



# BSMEFFGS



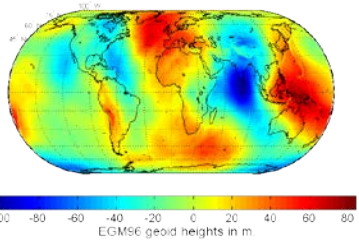
## Lebanon Case Study

Flash Flood

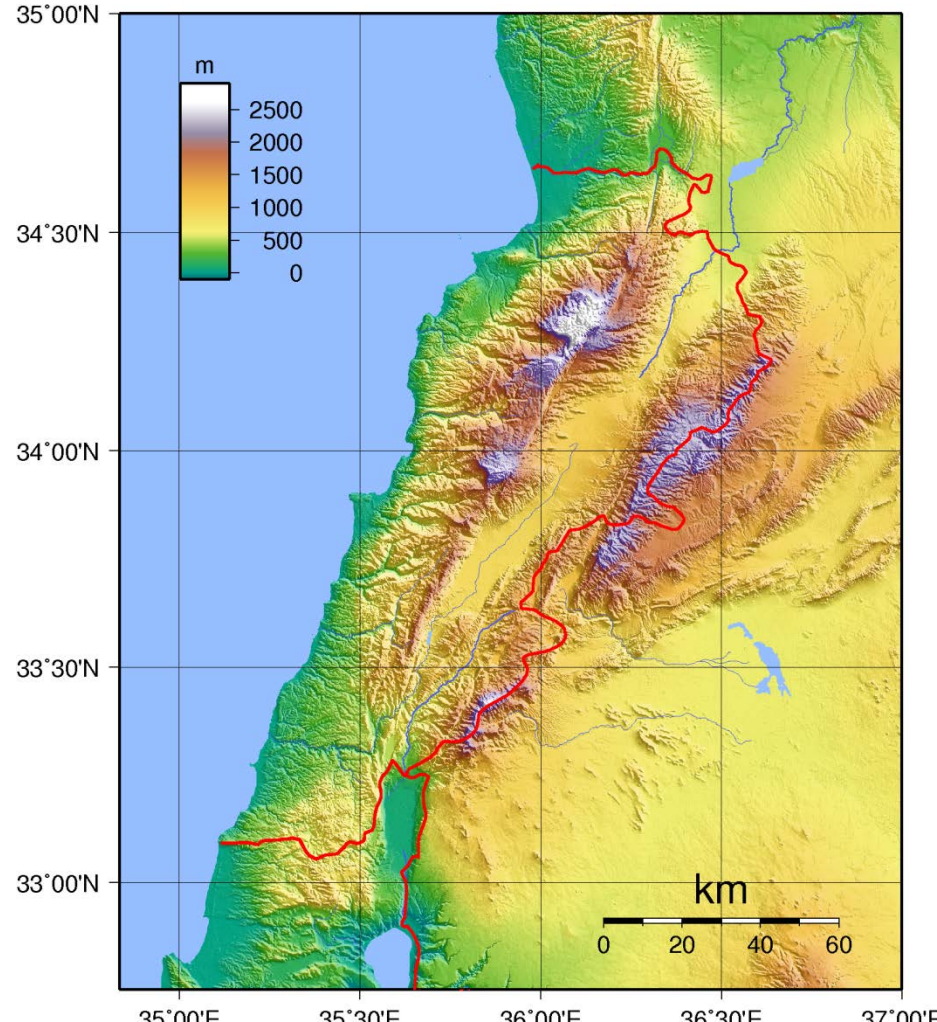
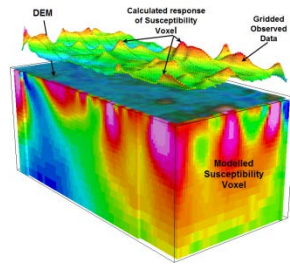
25-10-2015





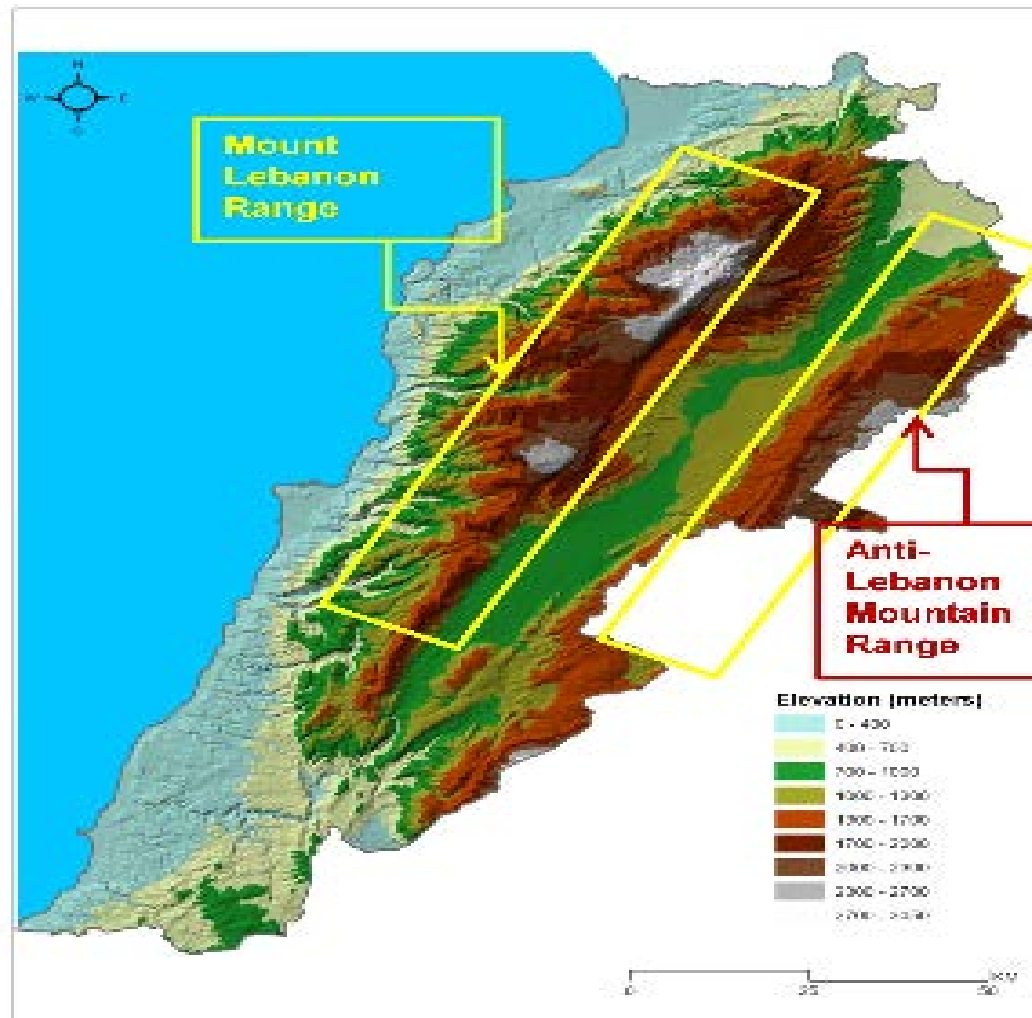
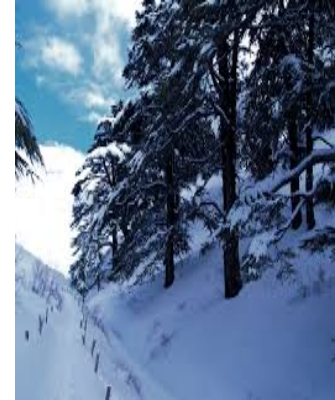


