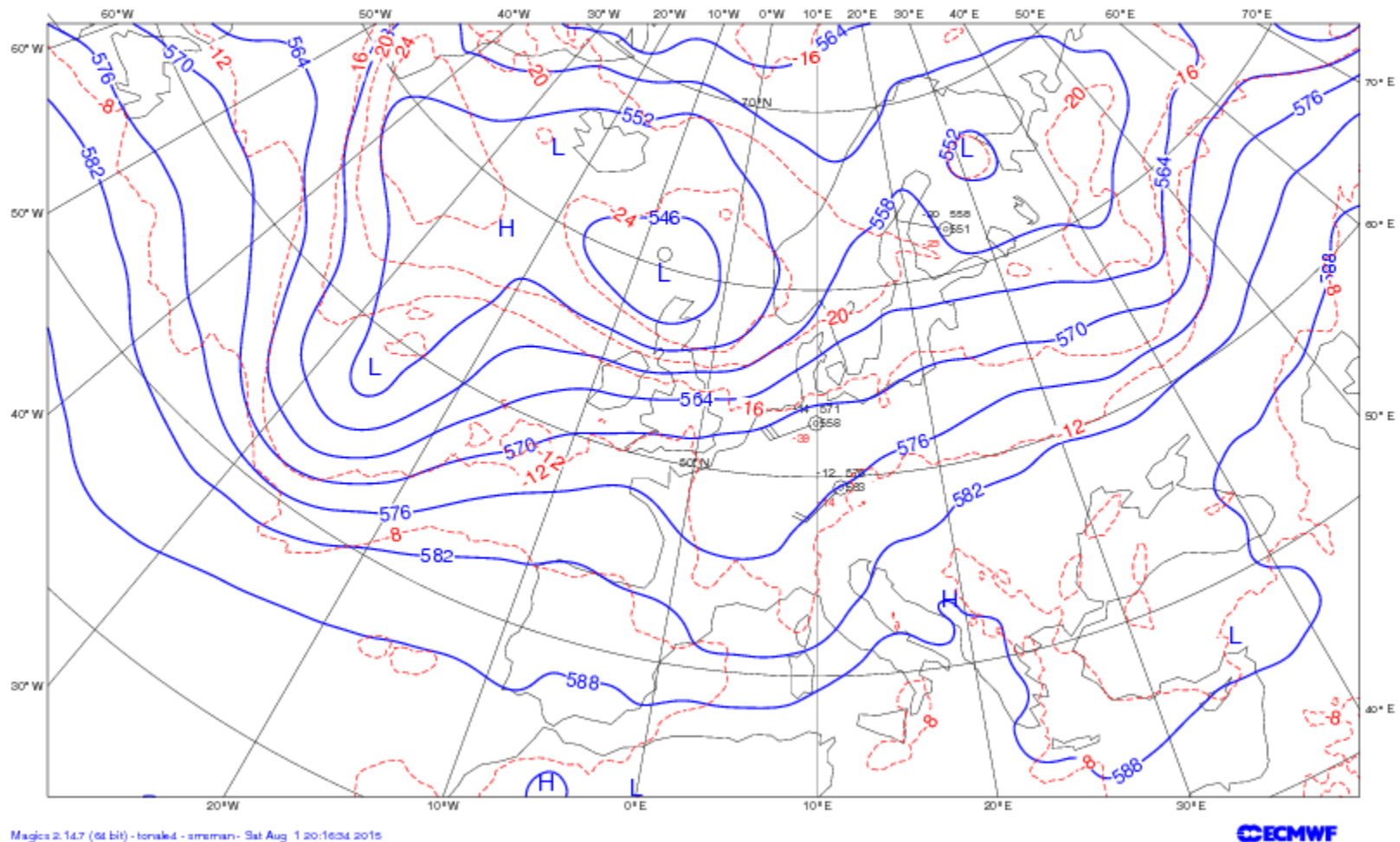
Antonio Troisi  
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Operational Centre for Meteorology  
P. di Mare (Italy)

# A Severe Rainstorm with Flood in Florence

A heavy storm occurred over Florence, last august 1st 2015 in the evening, including severe thunderstorms while some tornado-like incident being reported; a remarkable amount of rainfall has been recorded and consequent flood incidents all over the eastern urban sector as well.

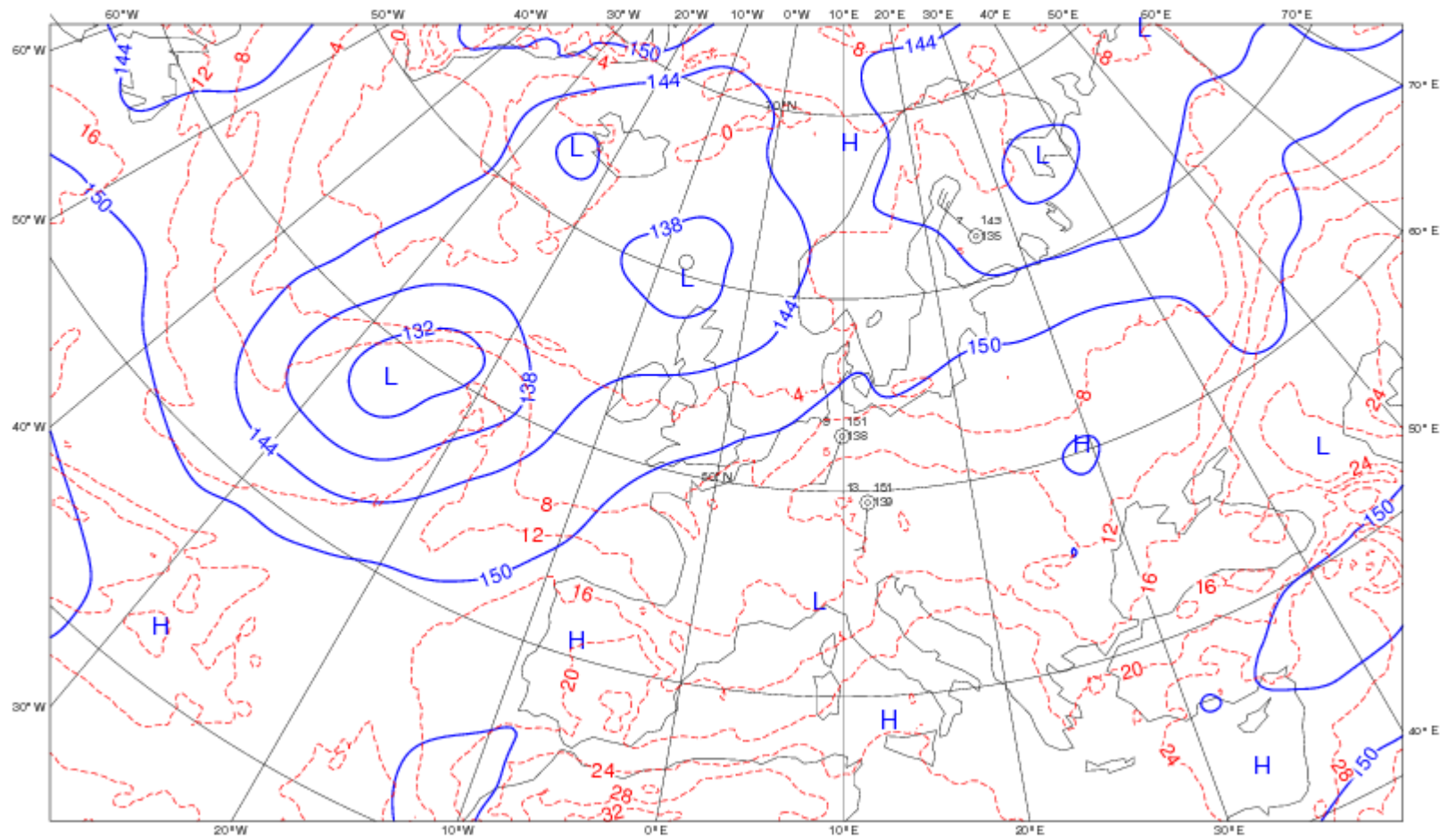
## ROME Analysis VT: Saturday 01 August 2015 - 18 UTC Geopotenziale 500 hPa + Temperatura 500 hPa N.A.



Analysis 00.00UTC – 12.00 UTC – 18.00UTC: 588 isoline over Mediterranean area, lowering down after a trough due to classical Atlantic mid latitude cyclone working over northern Europe

# ROME Analysis VT: Saturday 01 August 2015 - 18 UTC

## Geopotenziale 850 hPa + Temperatura 850 hPa N.A.



Magic 2.147 (64 bit) - tonale6 - srmman - Sat Aug 1 20:16:05 2015

CECMWF

Analysis 00.00UTC – 12.00 UTC – 18.00UTC: summer situation with main subjects moving at higher latitudes, jet stream main branches along 50°-55° N parallels, anticyclone over Mediterranean area

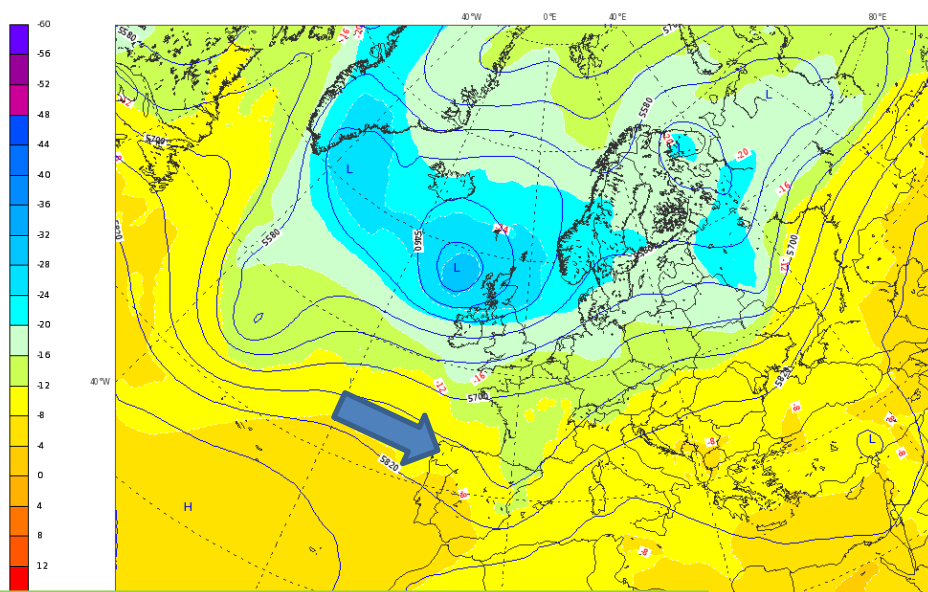
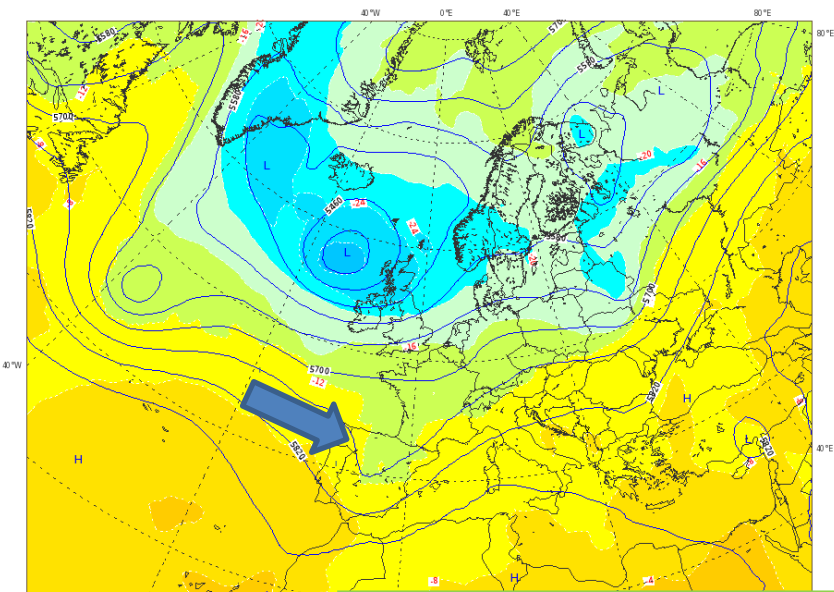




ECMWF 31 July 2015 00UTC Forecast T+24 VT: Saturday 01 August 2015 00UTC  
EUROATLANTIC - Geopotential at 500 hPa + Temperature at 500 hPa



ECMWF 31 July 2015 00UTC Forecast T+30 VT: Saturday 01 August 2015 06UTC  
EUROATLANTIC - Geopotential at 500 hPa + Temperature at 500 hPa



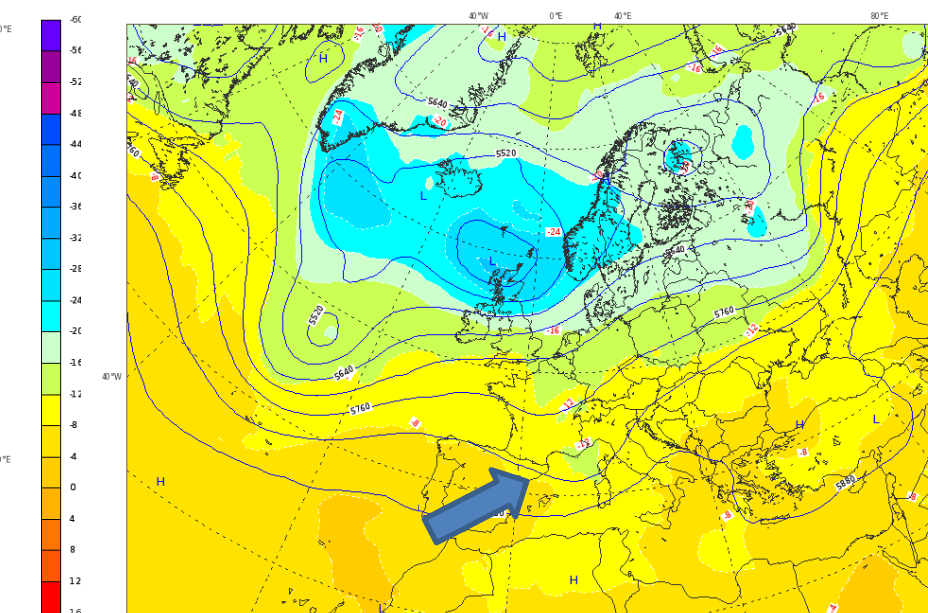
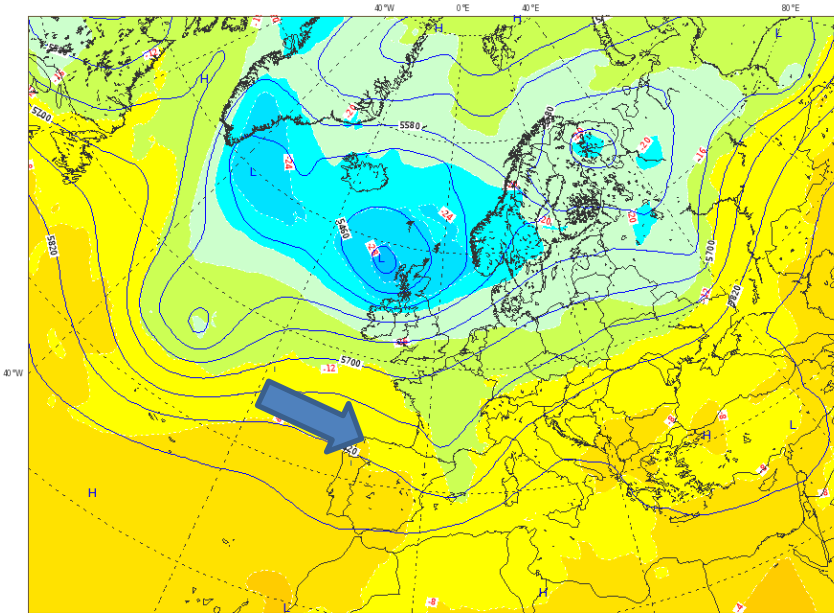
ECMWF , GM over Italy; run jul 31 00UTC, T+24- T+42



ECMWF 31 July 2015 00UTC Forecast T+36 VT: Saturday 01 August 2015 12UTC  
EUROATLANTIC - Geopotential at 500 hPa + Temperature at 500 hPa



ECMWF 31 July 2015 00UTC Forecast T+42 VT: Saturday 01 August 2015 18UTC  
EUROATLANTIC - Geopotential at 500 hPa + Temperature at 500 hPa