# Lebanon Maps

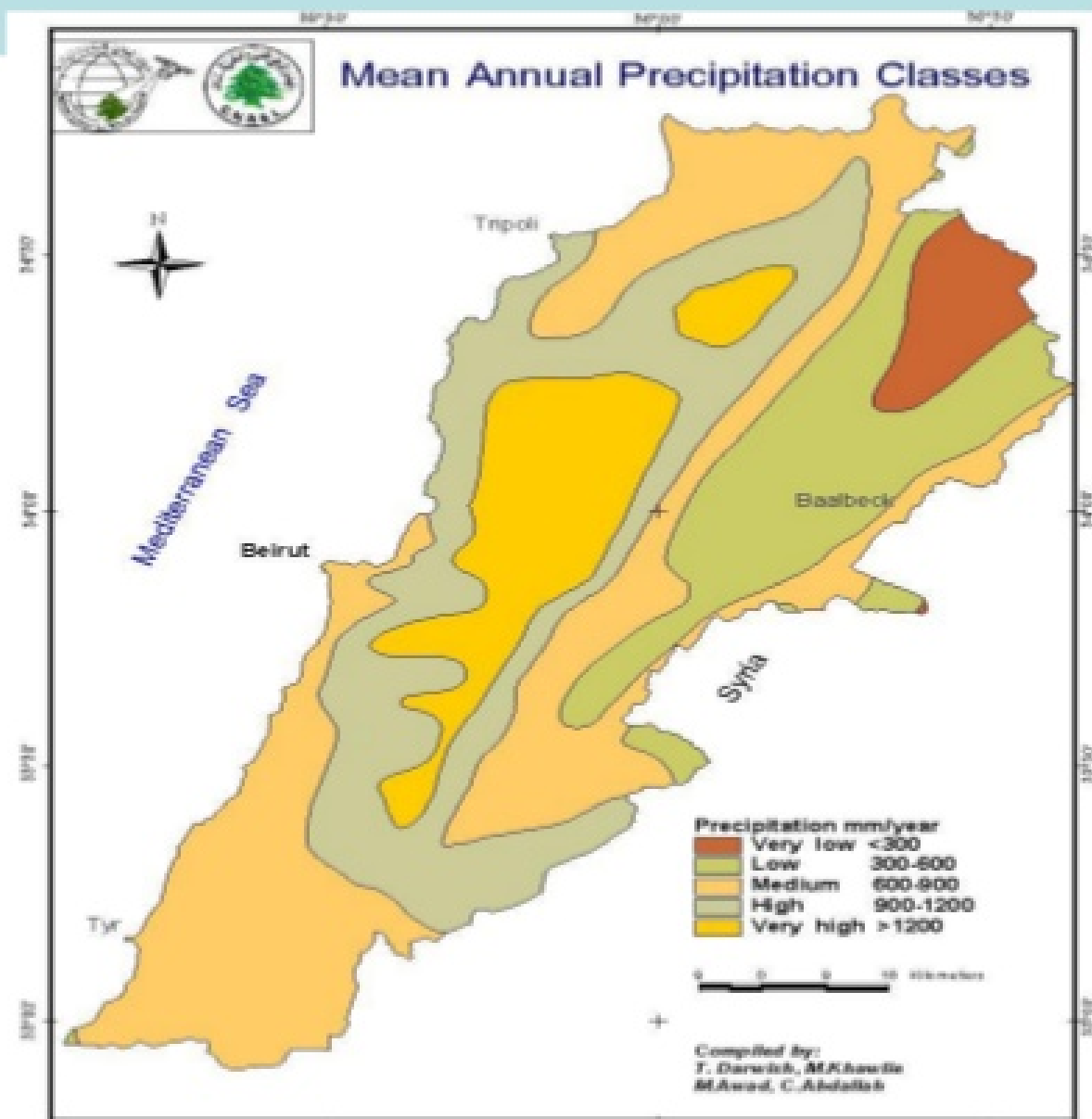




# Different maps



# Precipitation



25-10-2015

mm/< 3hrs:

Beirut 49

Tripoli 67 + 104

Abdeh 75

Qartaba 48

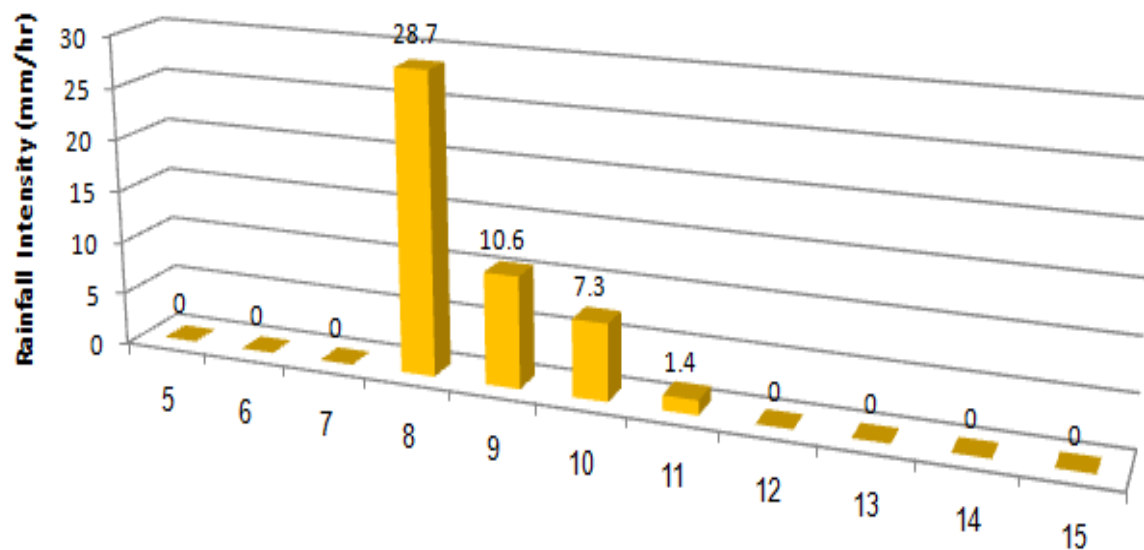
QARTABA

40133

E: 1222m



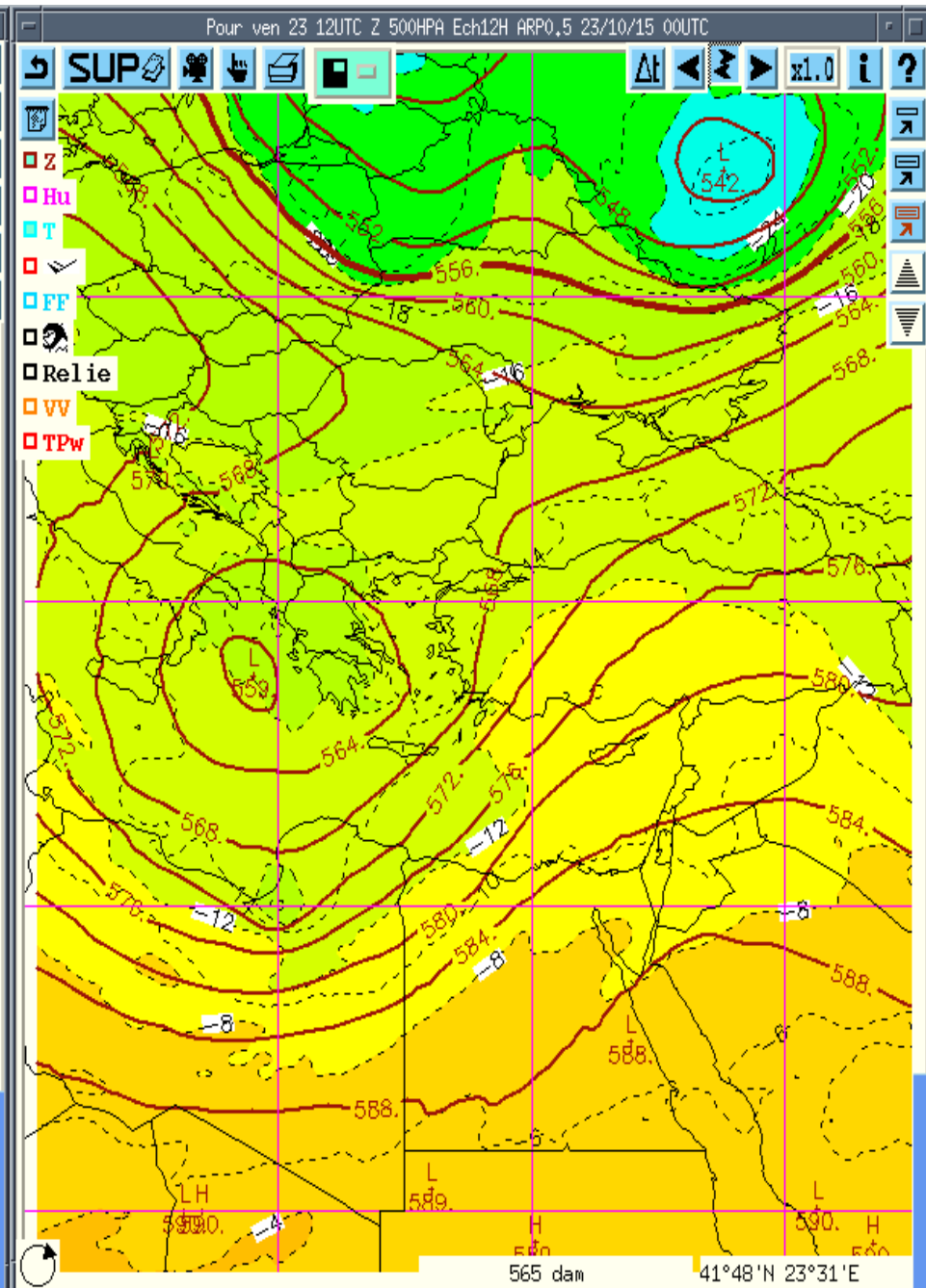
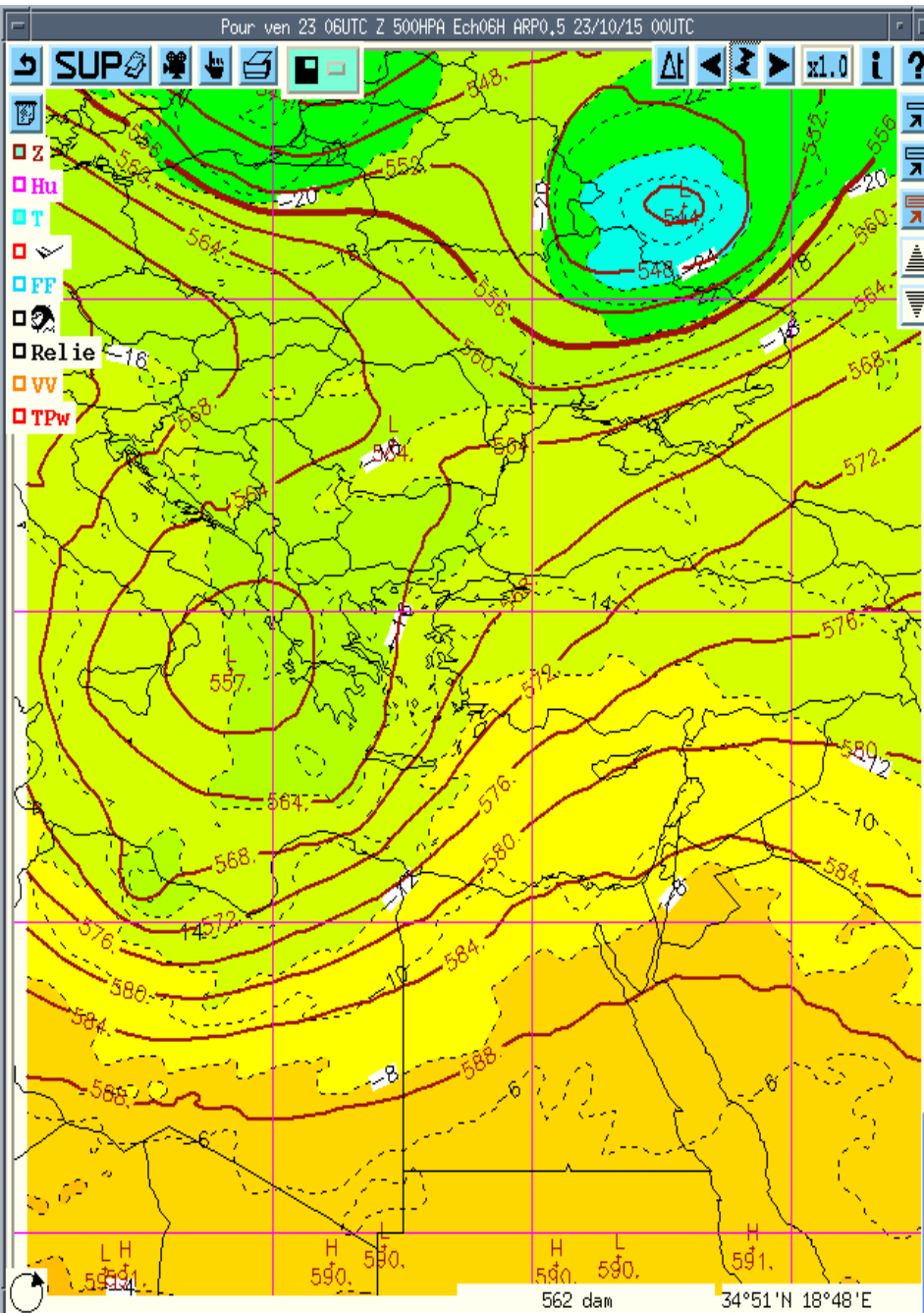
Qartaba Rainfall Intensity - Lebanon