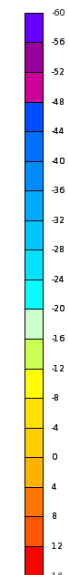
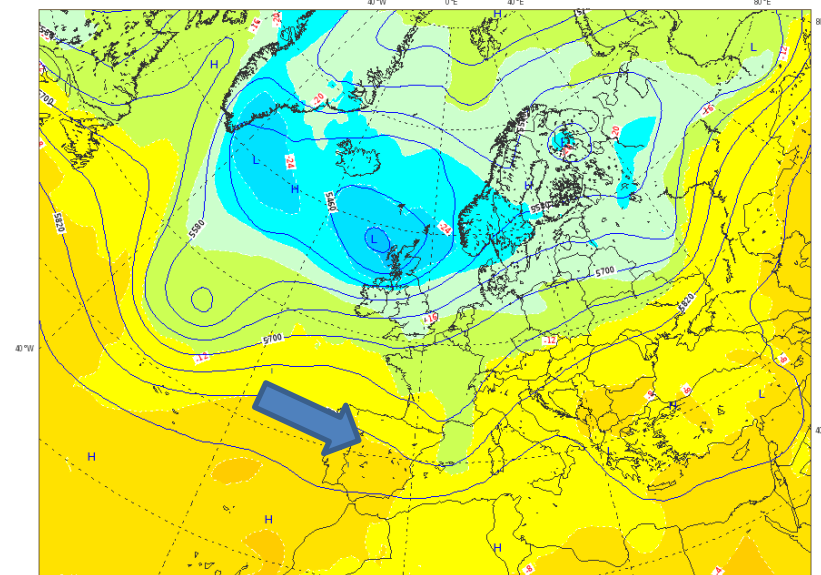
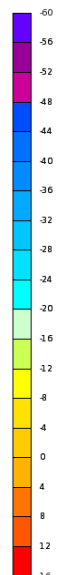
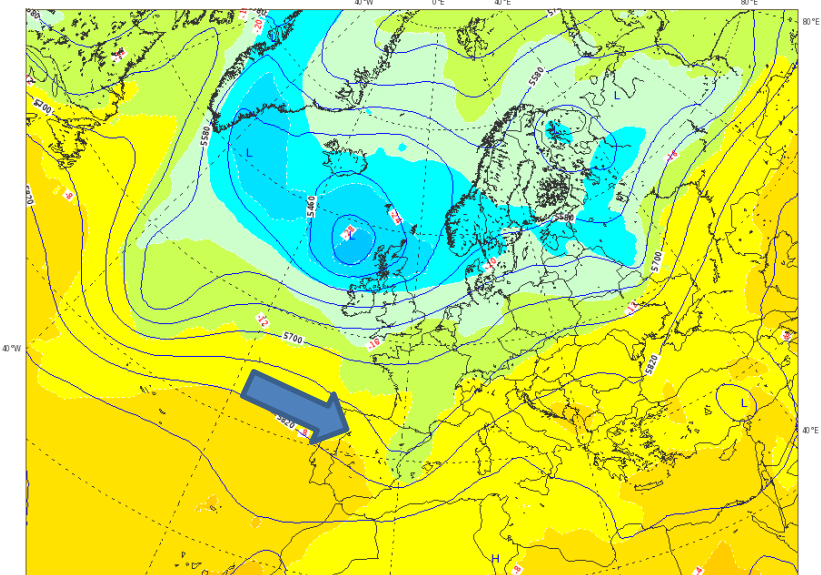




ECMWF 01 August 2015 00UTC Forecast T+6 VT: Saturday 01 August 2015 06UTC  
EUROATLANTIC - Geopotential at 500 hPa + Temperature at 500 hPa



ECMWF 01 August 2015 00UTC Forecast T+12 VT: Saturday 01 August 2015 12UTC  
EUROATLANTIC - Geopotential at 500 hPa + Temperature at 500 hPa



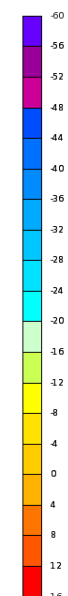
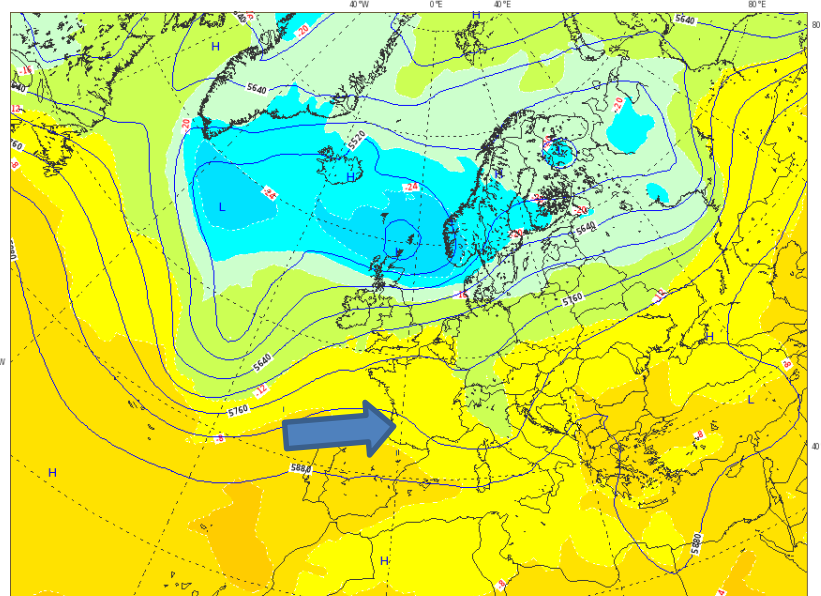
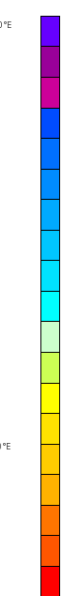
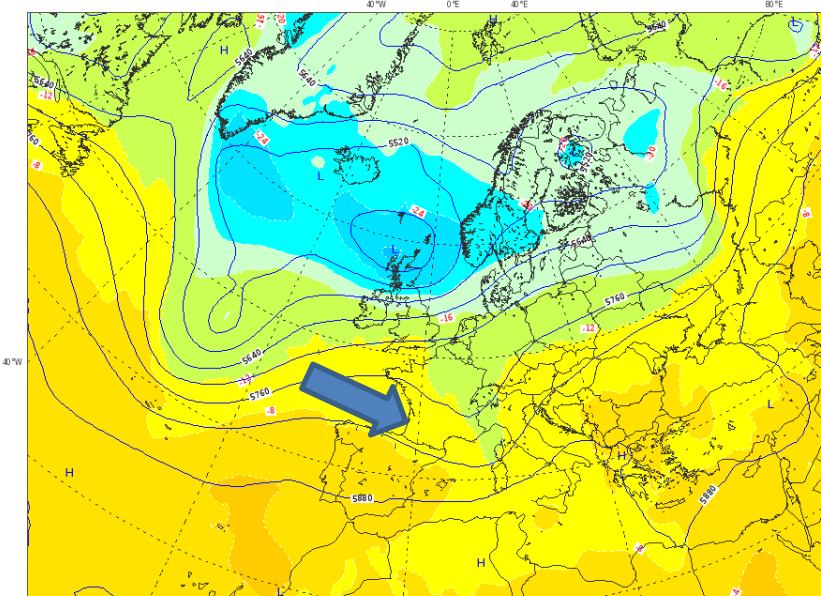
ECMWF , GM over Italy; run aug 01 00UTC, T+06- T+24



ECMWF 01 August 2015 00UTC Forecast T+18 VT: Saturday 01 August 2015 18UTC  
EUROATLANTIC - Geopotential at 500 hPa + Temperature at 500 hPa



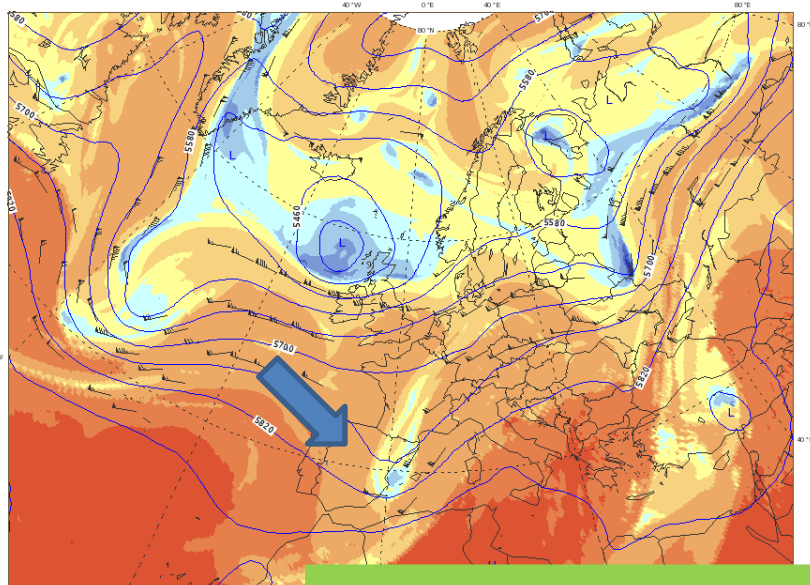
ECMWF 01 August 2015 00UTC Forecast T+24 VT: Sunday 02 August 2015 00UTC  
EUROATLANTIC - Geopotential at 500 hPa + Temperature at 500 hPa



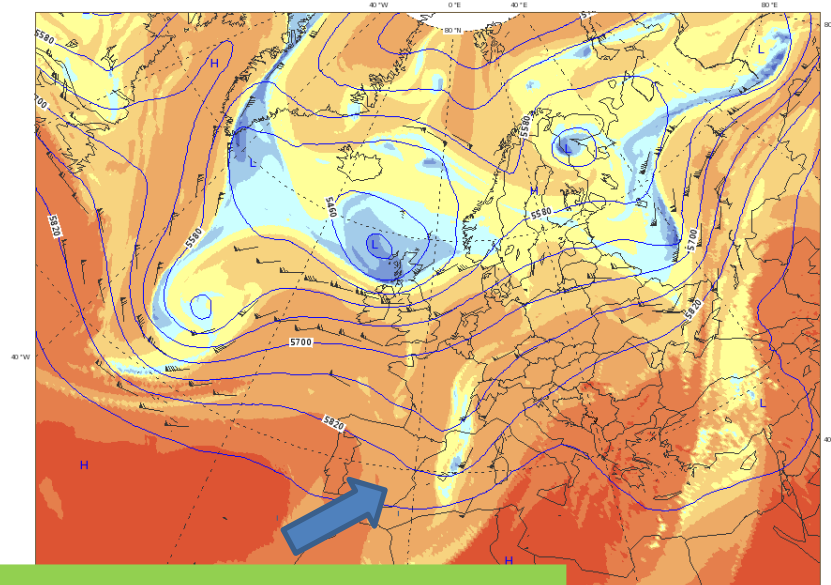




ECMWF 01 August 2015 00UTC Forecast T+6 VT: Saturday 01 August 2015 06UTC  
EUROATLANTIC - Dynamic tropopause (dam geop)  
Wind 300 hPa + Geopotential 500 hPa



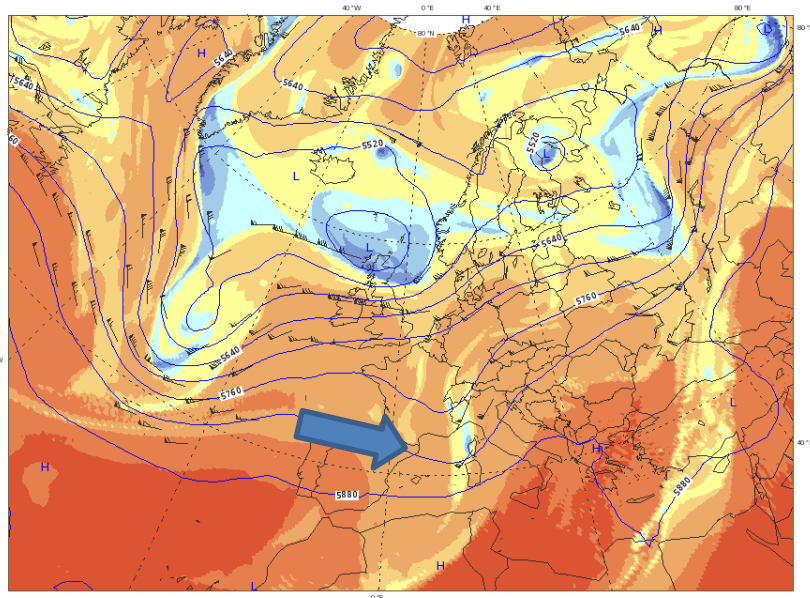
ECMWF 01 August 2015 00UTC Forecast T+12 VT: Saturday 01 August 2015 12UTC  
EUROATLANTIC - Dynamic tropopause (dam geop)  
Wind 300 hPa + Geopotential 500 hPa



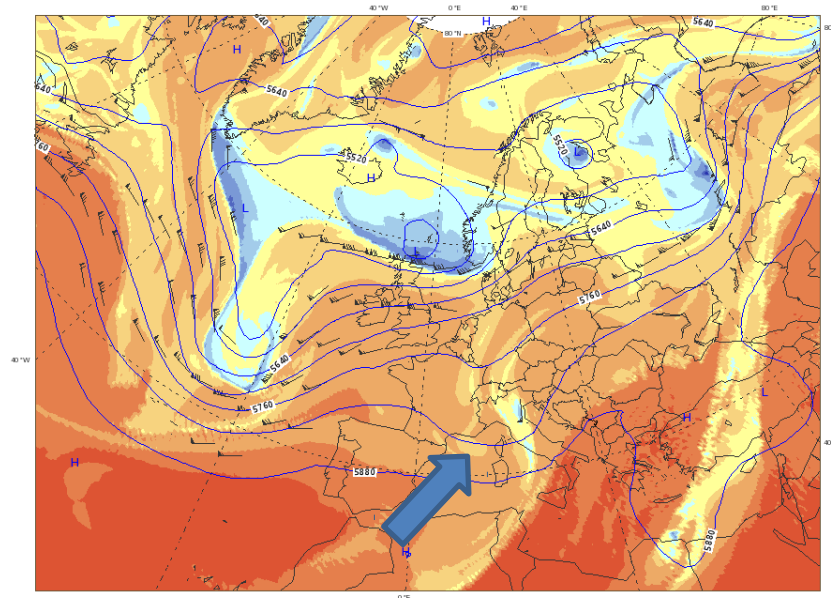
ECMWF , GM over Italy; run aug 01 00UTC, T+06- T+24



ECMWF 01 August 2015 00UTC Forecast T+18 VT: Saturday 01 August 2015 18UTC  
EUROATLANTIC - Dynamic tropopause (dam geop)  
Wind 300 hPa + Geopotential 500 hPa



ECMWF 01 August 2015 00UTC Forecast T+24 VT: Sunday 02 August 2015 00UTC  
EUROATLANTIC - Dynamic tropopause (dam geop)  
Wind 300 hPa + Geopotential 500 hPa

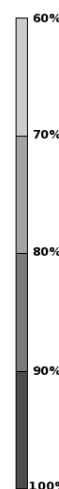
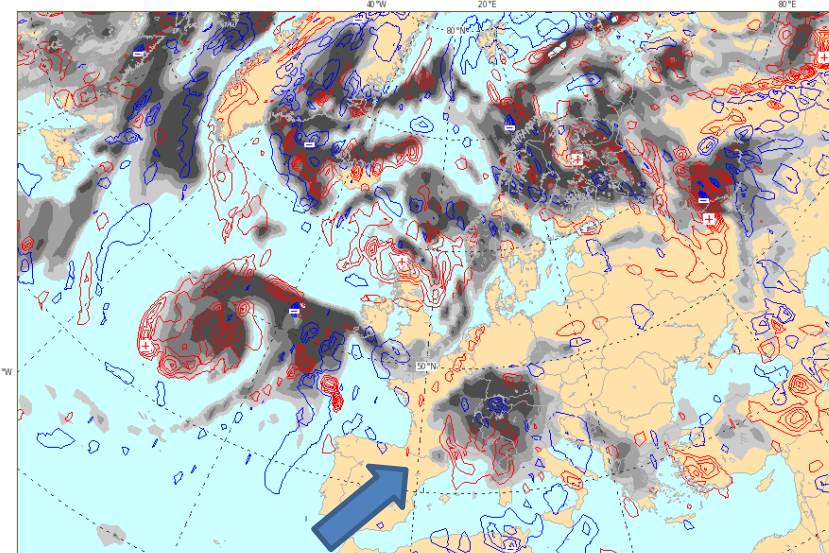
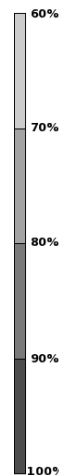
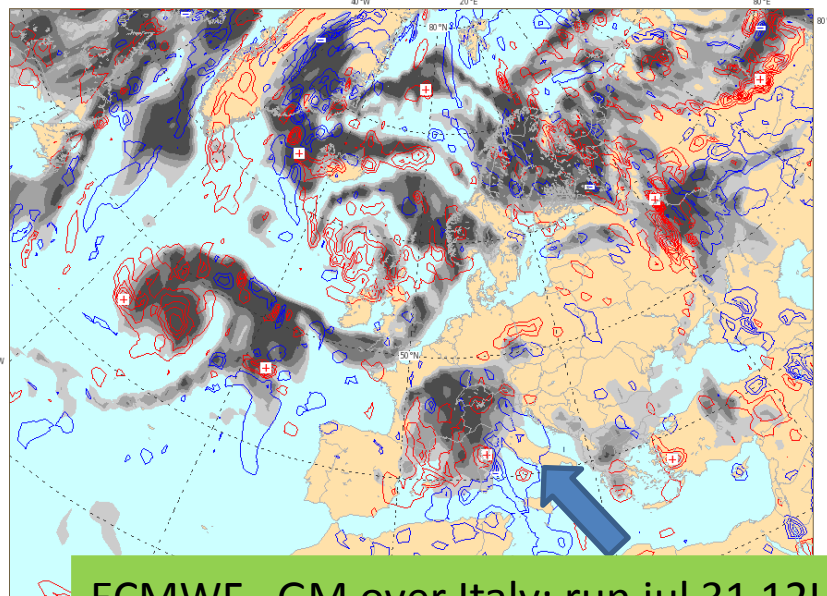




ECMWF 31 July 2015 00UTC Forecast T+36 VT: Saturday 01 August 2015 12UTC  
EUROATLANTIC - Relative Humidity at 700 hPa + Vorticity at 500 hPa



ECMWF 31 July 2015 00UTC Forecast T+42 VT: Saturday 01 August 2015 18UTC  
EUROATLANTIC - Relative Humidity at 700 hPa + Vorticity at 500 hPa