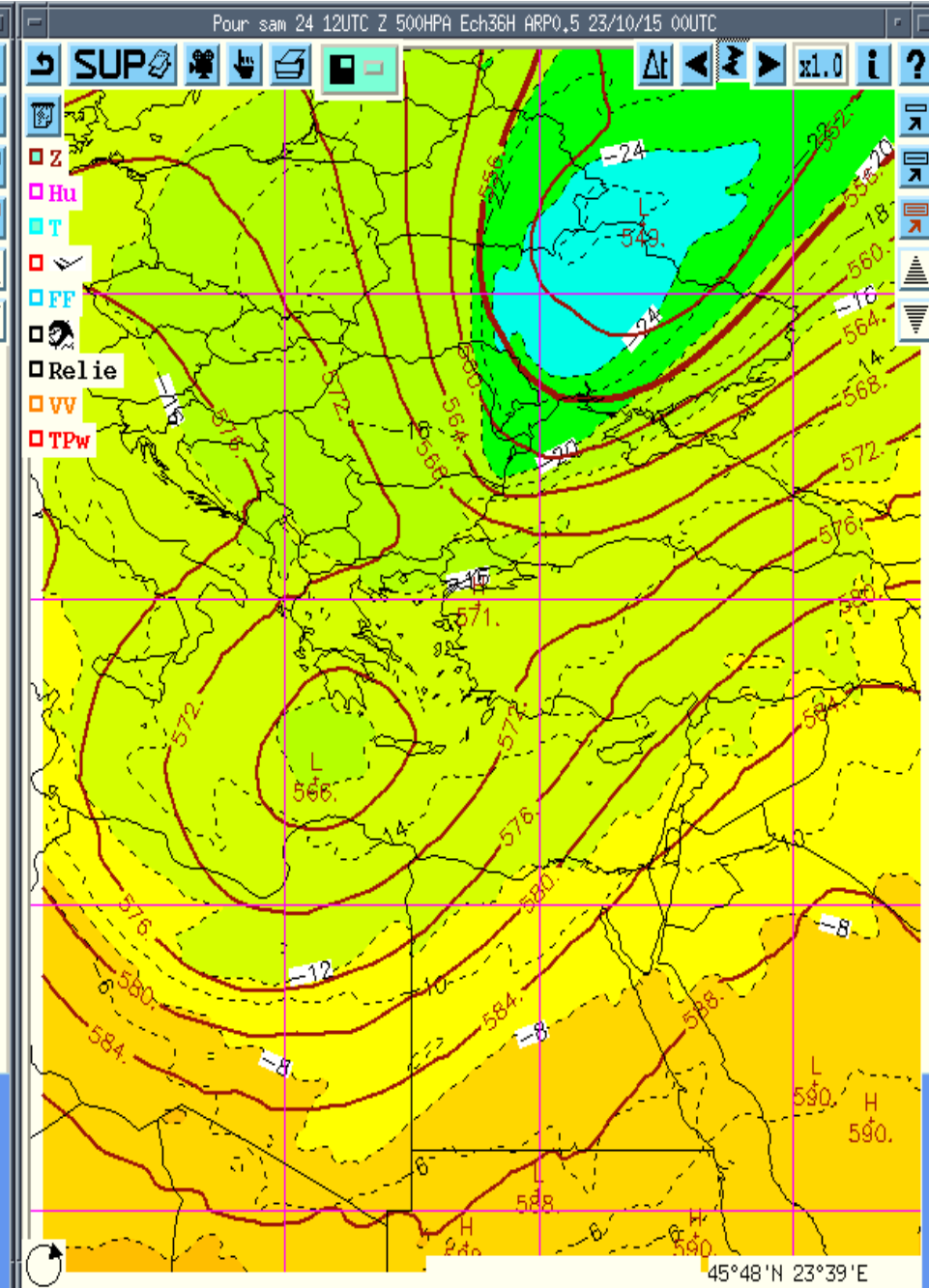
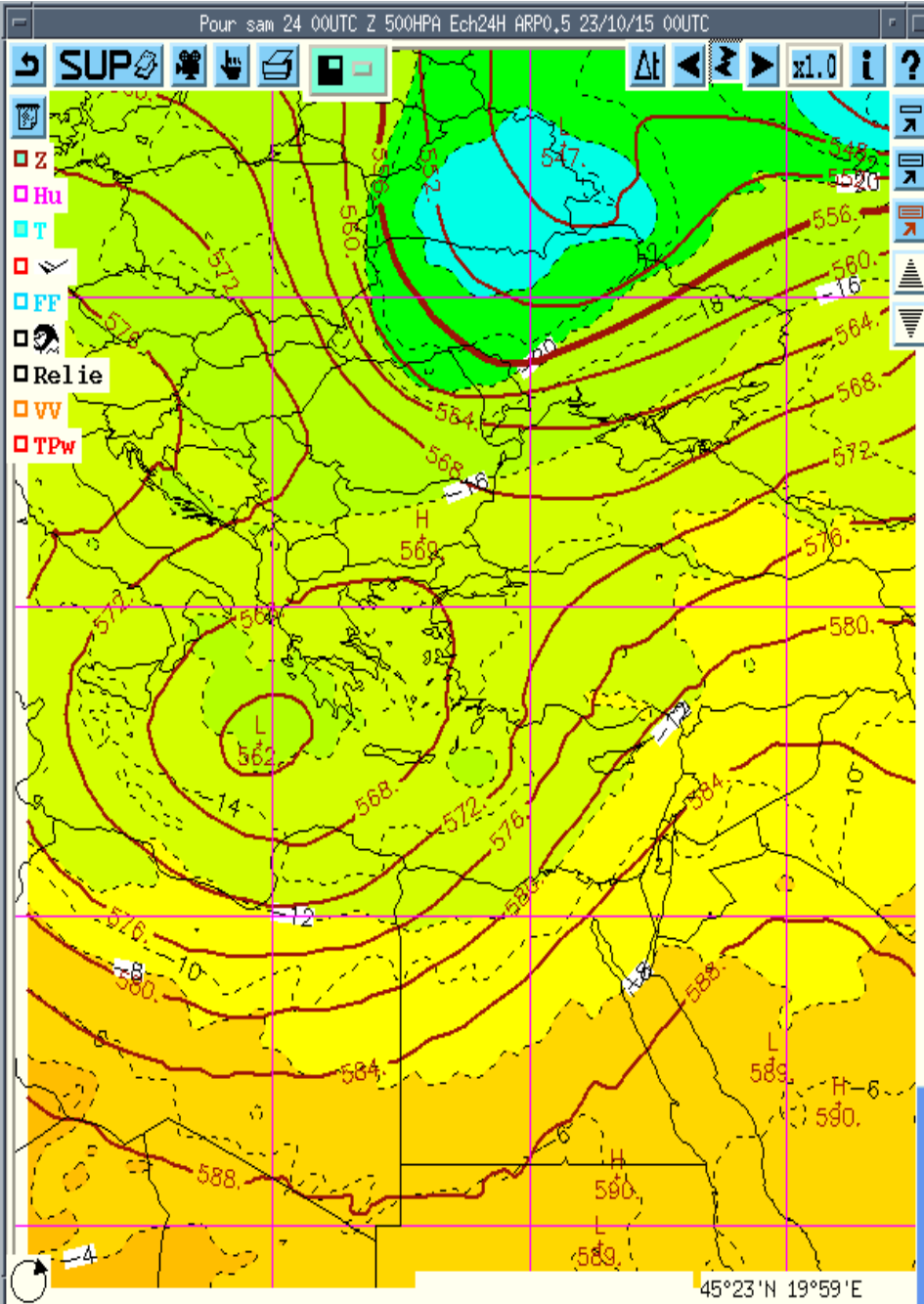
25-10-2015



# Synop.Analysis (Z+T) 500 hpa 23 Oct 2015 (06 & 12)UTC

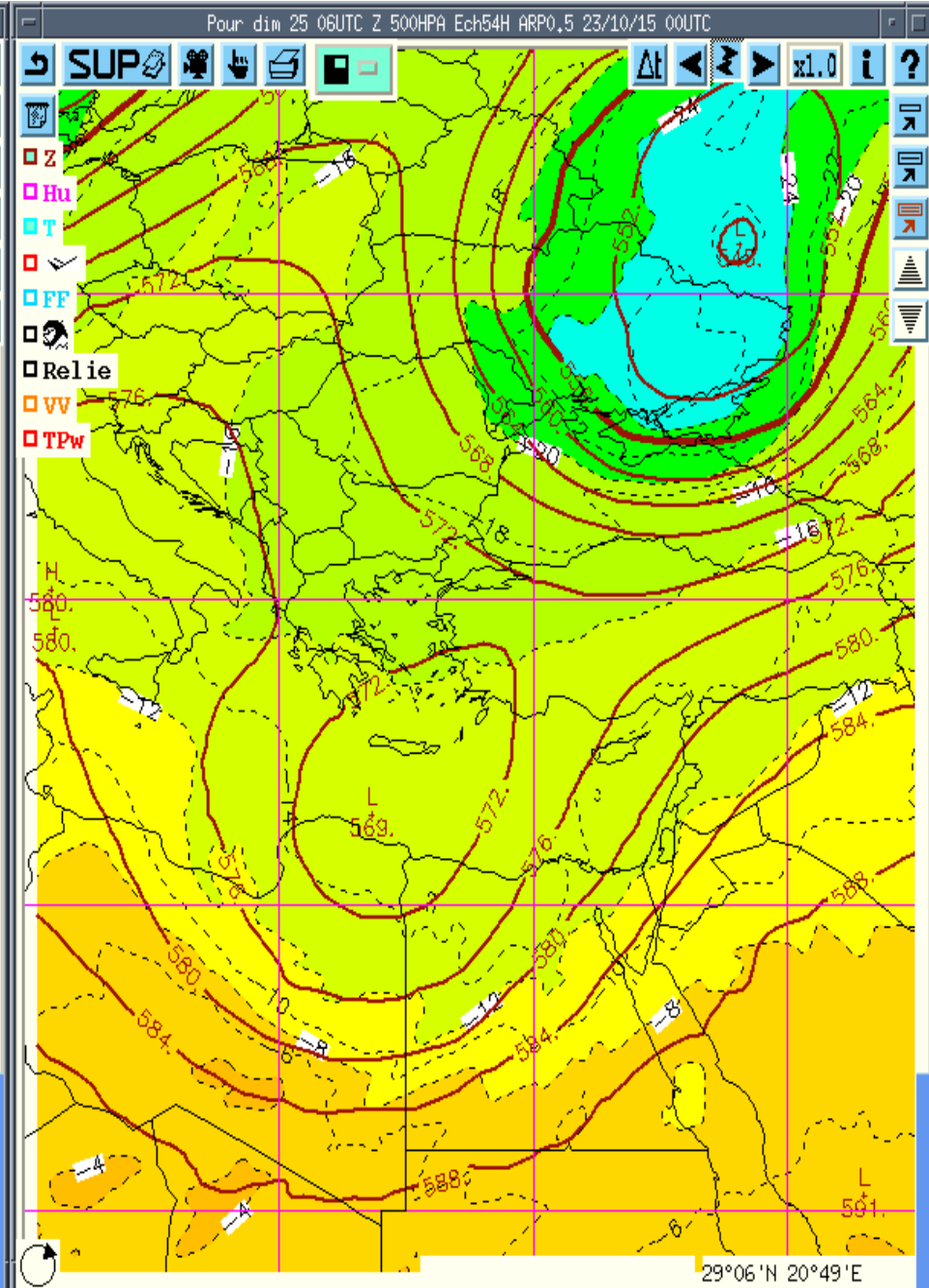
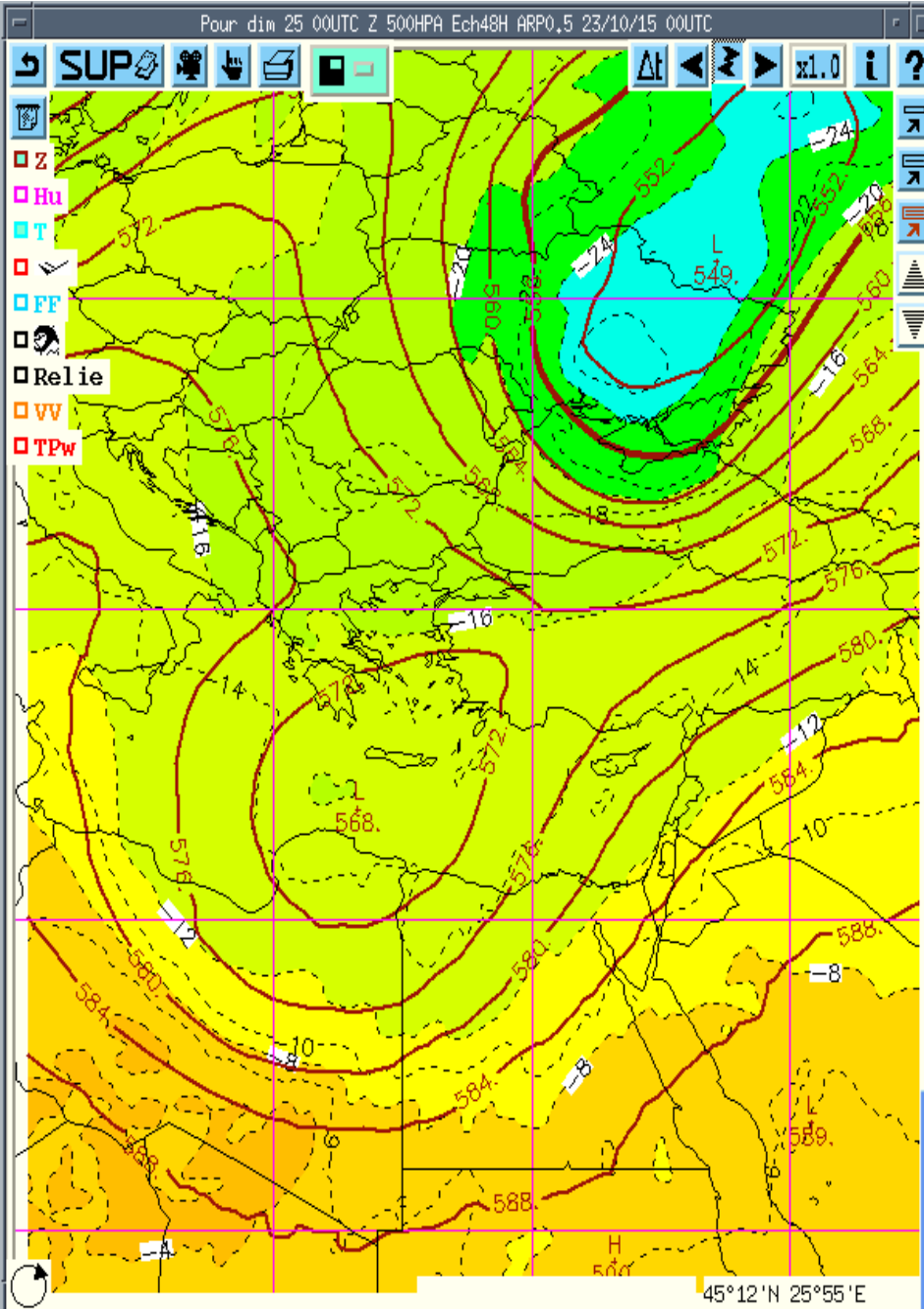