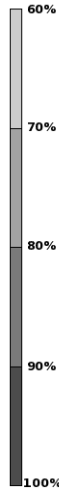
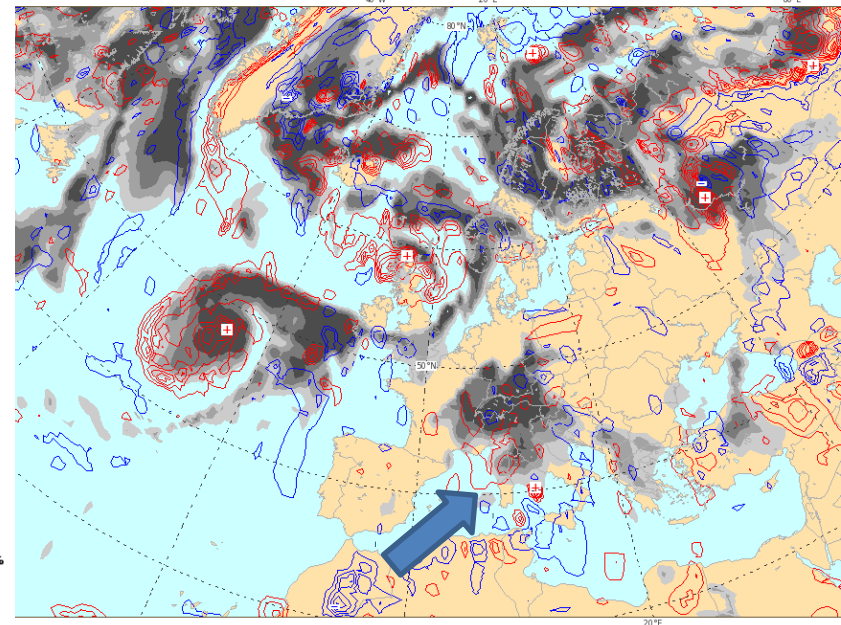
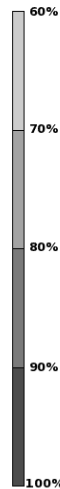
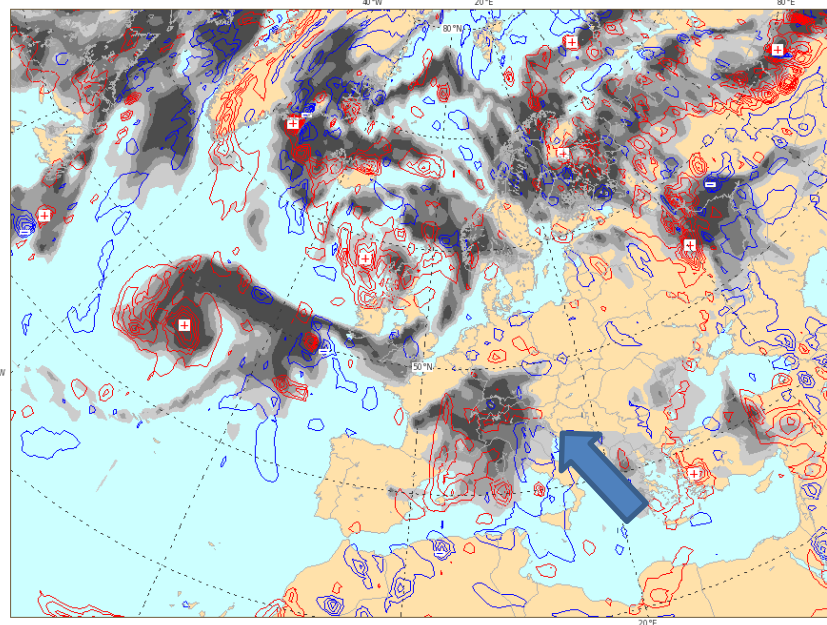
ECMWF , GM over Italy; run jul 31 12UTC, T+36- T+42; aug 01 00UTC, T+12- T+18



ECMWF 01 August 2015 00UTC Forecast T+12 VT: Saturday 01 August 2015 12UTC  
EUROATLANTIC - Relative Humidity at 700 hPa + Vorticity at 500 hPa

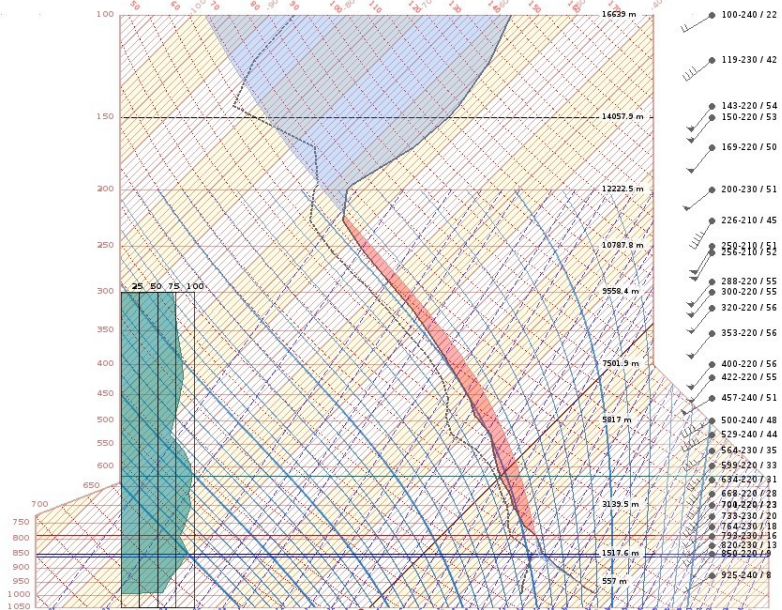


ECMWF 01 August 2015 00UTC Forecast T+18 VT: Saturday 01 August 2015 18UTC  
EUROATLANTIC - Relative Humidity at 700 hPa + Vorticity at 500 hPa





Ref. Model: COSMO-ME Title: 172578 Model Site: 43.806,11.212  
 Run Model: 2015-08-01 12:00:00 VT: 01/08/2015 16:00 (+004) +Terrain: 100%  
 Ref. TZone: GMT Alt. Corr.: off +Elevation: 144.25 m



#### Special levels and indexes of vertical profile:

FZL: 4060 m (624 hPa)  
 LCL: 1411 m (860 hPa)  
 LFC: 2129 m (789 hPa)  
 CCL: 1534 m (849 hPa)  
 TPL: 14058 m (1150 hPa)  
 EL: 11590 m (221 hPa)  
 TC: 29 °C  
 CAPE: 689 J/Kg  
 CINH: -22 J/Kg

#### Stability indexes:

KO: 9999  
 LT: 9999  
 WHITING: 29.9  
 SHOWALTER: -23  
 SWEAT: 9999

#### Ice and Turbulence:

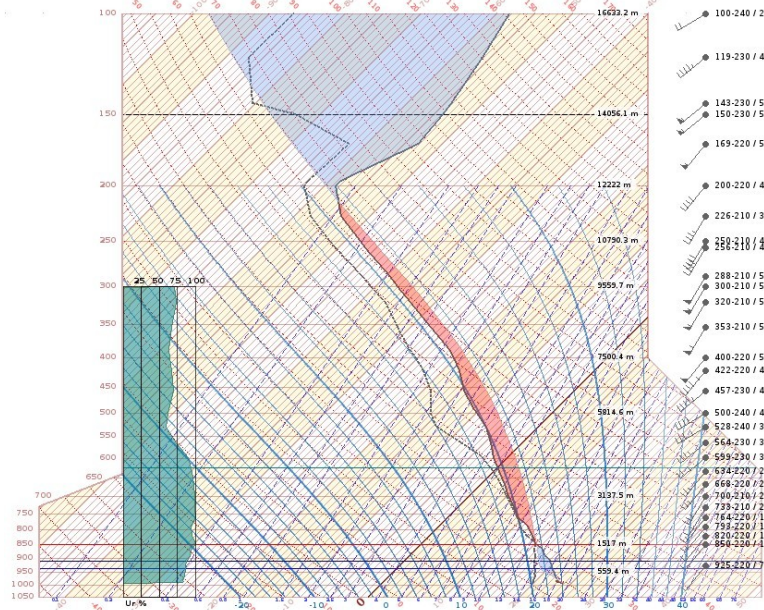
##### Ice:

high prob  
 Between 4060 m (13316 ft)  
 and 5817 m (19080 ft)

##### Turbulence:

Ground: NIL

Ref. Model: COSMO-ME Title: 172578 Model Site: 43.806,11.212  
 Run Model: 2015-08-01 12:00:00 VT: 01/08/2015 17:00 (+005) +Terrain: 100%  
 Ref. TZone: GMT Alt. Corr.: off +Elevation: 144.25 m



#### Special levels and indexes of vertical profile:

FZL: 4072 m (623 hPa)  
 LCL: 666 m (937 hPa)  
 LFC: 1525 m (849 hPa)  
 CCL: 1026 m (908 hPa)  
 TPL: 14056 m (1150 hPa)  
 EL: 11808 m (214 hPa)  
 TC: 27 °C  
 CAPE: 770 J/Kg  
 CINH: -44 J/Kg

#### Stability indexes:

KO: 9999  
 LT: 9999  
 WHITING: 30.1  
 SHOWALTER: -23  
 SWEAT: 9999

#### Ice and Turbulence:

##### Ice:

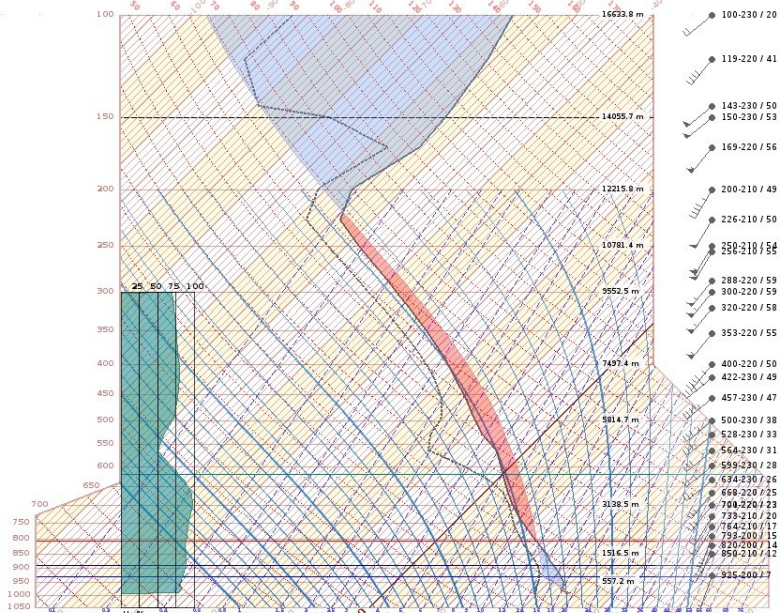
high prob  
 Between 4072 m (13357 ft)  
 and 5828 m (19114 ft)

##### Turbulence:

Ground: NIL

## CosmoMe , LM over Italy; run aug 01 12.00UTC, Th. Diagram T+04- T+08

Ref. Model: COSMO-ME Title: 172578 Model Site: 43.806,11.212  
 Run Model: 2015-08-01 12:00:00 VT: 01/08/2015 18:00 (+006) +Terrain: 100%  
 Ref. TZone: GMT Alt. Corr.: off +Elevation: 144.25 m



#### Special levels and indexes of vertical profile:

FZL: 4140 m (618 hPa)  
 LCL: 732 m (929 hPa)  
 LFC: 1936 m (808 hPa)  
 CCL: 1208 m (889 hPa)  
 TPL: 14056 m (1150 hPa)  
 EL: 11632 m (219 hPa)  
 TC: 28 °C  
 CAPE: 776 J/Kg  
 CINH: -75 J/Kg

#### Stability indexes:

KO: 9999  
 LT: 9999  
 WHITING: 30.4  
 SHOWALTER: -24  
 SWEAT: 9999

#### Ice and Turbulence:

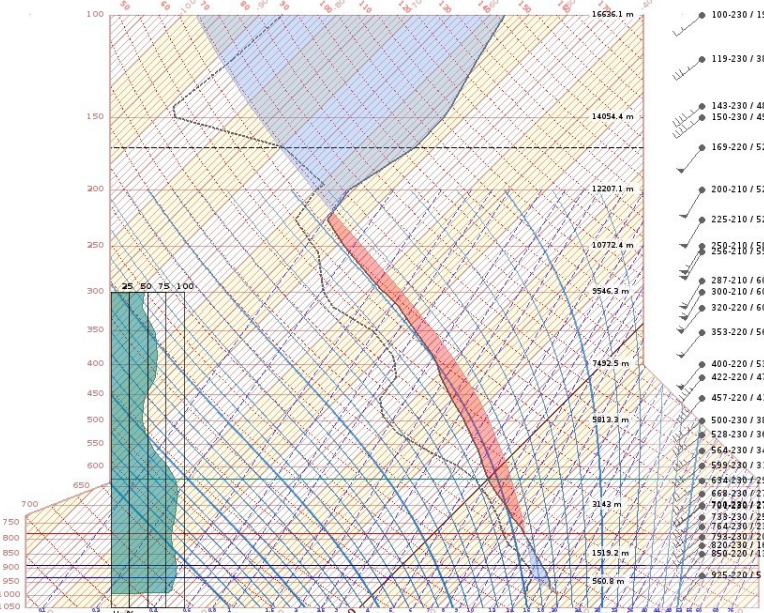
##### Ice:

high prob  
 Between 4140 m (13580 ft)  
 and 5737 m (18816 ft)

##### Turbulence:

Ground: NIL

Ref. Model: COSMO-ME Title: 172578 Model Site: 43.806,11.212  
 Run Model: 2015-08-01 12:00:00 VT: 01/08/2015 19:00 (+007) +Terrain: 100%  
 Ref. TZone: GMT Alt. Corr.: off +Elevation: 144.25 m



#### Special levels and indexes of vertical profile:

FZL: 3985 m (630 hPa)  
 LCL: 693 m (934 hPa)  
 LFC: 2196 m (783 hPa)  
 CCL: 1165 m (889 hPa)  
 TPL: 13293 m (1159 hPa)  
 EL: 11638 m (219 hPa)  
 TC: 28 °C  
 CAPE: 886 J/Kg  
 CINH: -70 J/Kg

#### Stability indexes:

KO: 9999  
 LT: 9999  
 WHITING: 30.5  
 SHOWALTER: -24  
 SWEAT: 9999

#### Ice and Turbulence:

##### Ice:

high prob  
 Between 3985 m (13072 ft)  
 and 5713 m (18738 ft)

##### Turbulence:

Ground: NIL







ECMWF 31 July 2015 00UTC Forecast T+36 VT: Saturday 01 August 2015 12UTC

Umidita` relativa 700hPa (%) + MSLP (hPa)

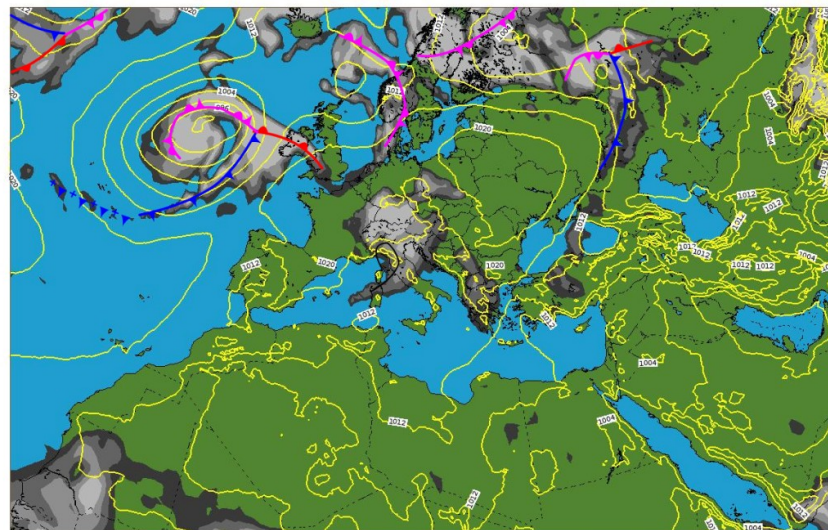


hgdcs+ 26.1 64 bit - torak2 - smman - Fri Jul 31 06:34:56 2015



ECMWF 31 July 2015 00UTC Forecast T+48 VT: Sunday 02 August 2015 00UTC

Umidita` relativa 700hPa (%) + MSLP (hPa)

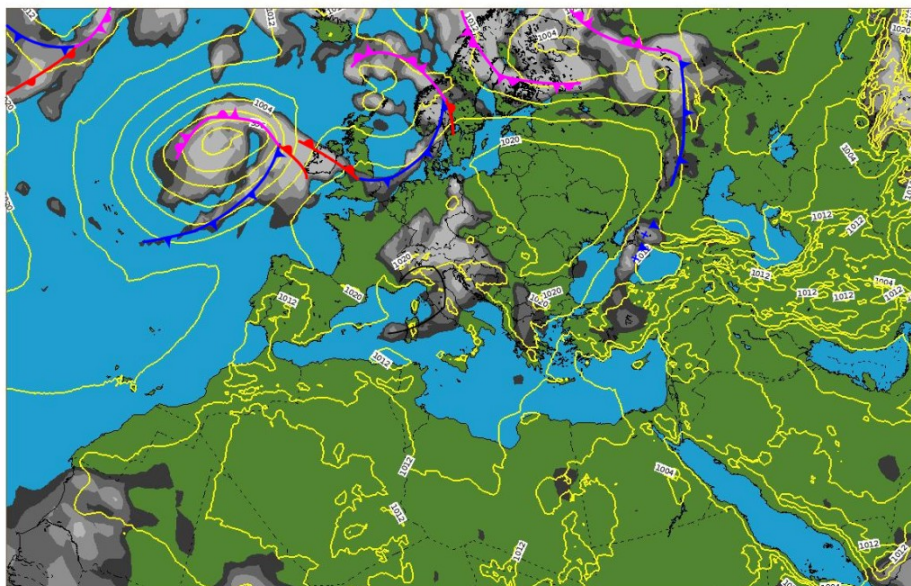


hgdcs+ 26.1 64 bit - torak2 - smman - Fri Jul 31 06:35:01 2015



ECMWF 01 August 2015 00UTC Forecast T+24 VT: Sunday 02 August 2015 00UTC

Umidita` relativa 700hPa (%) + MSLP (hPa)

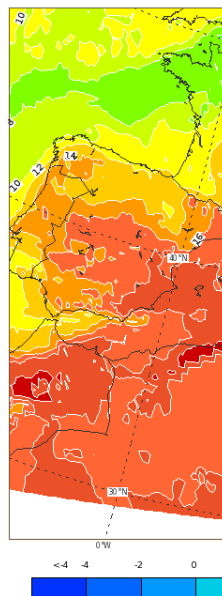


hgdcs+ 26.1 64 bit - torak2 - smman - Sat Aug 1 06:16:35 2015

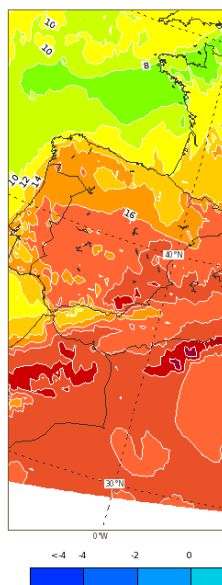
FS Maps- Fronts: run jul 31  
00UTC (T+36, T+48) and  
aug 01 00UTC (T+24)