# (Z+T) 500 hpa 24 Oct 2015 (00 & 12)UTC

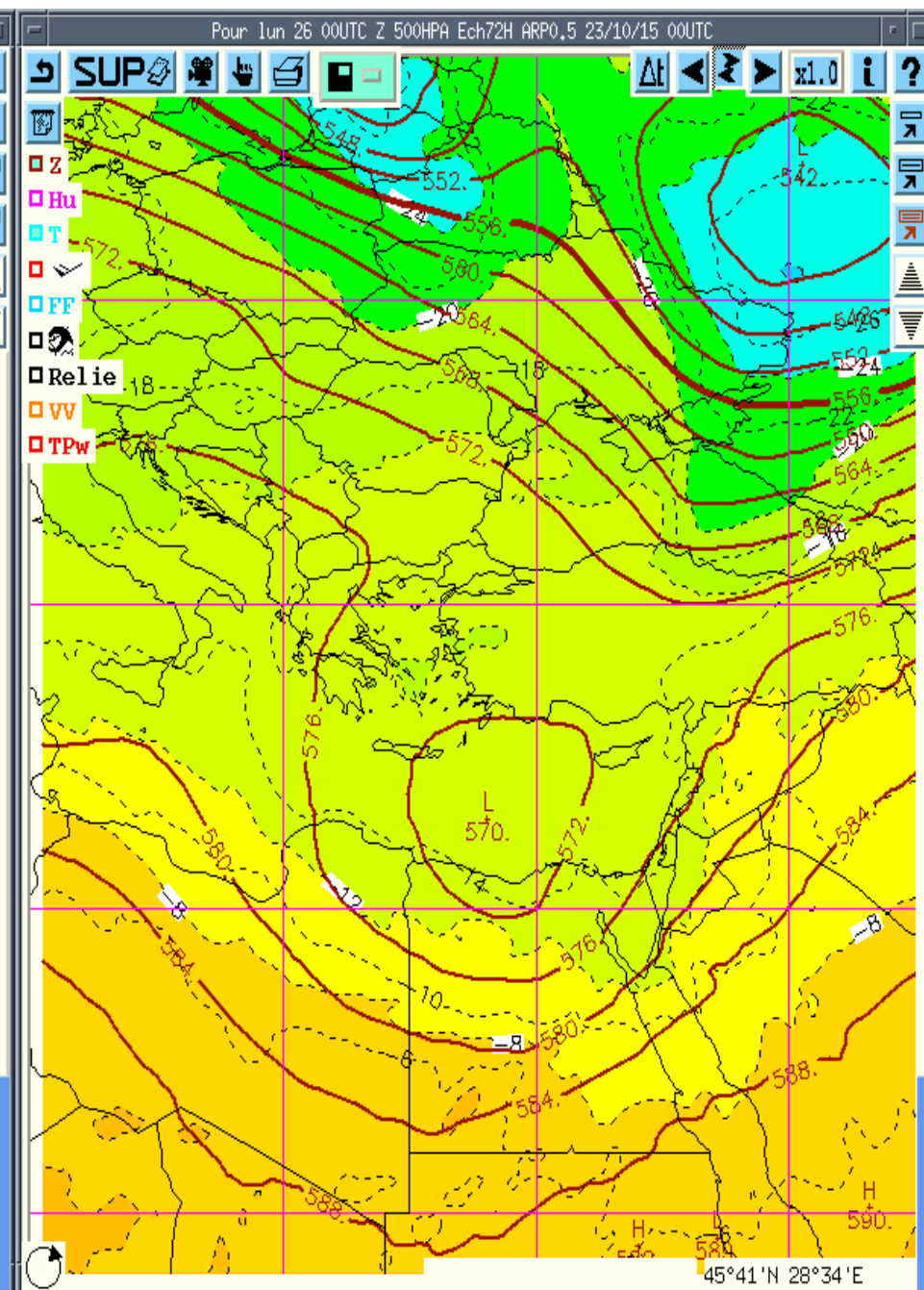
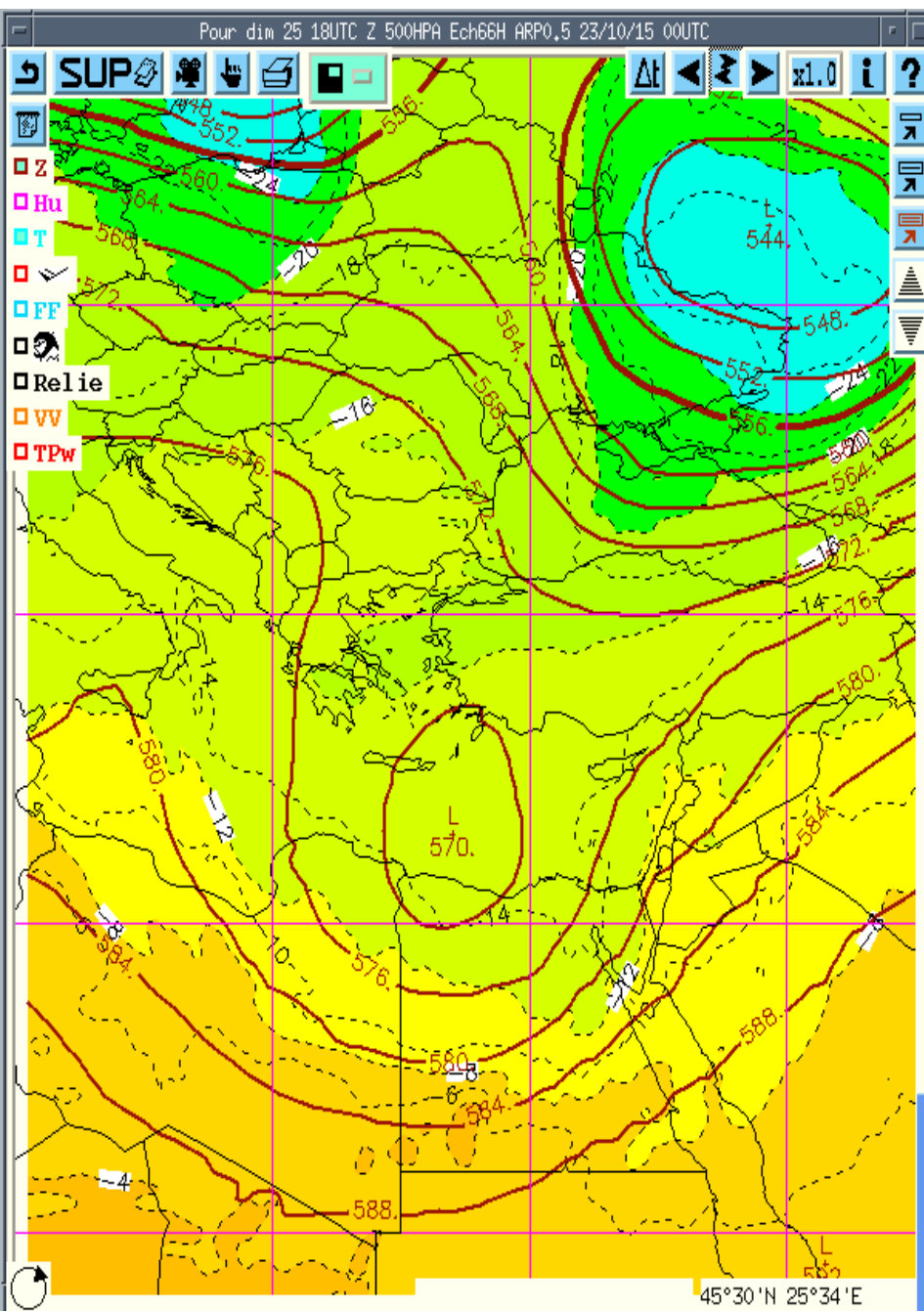