COSMOME 01 Aug  
MEDITERRANEAN

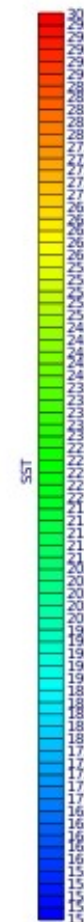
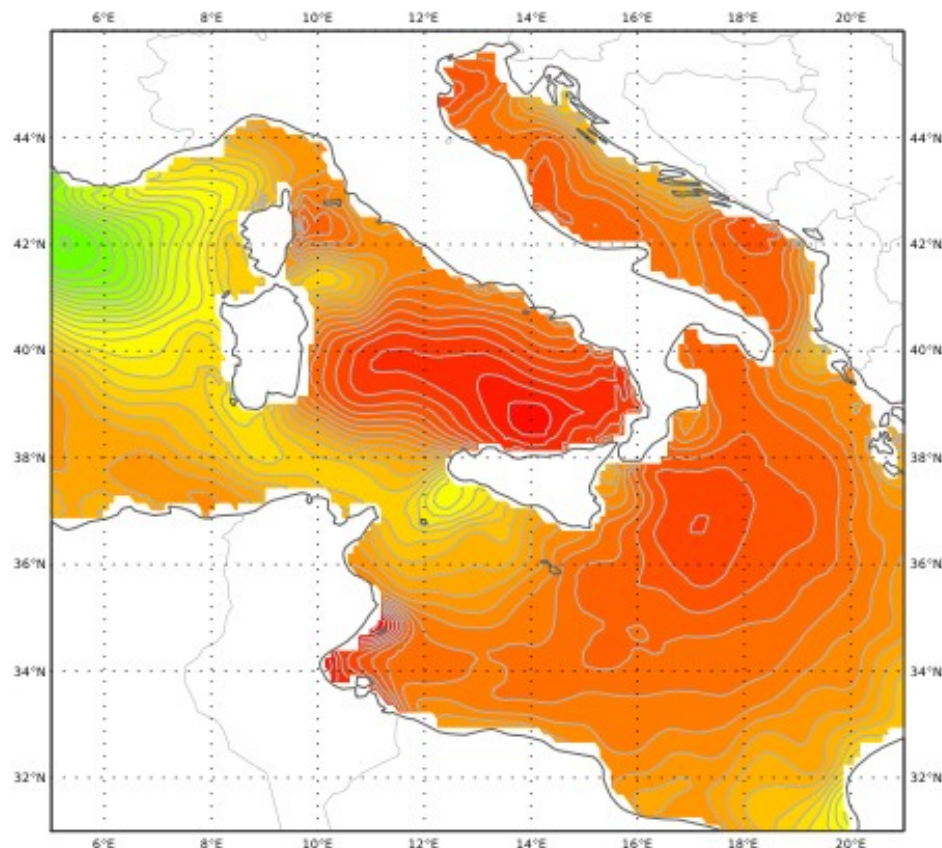


COSMOME 01 Aug  
MEDITERRANEAN

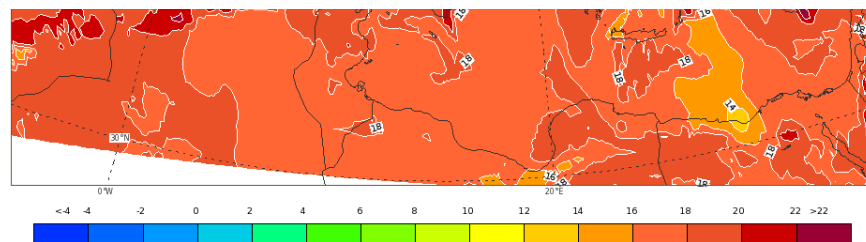


## Sea Surface Temperature - Op Analysis (ECMWF)

Year = 2015 - Month = July - 3rd ten-day period

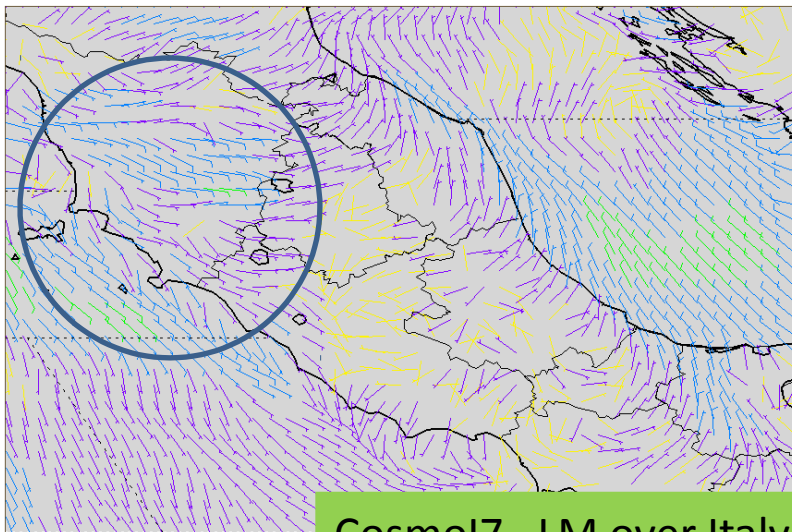


Remarkably high SST (summer 2015)

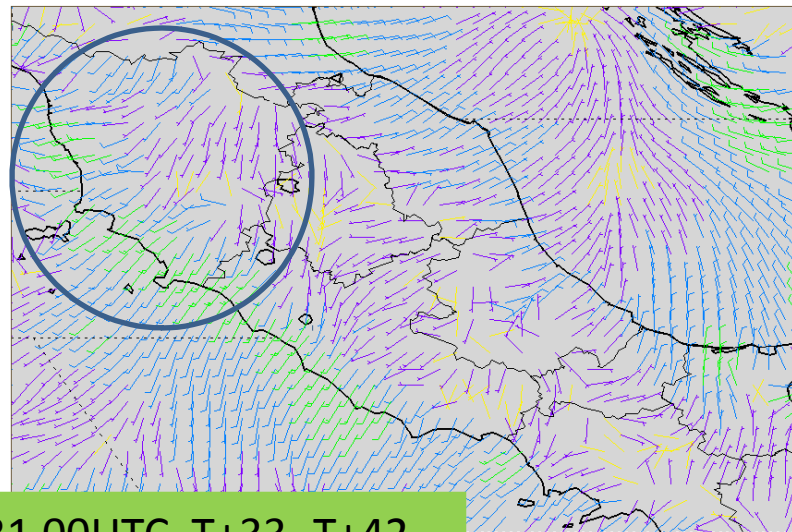




COSMOI7 31 July 2015 00UTC Forecast T+33 VT: Saturday 01 August 2015 09UTC  
ITALY CENTRE - Wind forecast at 10 m (Kts)

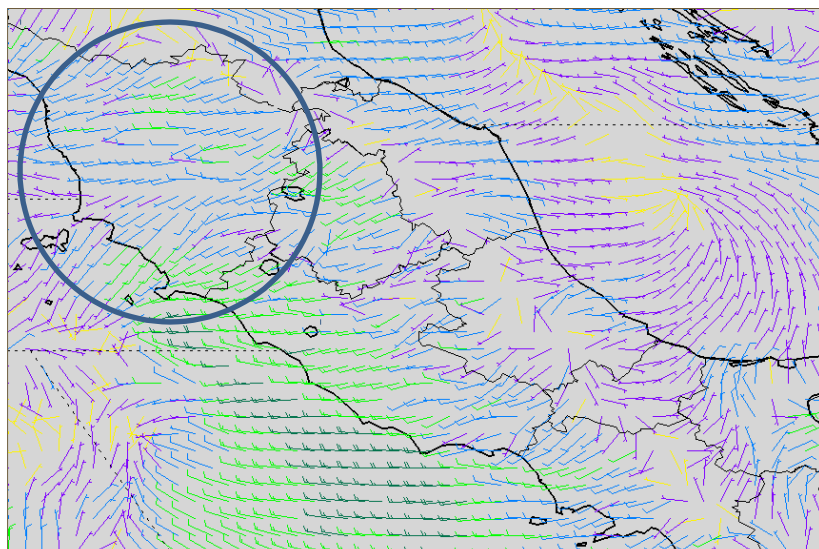


COSMOI7 31 July 2015 00UTC Forecast T+36 VT: Saturday 01 August 2015 12UTC  
ITALY CENTRE - Wind forecast at 10 m (Kts)

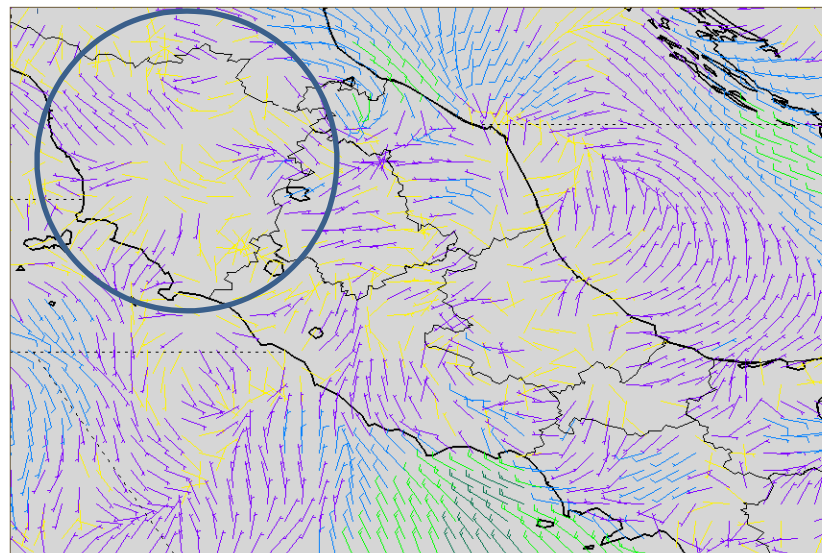


Cosmol7 , LM over Italy; run jul 31 00UTC, T+33- T+42

COSMOI7 31 July 2015 00UTC Forecast T+39 VT: Saturday 01 August 2015 15UTC  
ITALY CENTRE - Wind forecast at 10 m (Kts)



COSMOI7 31 July 2015 00UTC Forecast T+42 VT: Saturday 01 August 2015 18UTC  
ITALY CENTRE - Wind forecast at 10 m (Kts)



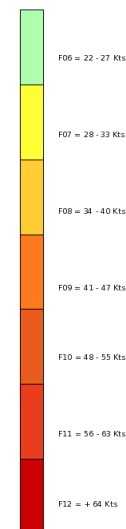
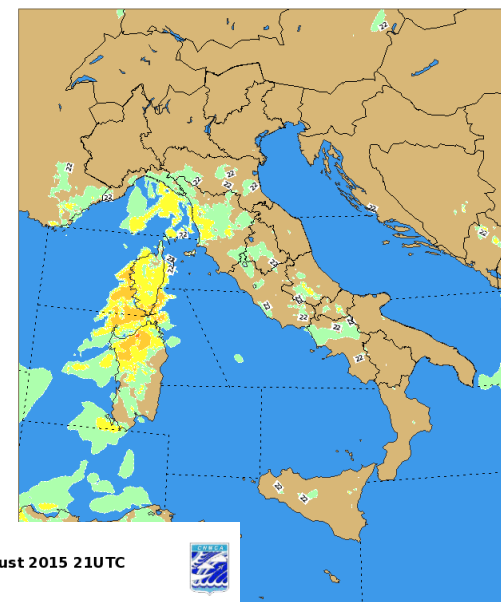
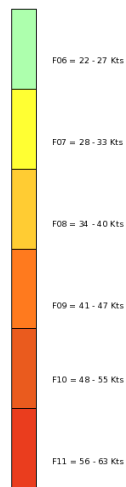
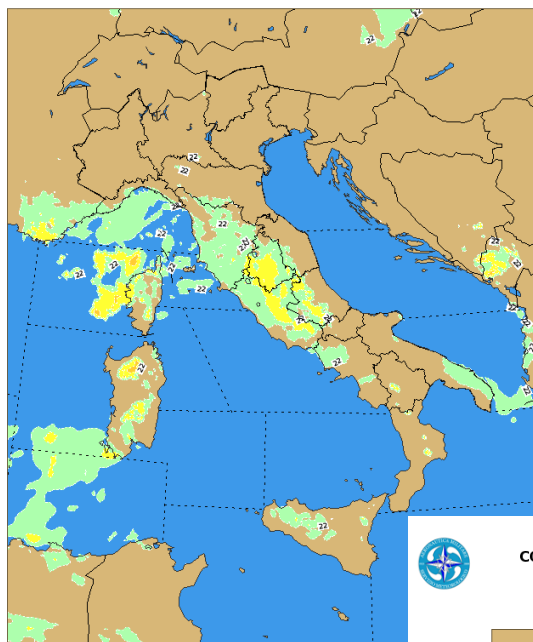




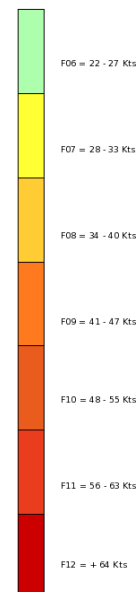
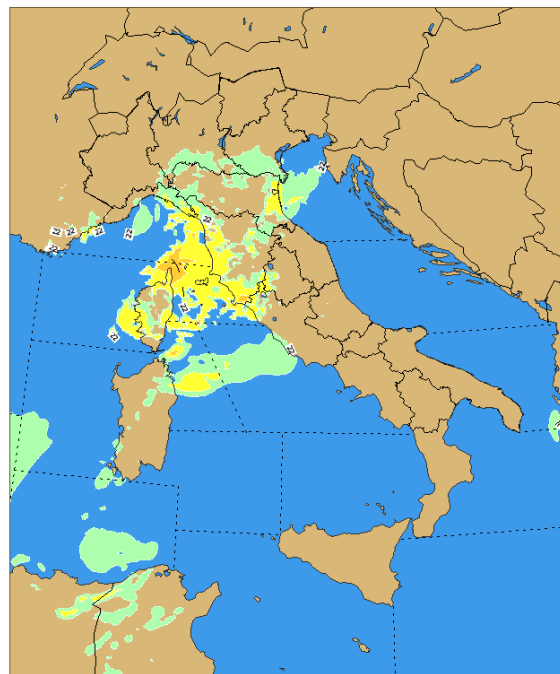
COSMOME 01 August 2015 00UTC Forecast T+15 VT: Saturday 01 August 2015 15UTC  
ITALY - 3h Maximum wind velocity (Kts)



COSMOME 01 August 2015 00UTC Forecast T+18 VT: Saturday 01 August 2015 18UTC  
ITALY - 3h Maximum wind velocity (Kts)



COSMOME 01 August 2015 00UTC Forecast T+21 VT: Saturday 01 August 2015 21UTC  
ITALY - 3h Maximum wind velocity (Kts)



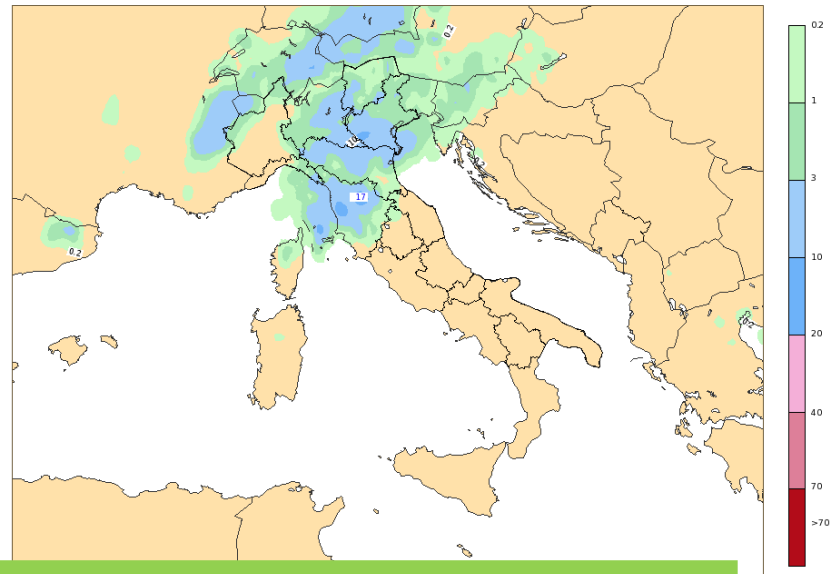
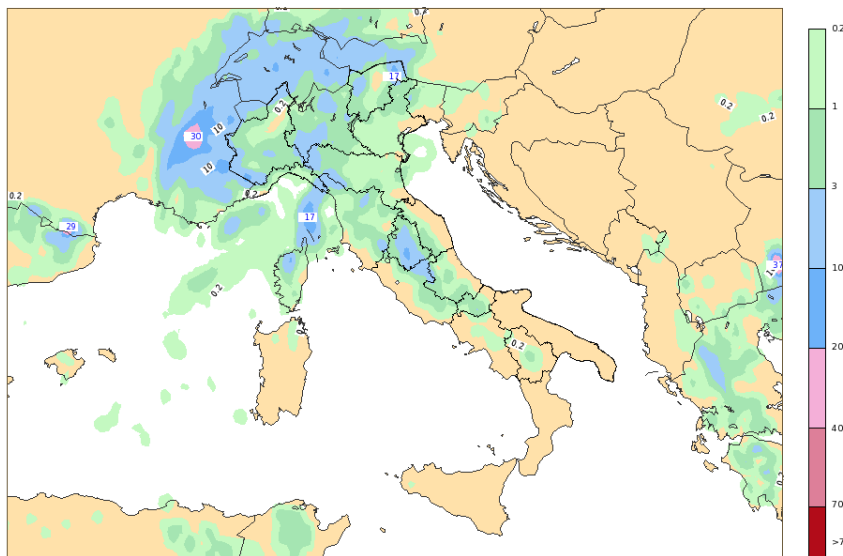
CosmoMe , LM over Italy;  
run aug 01 00UTC, T+15-  
T+21