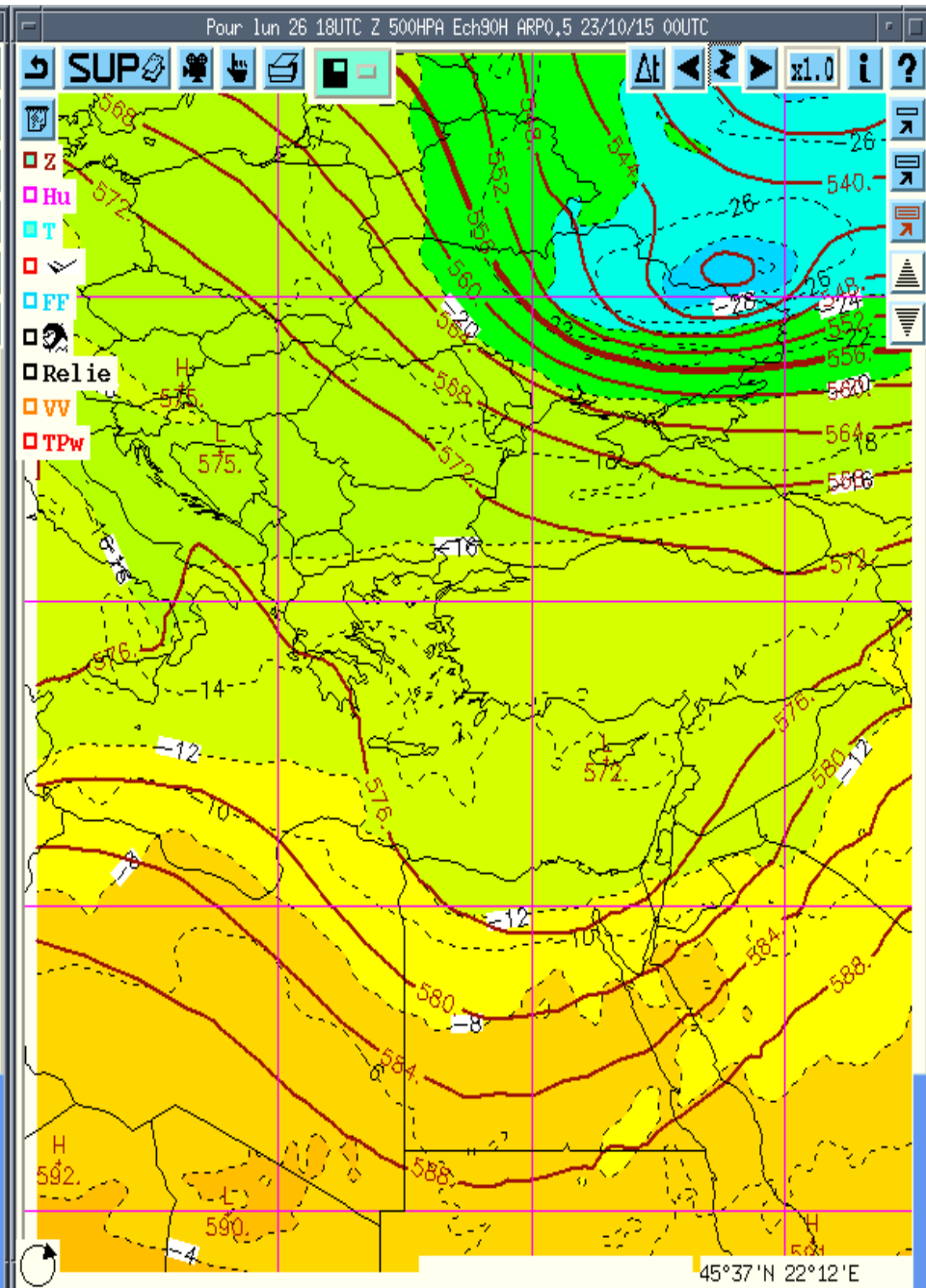
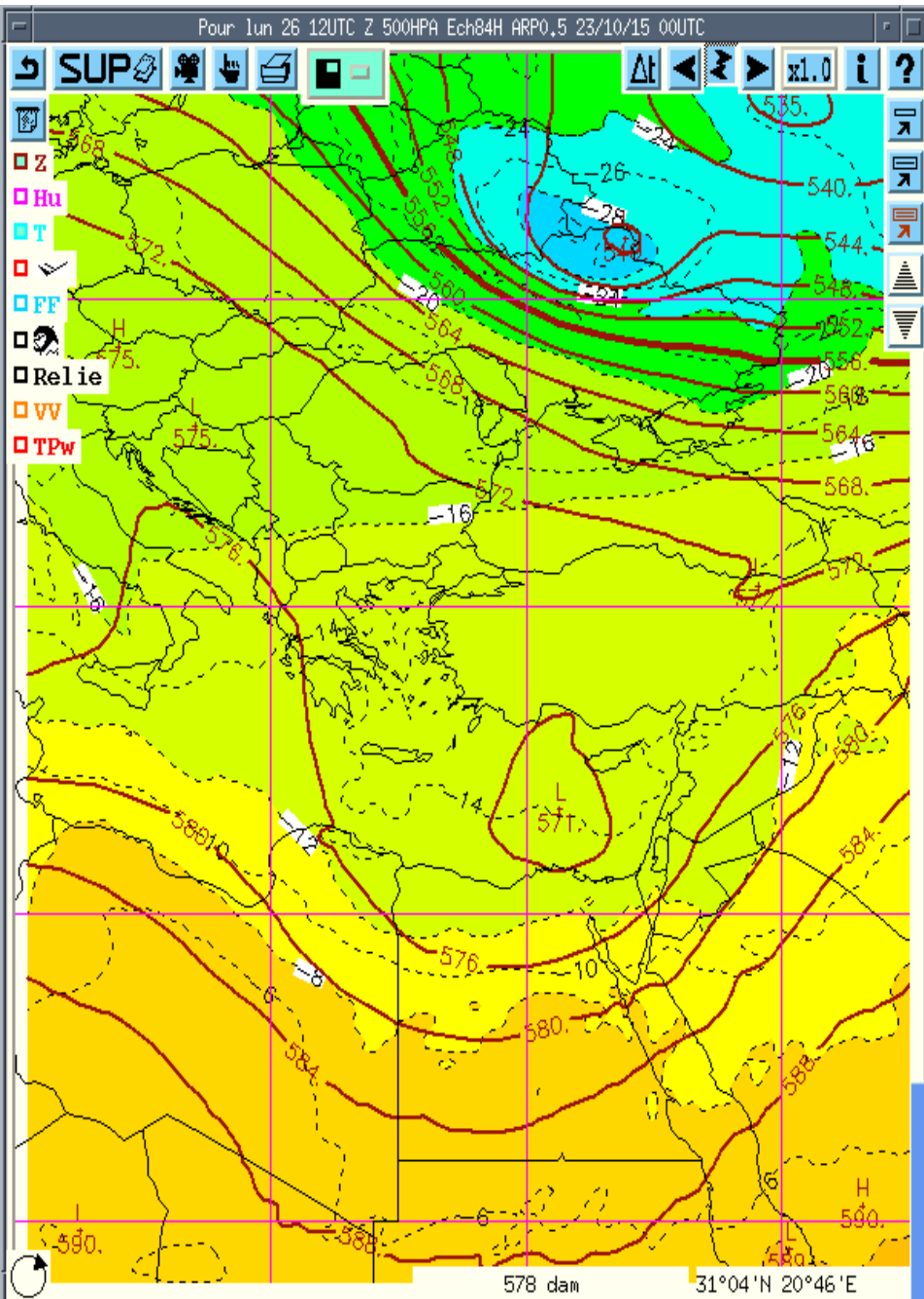
# (Z+T) 500 hpa 25 Oct 2015 (00 & 06)UTC