ECMWF 31 July 2015 00UTC Forecast T+42 VT: Saturday 01 August 2015 18UTC  
ITALY - 6h accumulated precipitations (mm)



ECMWF 31 July 2015 00UTC Forecast T+48 VT: Sunday 02 August 2015 00UTC  
ITALY - 6h accumulated precipitations (mm)



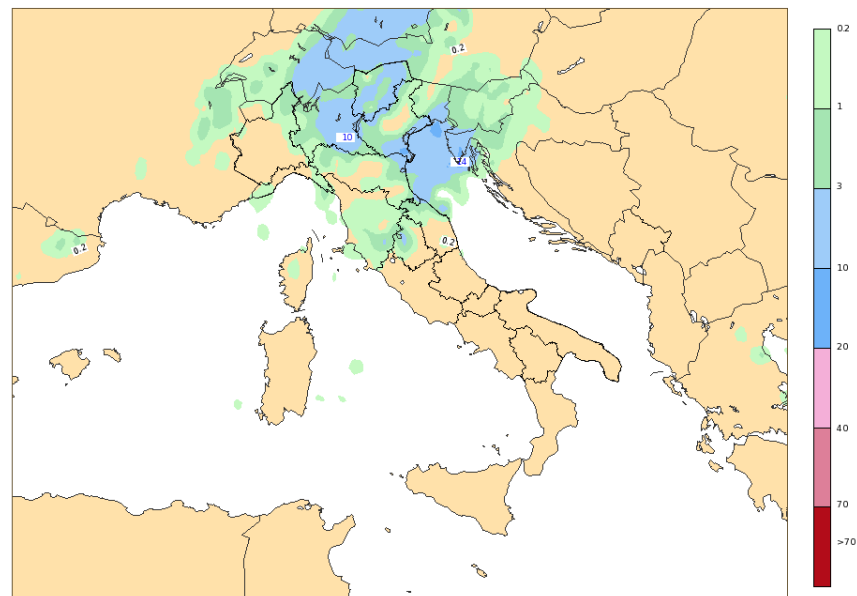
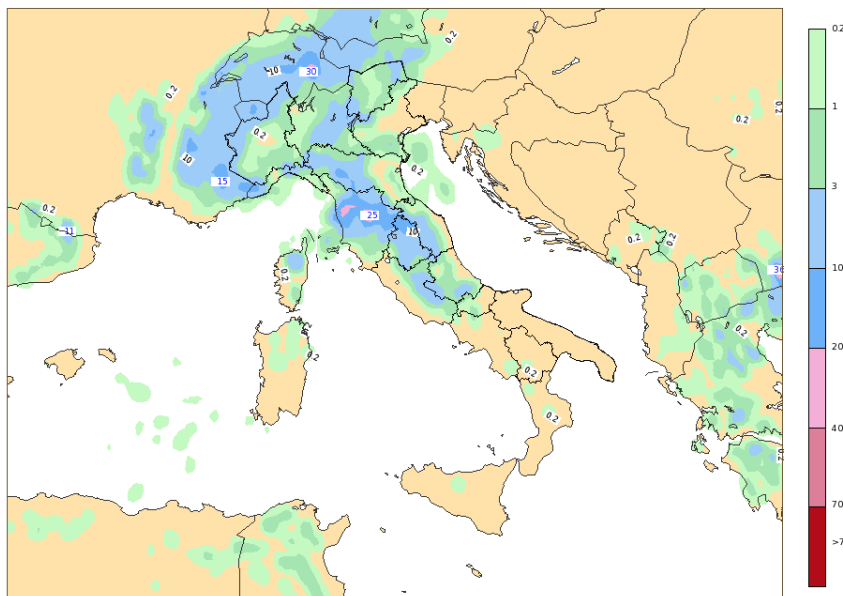
ECMWF , GM over Italy; run jul 31 00UTC, T+42- T+48; aug 01 00UTC, T+18- T+24



ECMWF 01 August 2015 00UTC Forecast T+18 VT: Saturday 01 August 2015 18UTC  
ITALY - 6h accumulated precipitations (mm)

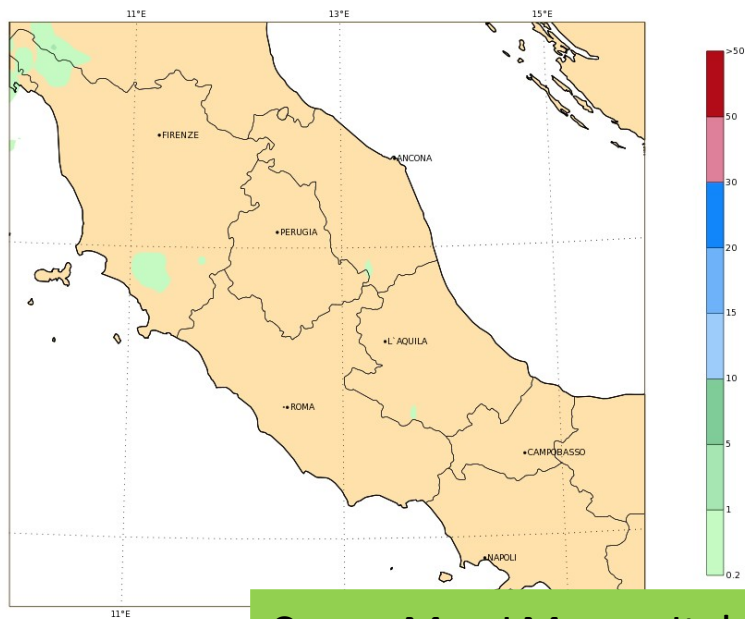


ECMWF 01 August 2015 00UTC Forecast T+24 VT: Sunday 02 August 2015 00UTC  
ITALY - 6h accumulated precipitations (mm)

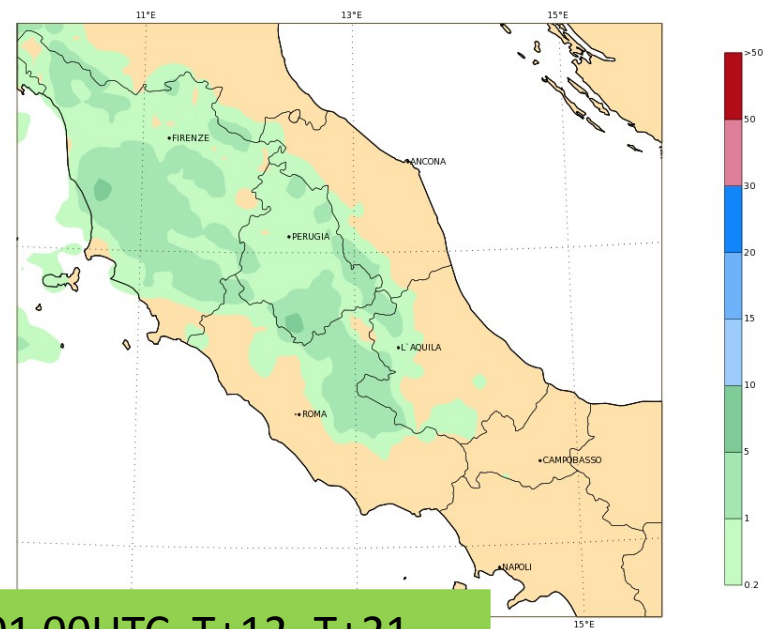




COSMOME 01 August 2015 00UTC Forecast T+12 VT: Saturday 01 August 2015 12UTC  
ITALY CENTRE - 3h accumulated precipitations (mm)



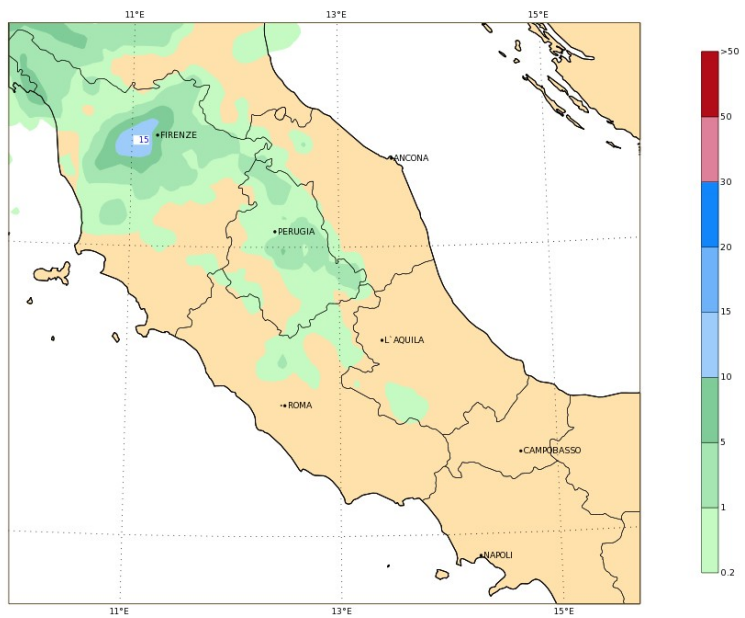
COSMOME 01 August 2015 00UTC Forecast T+15 VT: Saturday 01 August 2015 15UTC  
ITALY CENTRE - 3h accumulated precipitations (mm)



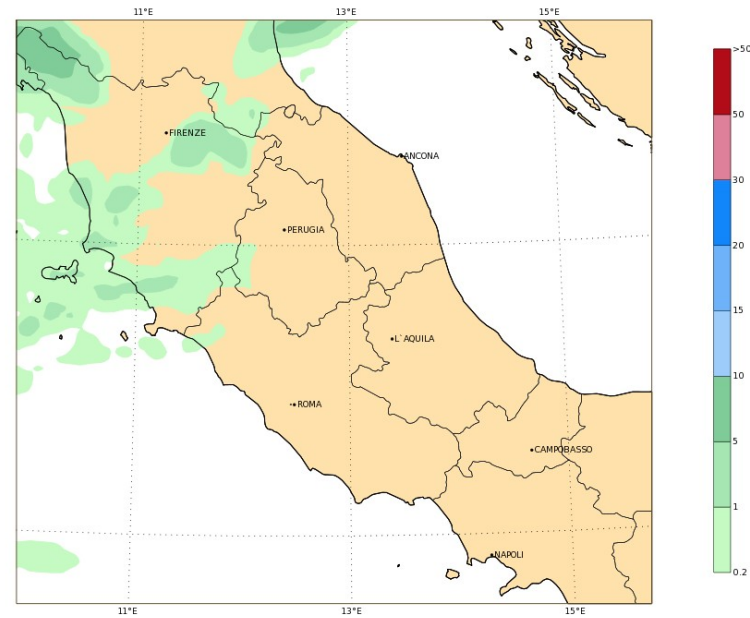
CosmoMe , LM over Italy; run aug 01 00UTC, T+12- T+21



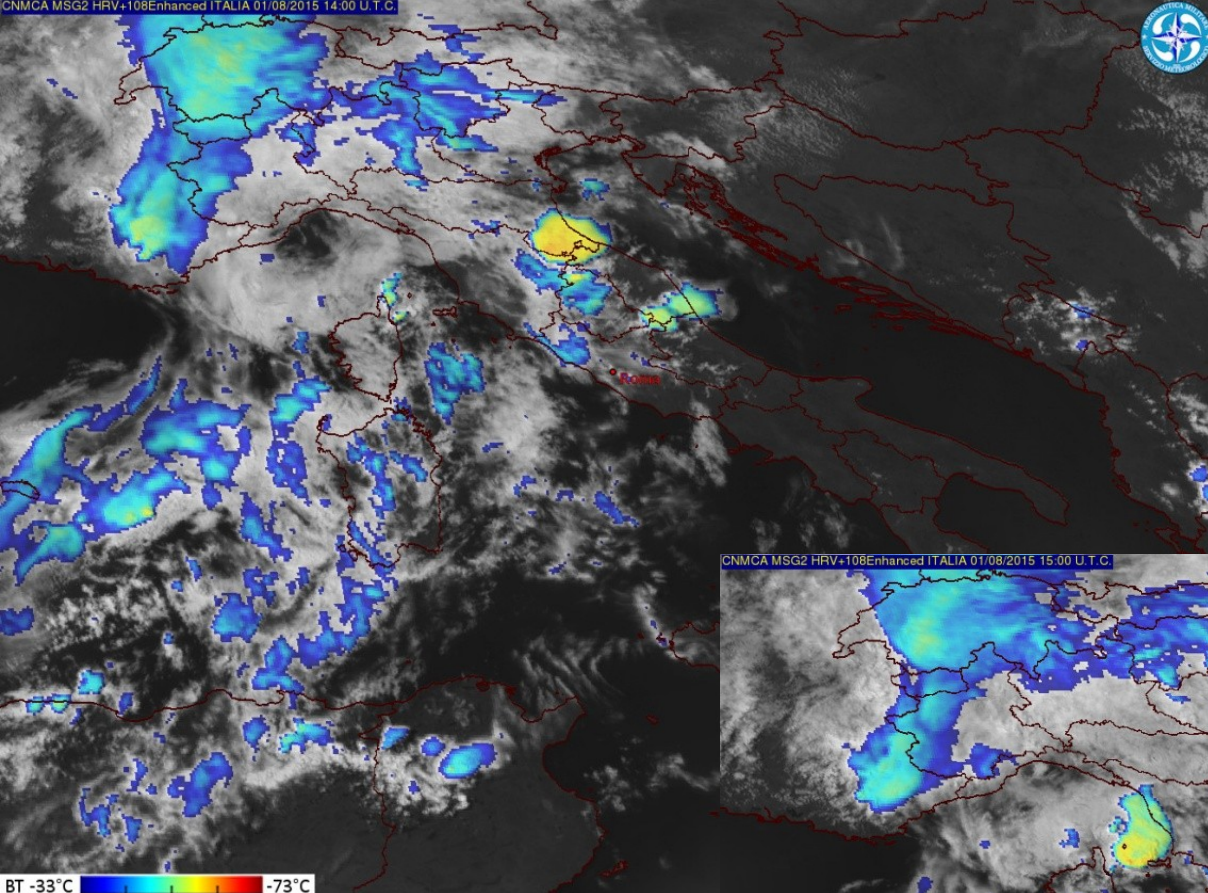
COSMOME 01 August 2015 00UTC Forecast T+18 VT: Saturday 01 August 2015 18UTC  
ITALY CENTRE - 3h accumulated precipitations (mm)



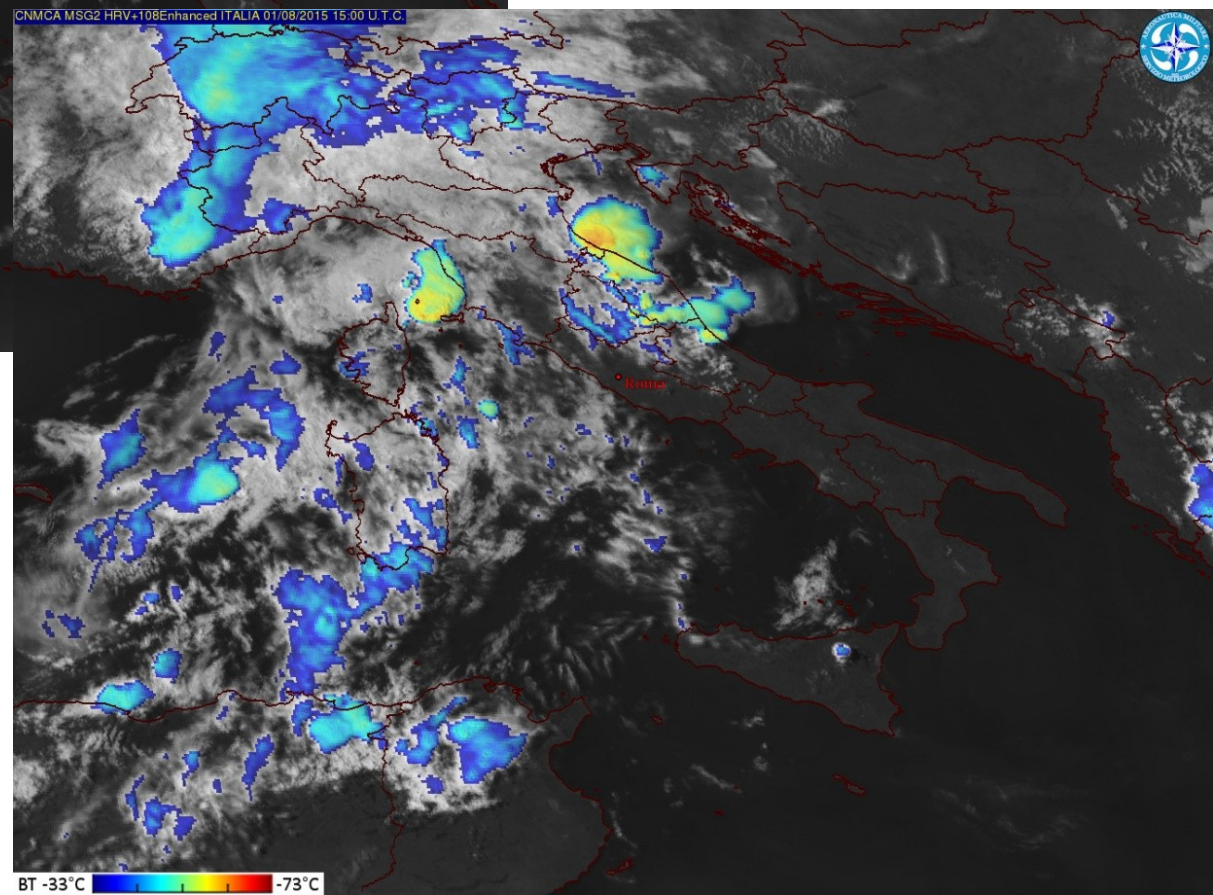
COSMOME 01 August 2015 00UTC Forecast T+21 VT: Saturday 01 August 2015 21UTC  
ITALY CENTRE - 3h accumulated precipitations (mm)



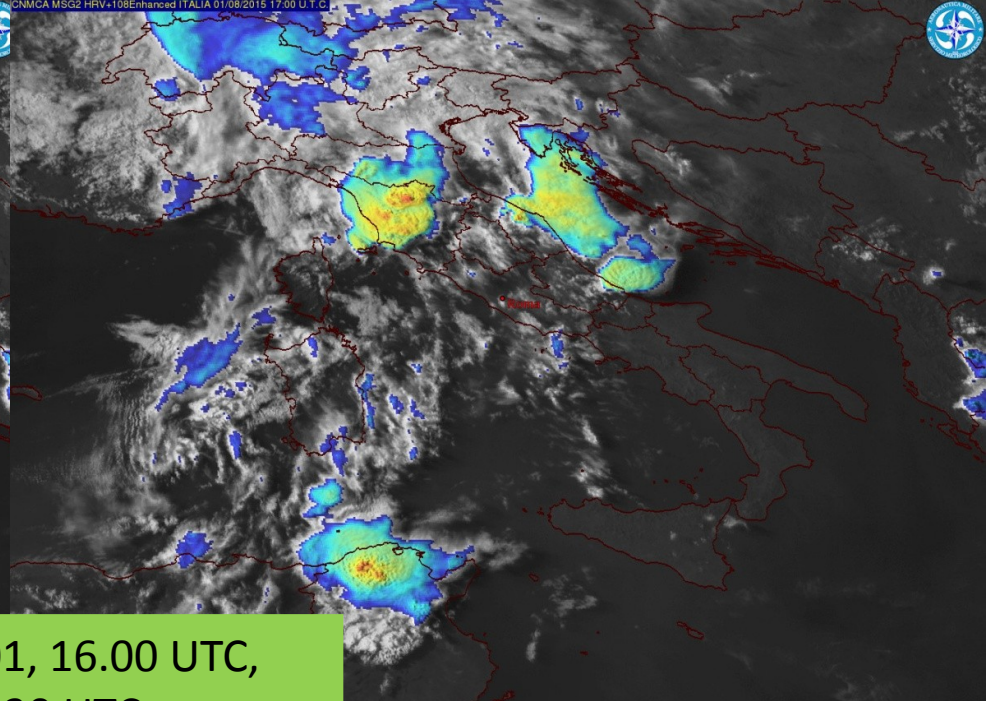
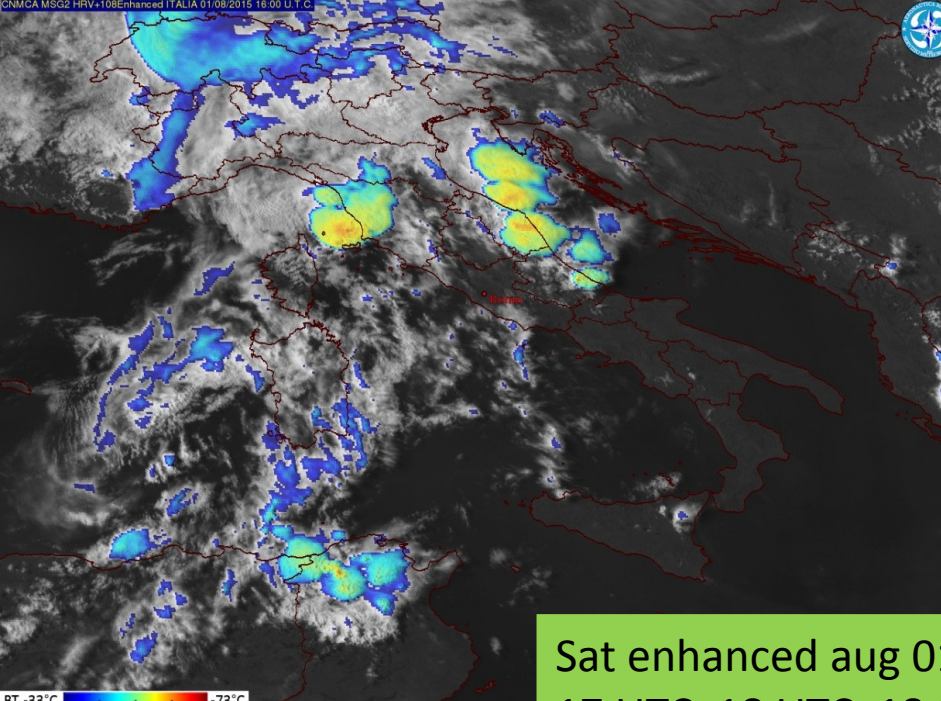




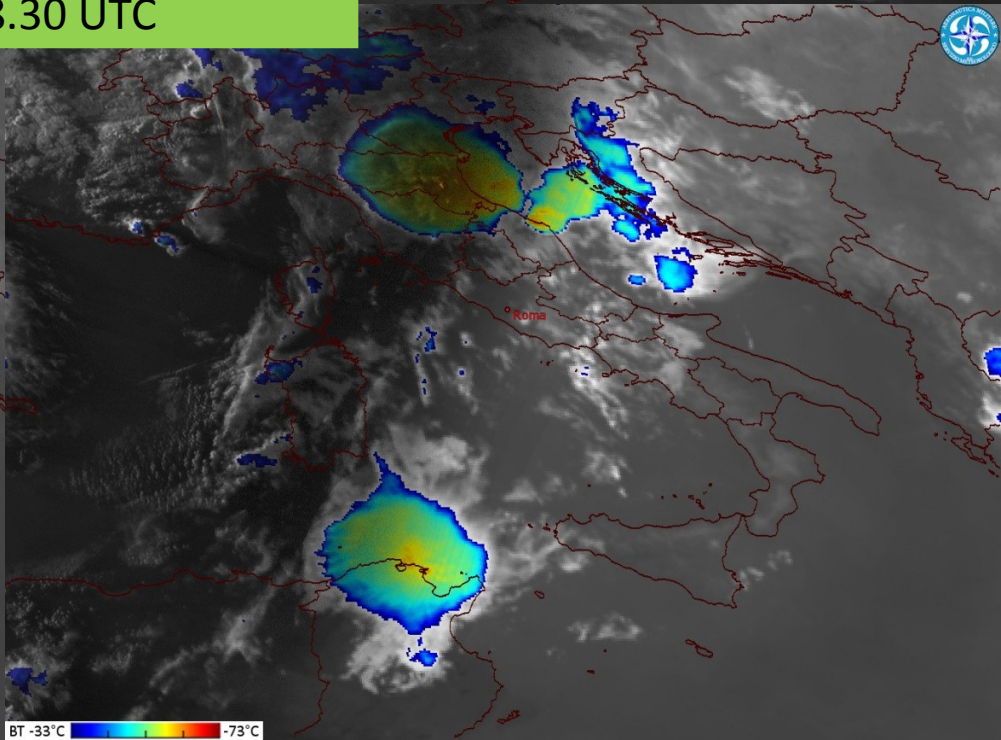
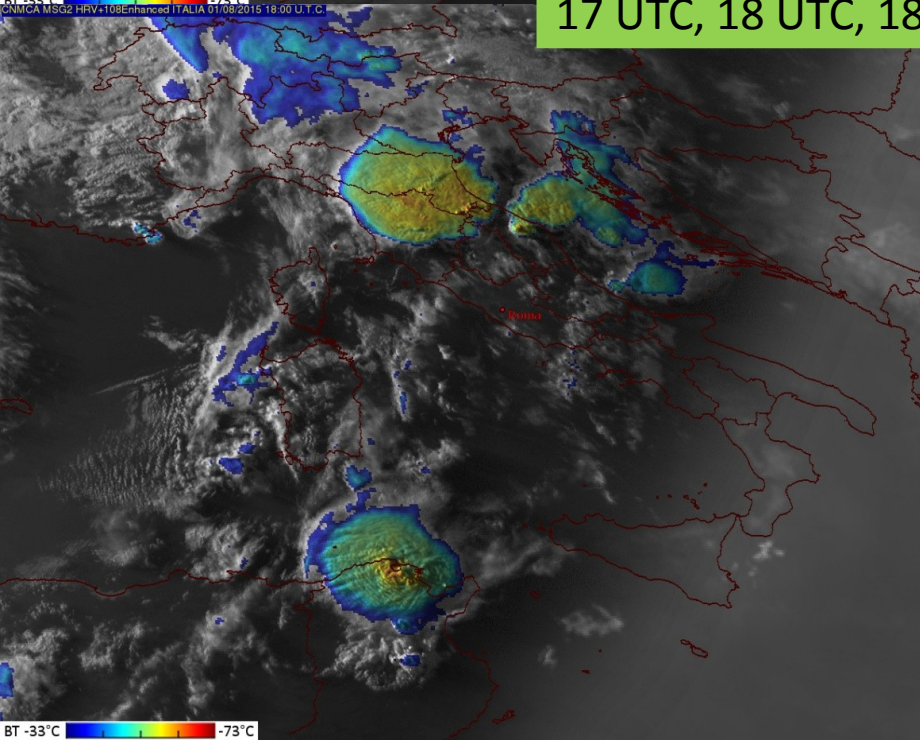
Sat enhanced aug 01,  
14.00 UTC,  
15 UTC



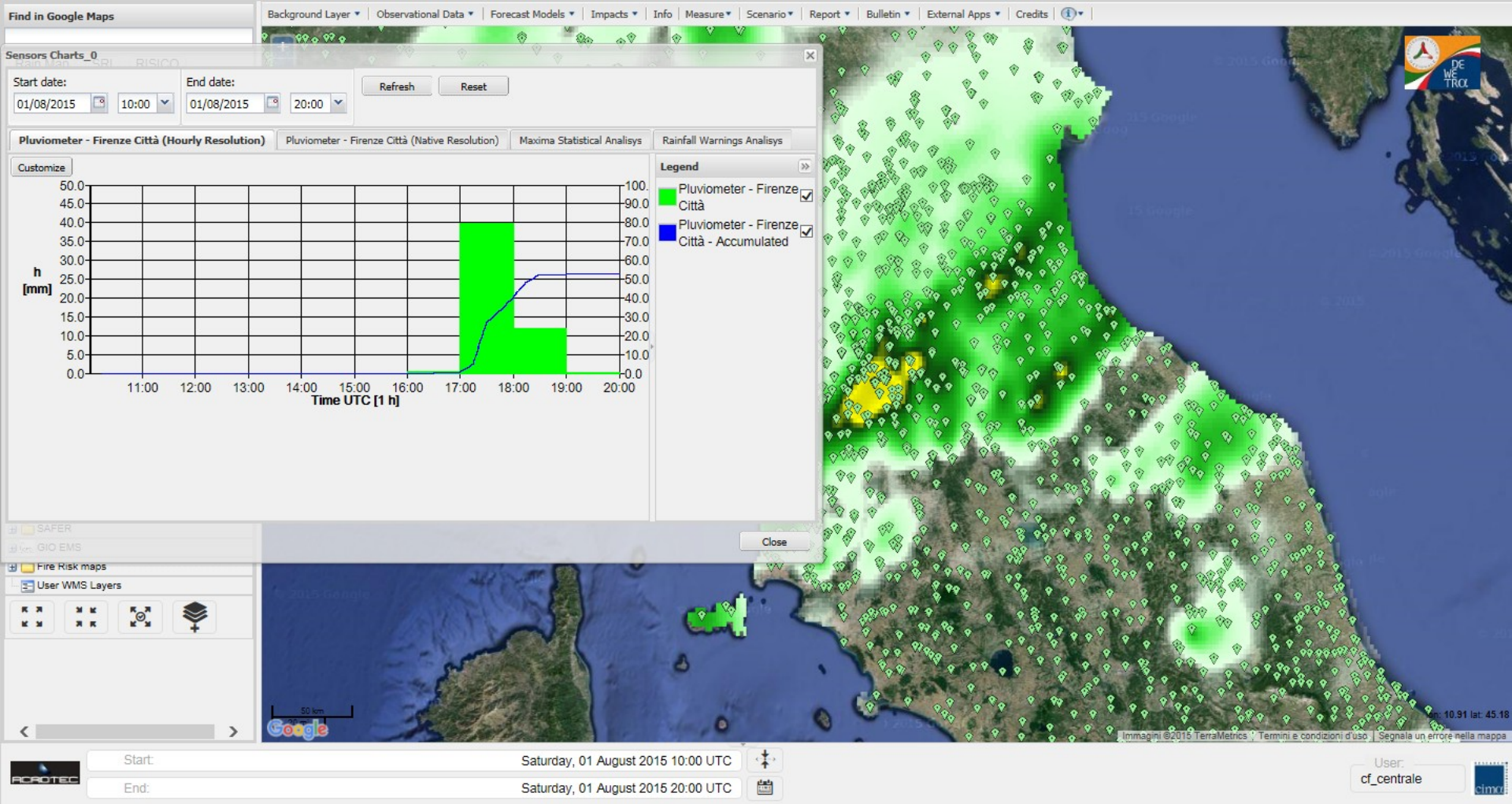




Sat enhanced aug 01, 16.00 UTC,  
17 UTC, 18 UTC, 18.30 UTC







Ground Observations: Locally 52 mm maximum recorded rate within two hours;  
city gauge (Firenze): 40 mm within 1 hour

Courtesy Civil Protection Department

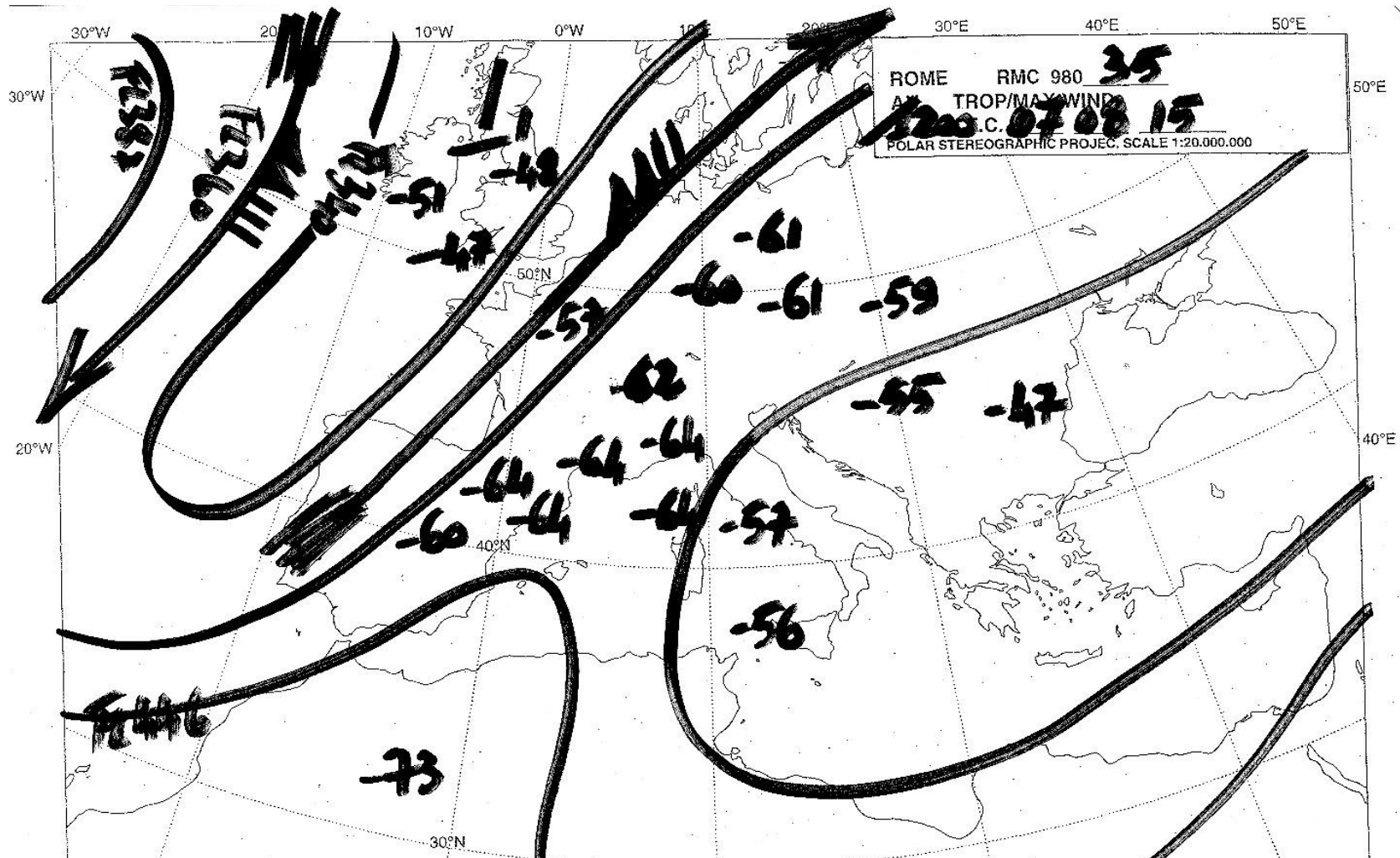
# Conclusions

1. Detected synoptic subjects: a warm front, not excessively active, within a well organized classic frontal system and a comma-like cold upper level low, being charged by the high sea temperature (SST) and umidity rate.
2. Phenomena have been not exclusively convective but kept a dynamical nature as well.
3. The rainfall has been quick, rich in amount though.
4. Possible tornado-like incidents are usually connected with such powerful summer subjects.

# An eavy Thunderstom Cluster Involves Central-Southern Italy

On last august 7th 2015 afternoon and evening, a heavy clustered thunderstom like cell occurred over Thyrranian Central-southern Italian regions as a consequence of a remarkable instability spreading over along the whole coastly area, up to Latium and Umbrian inner part.

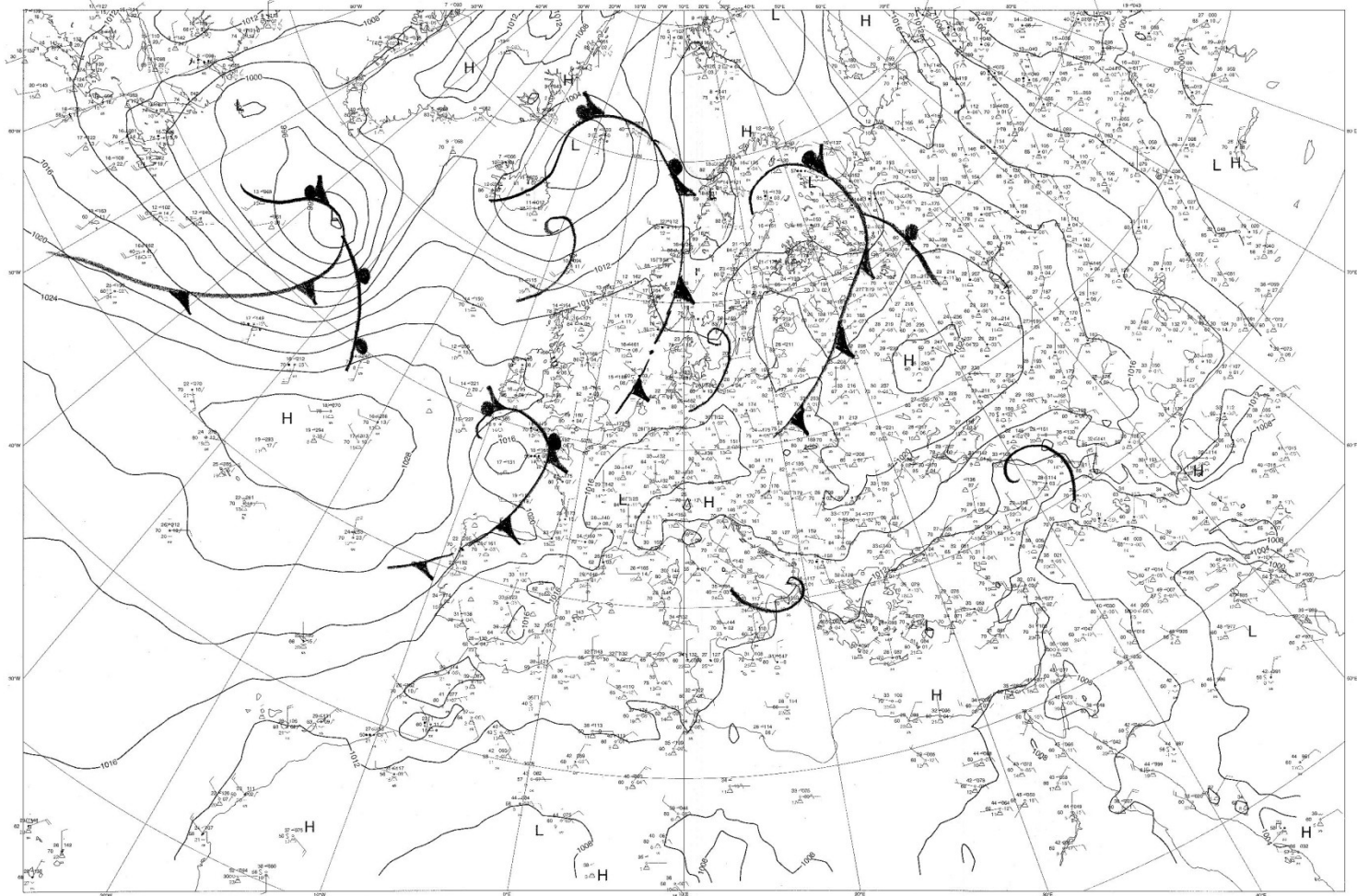




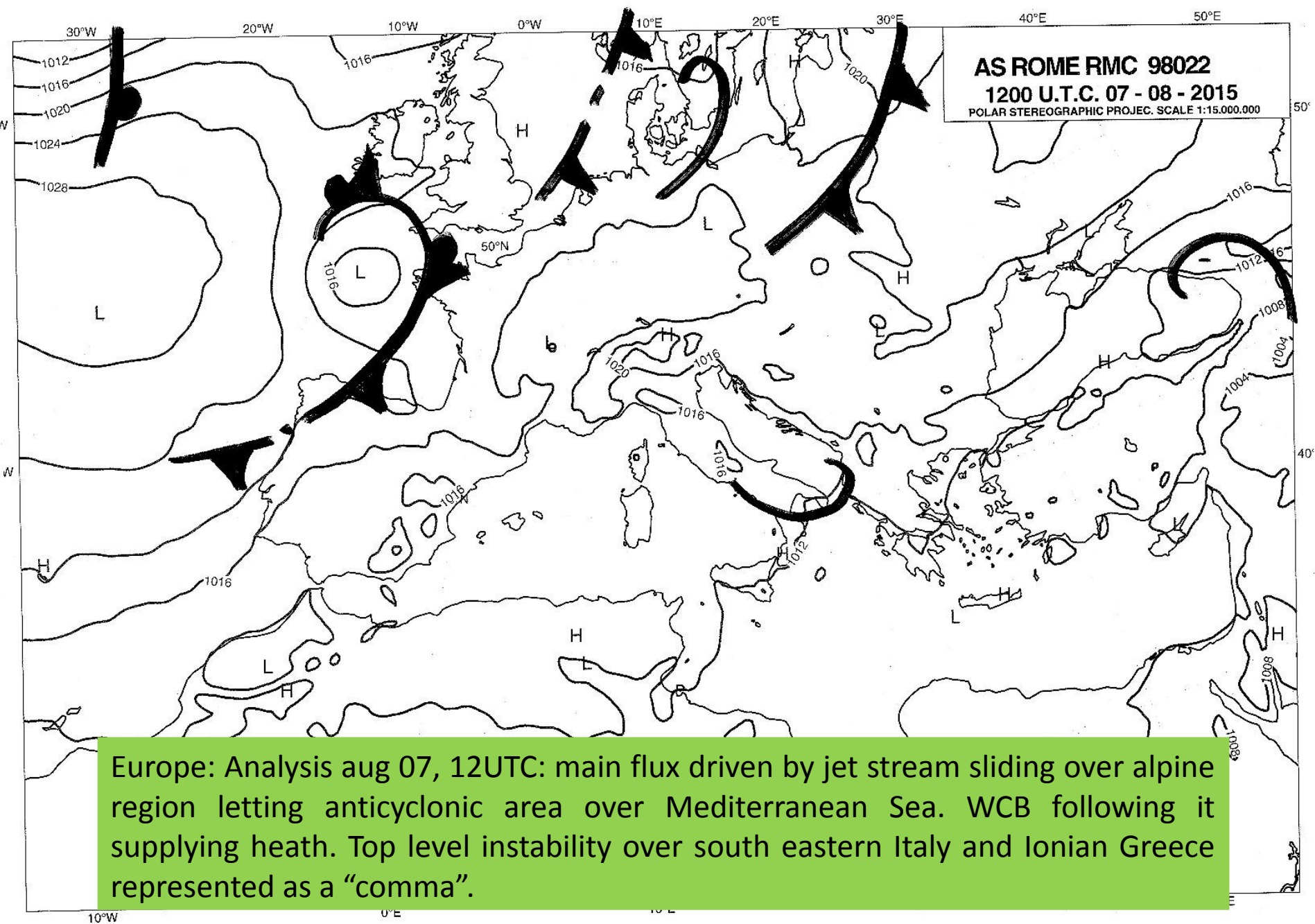
Europe: Analysis aug 07, 12UTC: thtropopause main wind (middle latitude jet stream) drawing a typical summer synoptic situation with fast high latitude circulation over continental Europe.

Europe: Analysis aug 07, 12UTC: russian thermal anticyclone determines levelled high pressure area over western Mediterranean area with relative low (1012 hPa) over central/ eastern basins. An upper level low reported.

### Carta del tempo + LTKF del 07 08 2015 12UTC





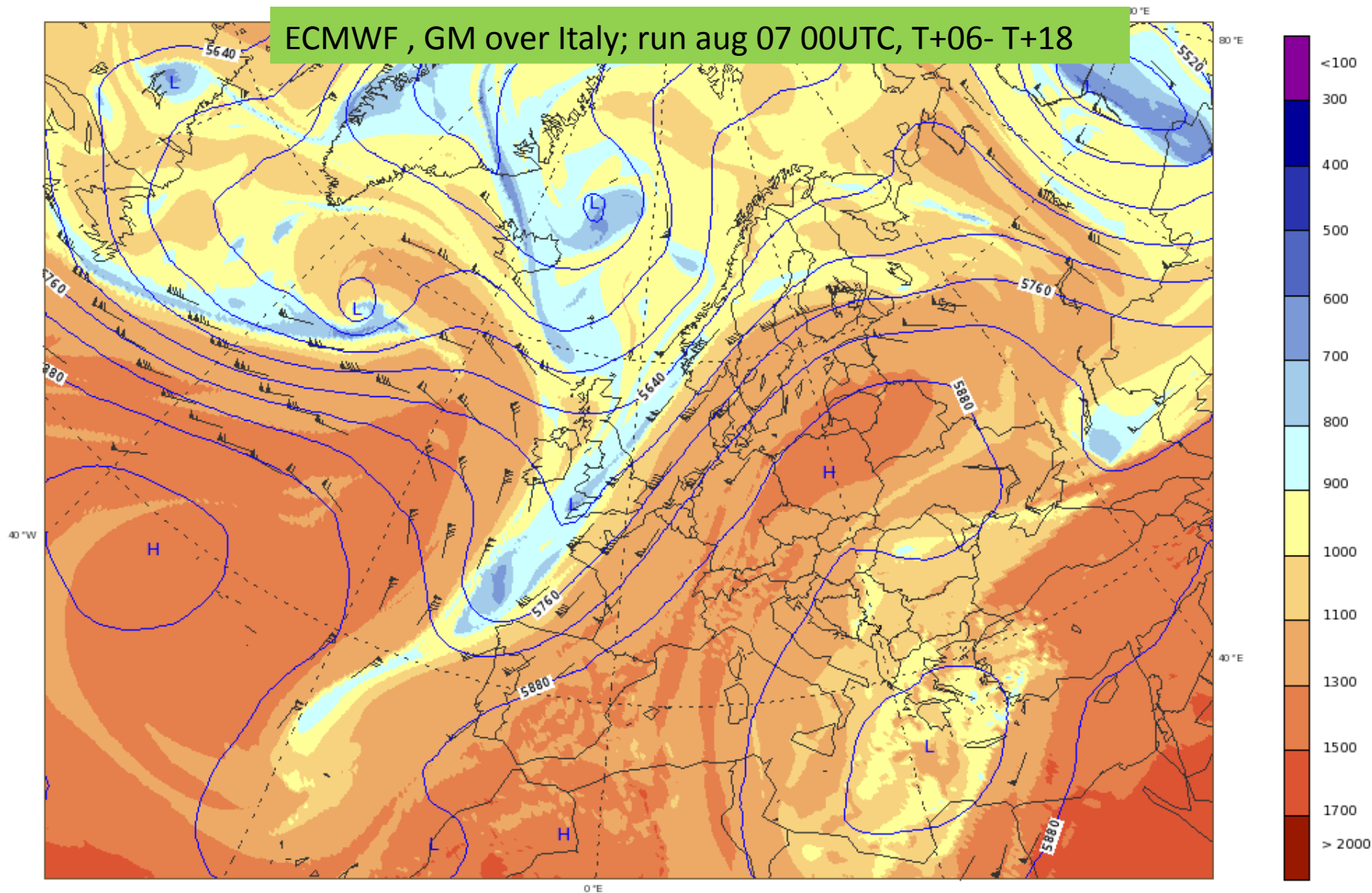




ECMWF 07 August 2015 00UTC Forecast T+18 VT: Friday 07 August 2015 18UTC  
EUROATLANTIC - Dynamic tropopause (dam geop)  
Wind 300 hPa + Geopotential 500 hPa



ECMWF , GM over Italy; run aug 07 00UTC, T+06- T+18

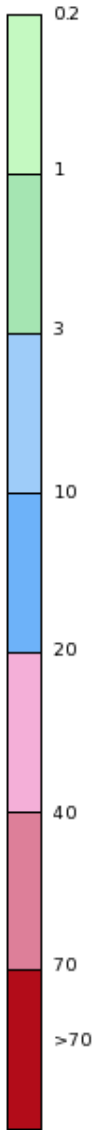
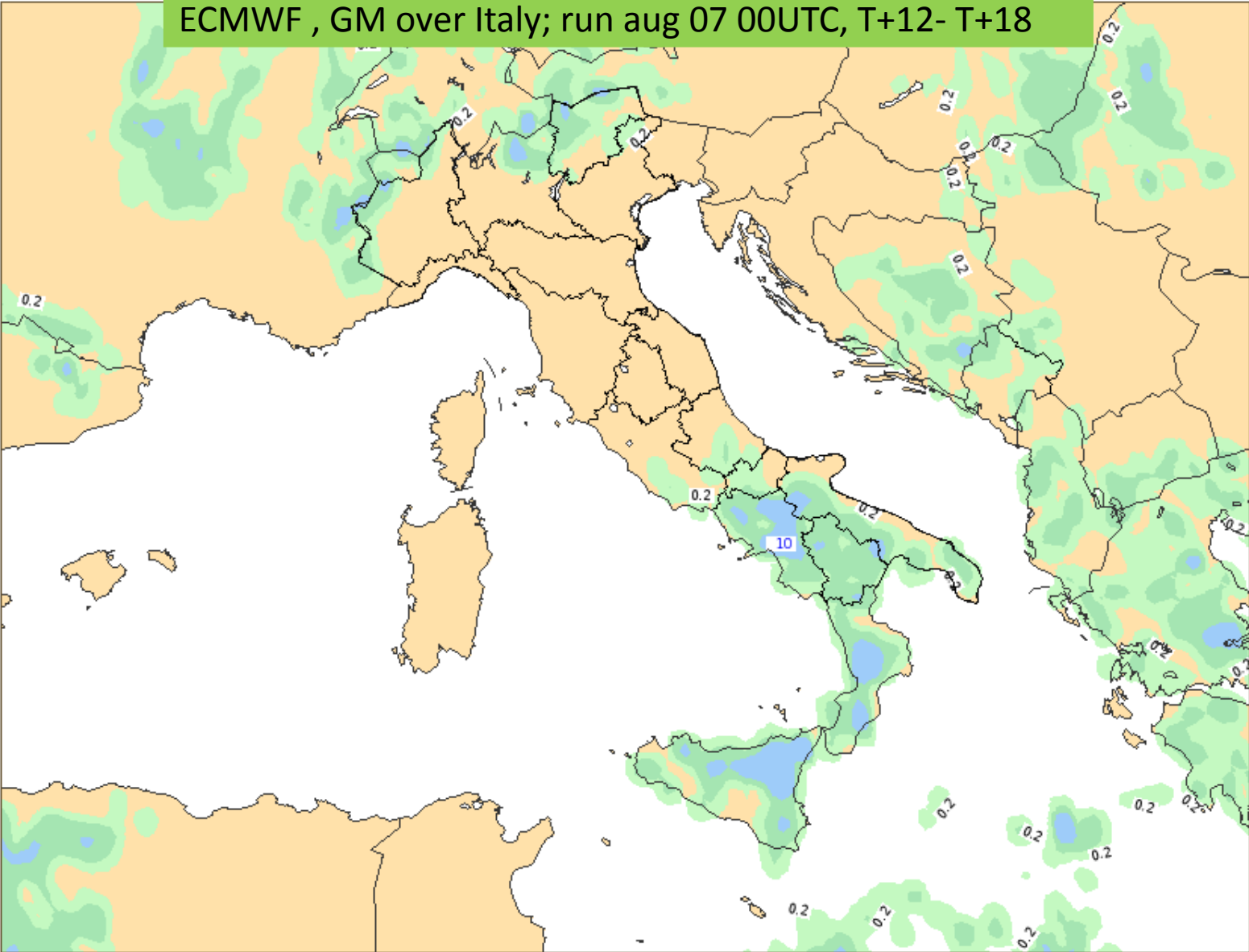




ECMWF 07 August 2015 00UTC Forecast T+18 VT: Friday 07 August 2015 18UTC  
ITALY - 6h accumulated precipitations (mm)



ECMWF , GM over Italy; run aug 07 00UTC, T+12- T+18

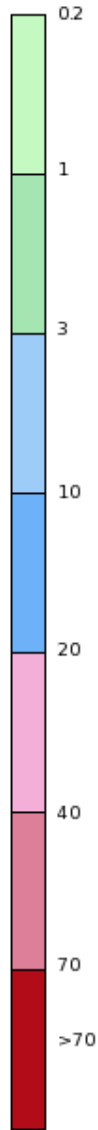
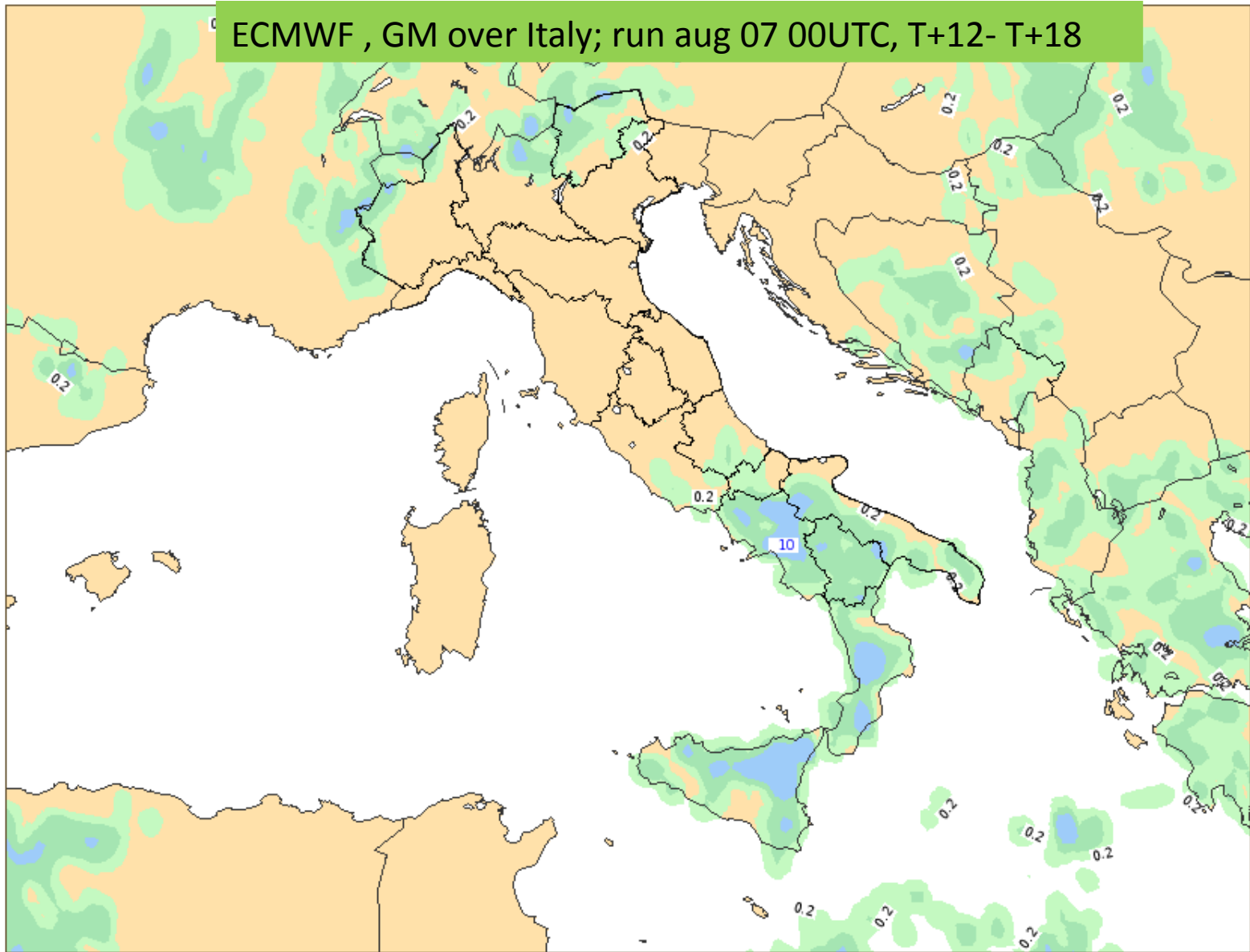




ECMWF 07 August 2015 00UTC Forecast T+18 VT: Friday 07 August 2015 18UTC  
ITALY - 6h accumulated convective precipitations (mm)



ECMWF , GM over Italy; run aug 07 00UTC, T+12- T+18

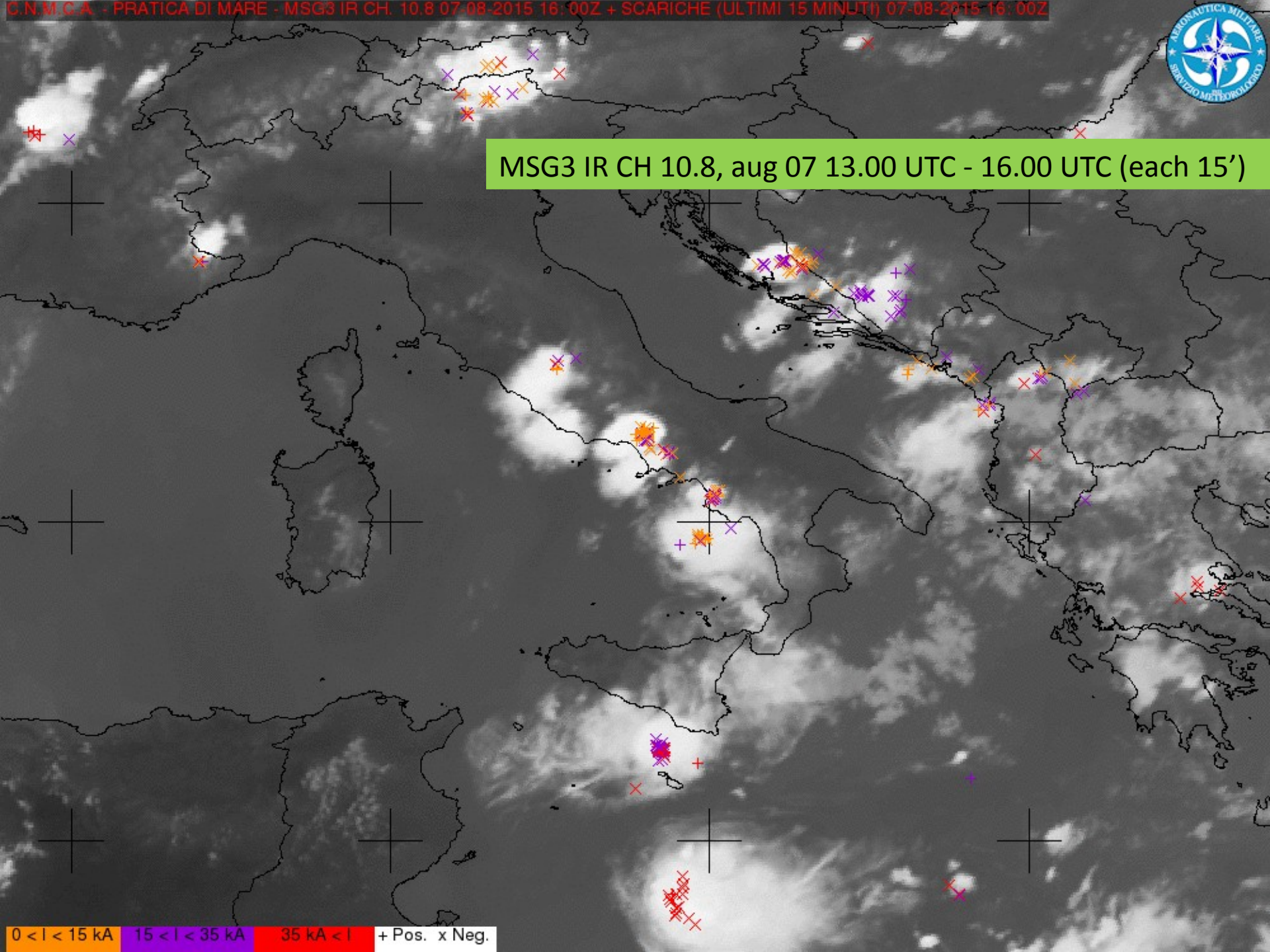






MSG3 IR CH 10.8, aug 07 13.00 UTC - 16.00 UTC (each 15')

0 < I < 15 kA    15 < I < 35 kA    35 kA < I    + Pos. x Neg.

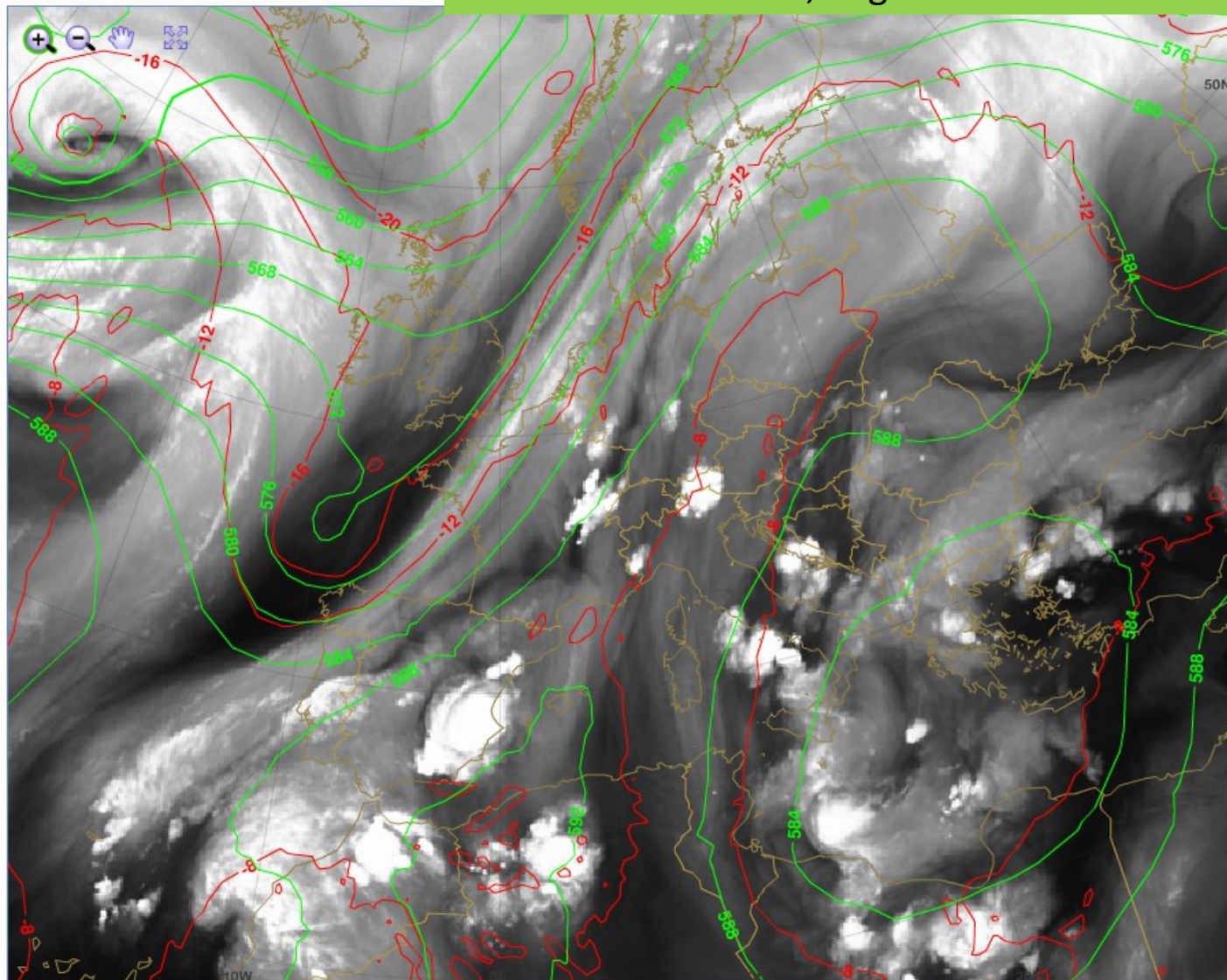




# Meteosat WV ch 6.2, aug 07 18.00 UTC + H500 + T500

## ECMWF NWP

- ☐ H300
- ☐ Streamlines300
- ☐ Isotachs300
- ☐ CVA300
- ☐ DIV300
- ☐ RV300
- ☐ Height PV=1.5
- ☒ H500
- ☒ T500
- ☐ ThetaE500
- ☐ CVA500
- ☐ RV500
- ☐ H700
- ☐ TA700
- ☐ RH700
- ☐ Omega700
- ☐ TFP
- ☐ Equiv. Thickness
- ☐ ThetaE850
- ☐ Wind850
- ☐ CAPE
- ☐ Showalter Index
- ☐ TPW
- ☐ Spec. Q-BL
- ☐ Lapse Rate
- ☐ BLH
- ☐ LCC
- ☐ Tdd
- ☐ DIV1000
- ☐ 10m. Windspeed
- ☐ 2m. Temperature
- ☐ MSLP



## Meteosat Second Generation

- ☐ IR10.8
- ☒ WV6.2
- ☐ VIS0.6
- ☐ Enhanced IR10.8
- ☐ Pseudo IR
- ☐ Pseudo WV
- ☐ Airmass RGB
- ☐ Dust RGB
- ☐ Day Microphys. RGB
- ☐ Natural Colour RGB
- ☐ HRVIS RGB
- ☐ Severe Storm RGB

## NWCSAF

- ☐ CT
- ☐ CTHH
- ☐ CRR
- ☐ PC
- ☐ SPhR LPW BL
- ☐ SPhR LPW ML
- ☐ SPhR LPW HL
- ☐ SPhR LI

## MPEF

- ☐ GII
- ☐ TPW
- ☐ DIV
- ☐ MPE

## Products

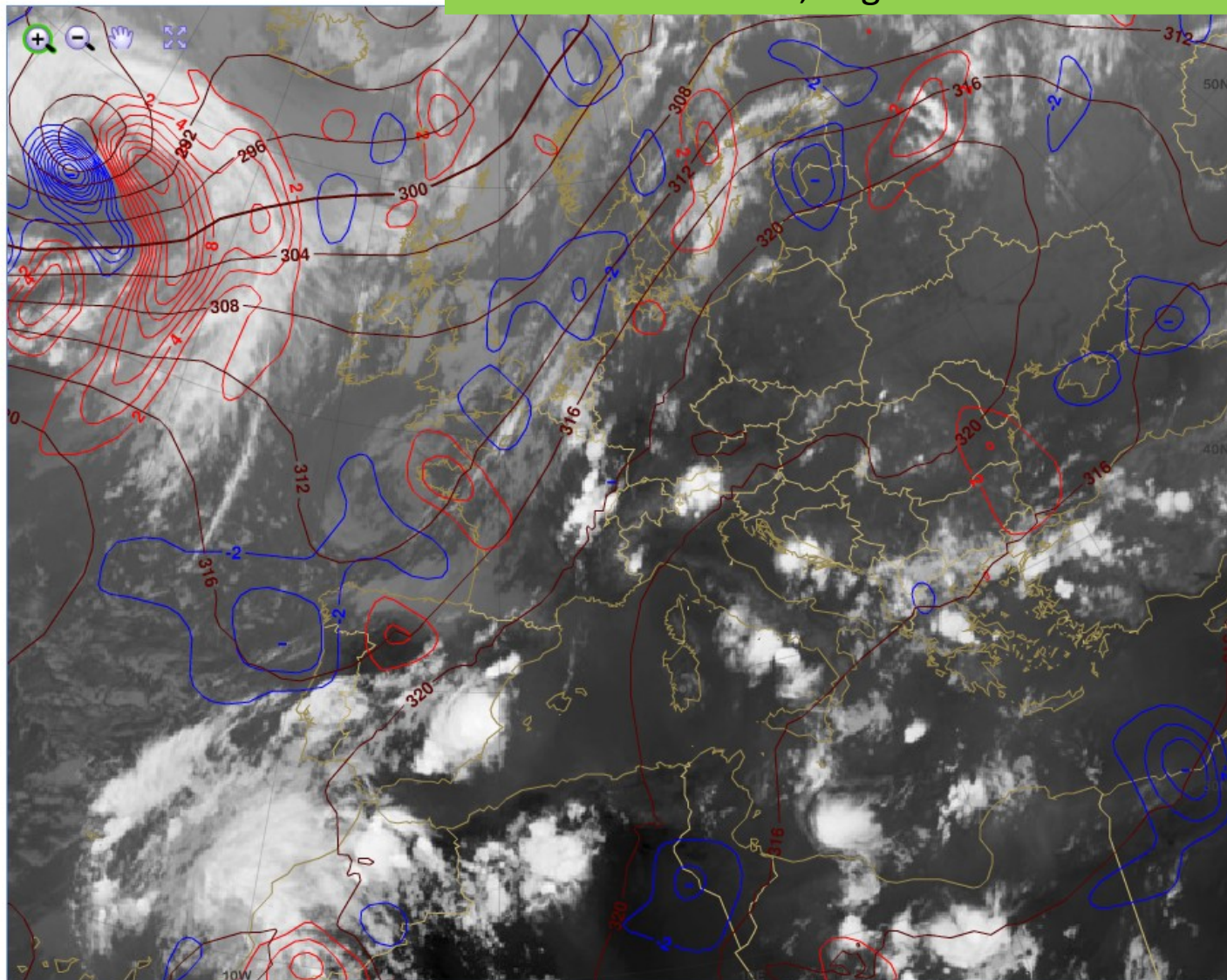
- ☐ SYNOP
- ☐ Opera RADAR
- ☐ ASCAT
- ☐ JASON
- ☐ ESTOFEX
- ☐ VCS
- ☐ Vertical Profile



## Meteosat IR ch 10.8, aug 07 18.00 UTC + H700 + TA500

### ECMWF NWP

- ☐ H300
- ☐ Streamlines300
- ☐ Isotachs300
- ☐ CVA300
- ☐ DIV300
- ☐ RV300
- ☐ Height PV=1.5
- ☐ H500
- ☐ T500
- ☐ ThetaE500
- ☐ CVA500
- ☐ RV500
- ☒ H700
- ☒ TA700
- ☐ RH700
- ☐ Omega700
- ☐ TFP
- ☐ Equiv. Thickness
- ☐ ThetaE850
- ☐ Wind850
- ☐ CAPE
- ☐ Showalter Index
- ☐ TPW
- ☐ Spec. Q-BL
- ☐ Lapse Rate
- ☐ BLH
- ☐ LCC
- ☐ Tdd
- ☐ DIV1000
- ☐ 10m. Windspeed
- ☐ 2m. Temperature
- ☐ MSLP



### Meteosat Second Generation

- ☒ IR10.8
- ☐ WV6.2
- ☐ VIS0.6
- ☐ Enhanced IR10.8
- ☐ Pseudo IR
- ☐ Pseudo WV
- ☐ Airmass RGB
- ☐ Dust RGB
- ☐ Day Microphys. RGB
- ☐ Natural Colour RGB
- ☐ HRVIS RGB
- ☐ Severe Storm RGB

### NWCSAF

- ☐ CT
- ☐ CTTH
- ☐ CRR
- ☐ PC
- ☐ SPhR LPW BL
- ☐ SPhR LPW ML
- ☐ SPhR LPW HL
- ☐ SPhR LI

### MPEF

- ☐ GII
- ☐ TPW
- ☐ DIV
- ☐ MPE

### Products

- ☐ SYNOP
- ☐ Opera RADAR
- ☐ ASCAT
- ☐ JASON
- ☐ ESTOFEX
- ☐ VCS
- ☐ Vertical Profile





The observed amount of rain has been not excessively high although some clusters had persisted over limited areas. Some severe hail storms have been reported over inner local areas between Latium and Umbria, where no phenomena had been expected (a flight competition was on in Rieti then with most Central Italy as interested air space ).

Observed Precipitation august 7 th 2016: 10.00 am UTC- 10 pm UTC  
Courtesy Civil Protection Department

## Conclusions

1. Detected synoptic subjects: a comma, wide and not excessively active, within a levelled isobaric ground field (1012 hPa), over Southern Italy by analysis 12.00 UTC.
2. Phenomena have been predicted over southern Adriatic and ionian area, not exclusively convective but kept a dynamical nature as well.
3. The rainfall has been quick and not too rich in amount although clustered over some sites.
4. Local severe hail storms like incidents are usually connected with such summer typical synoptic subjects.

Any question?

Thank you for your attention