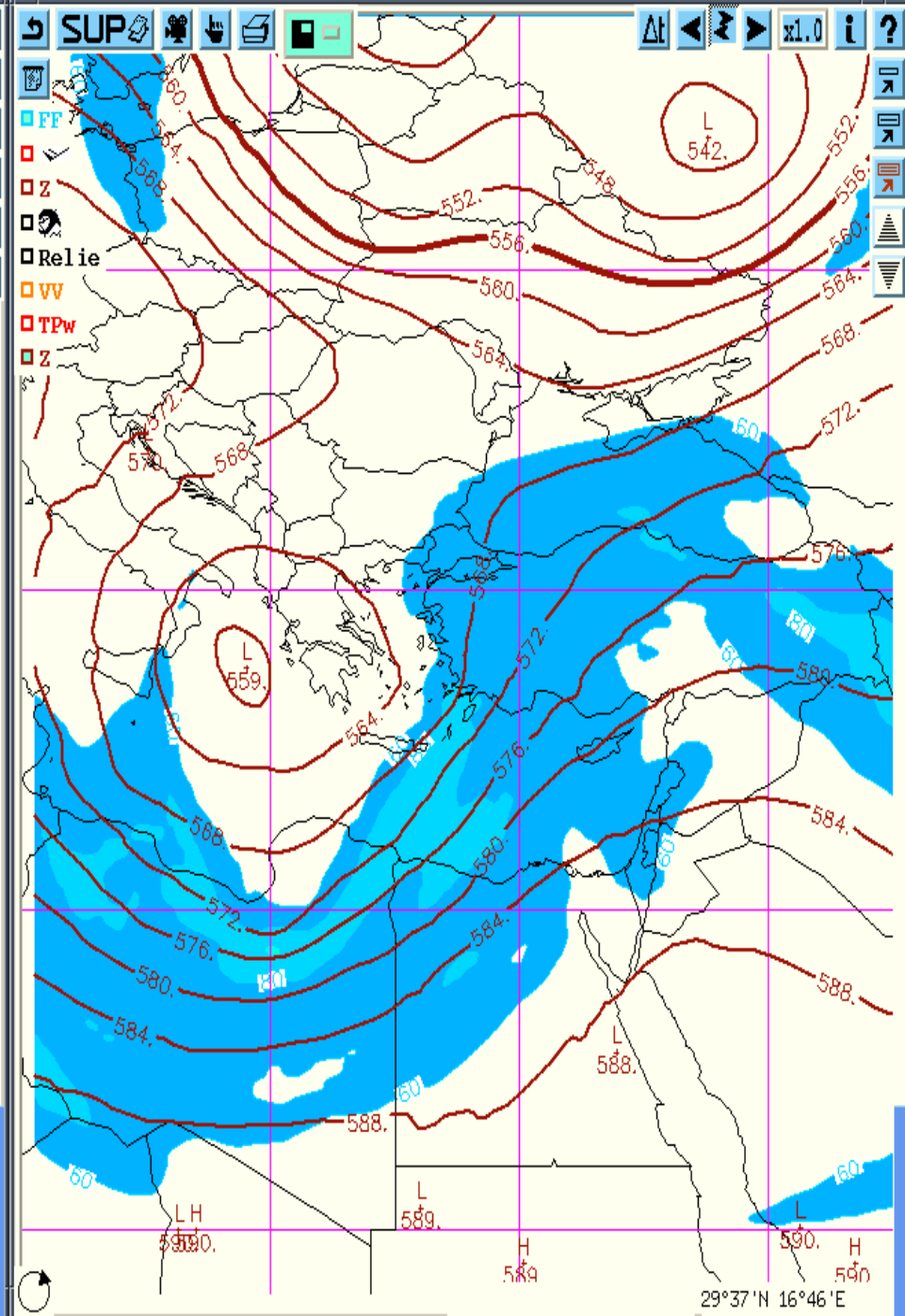
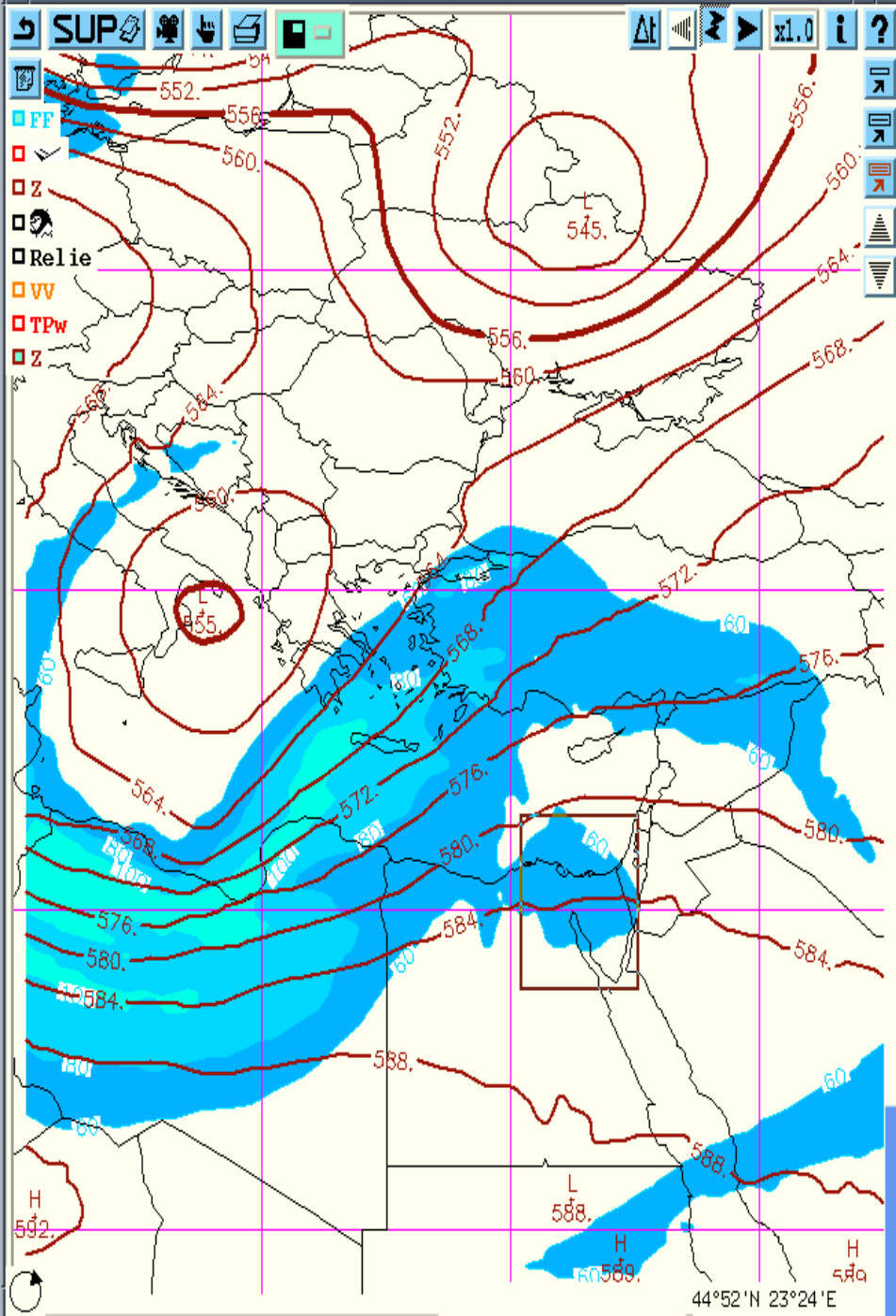


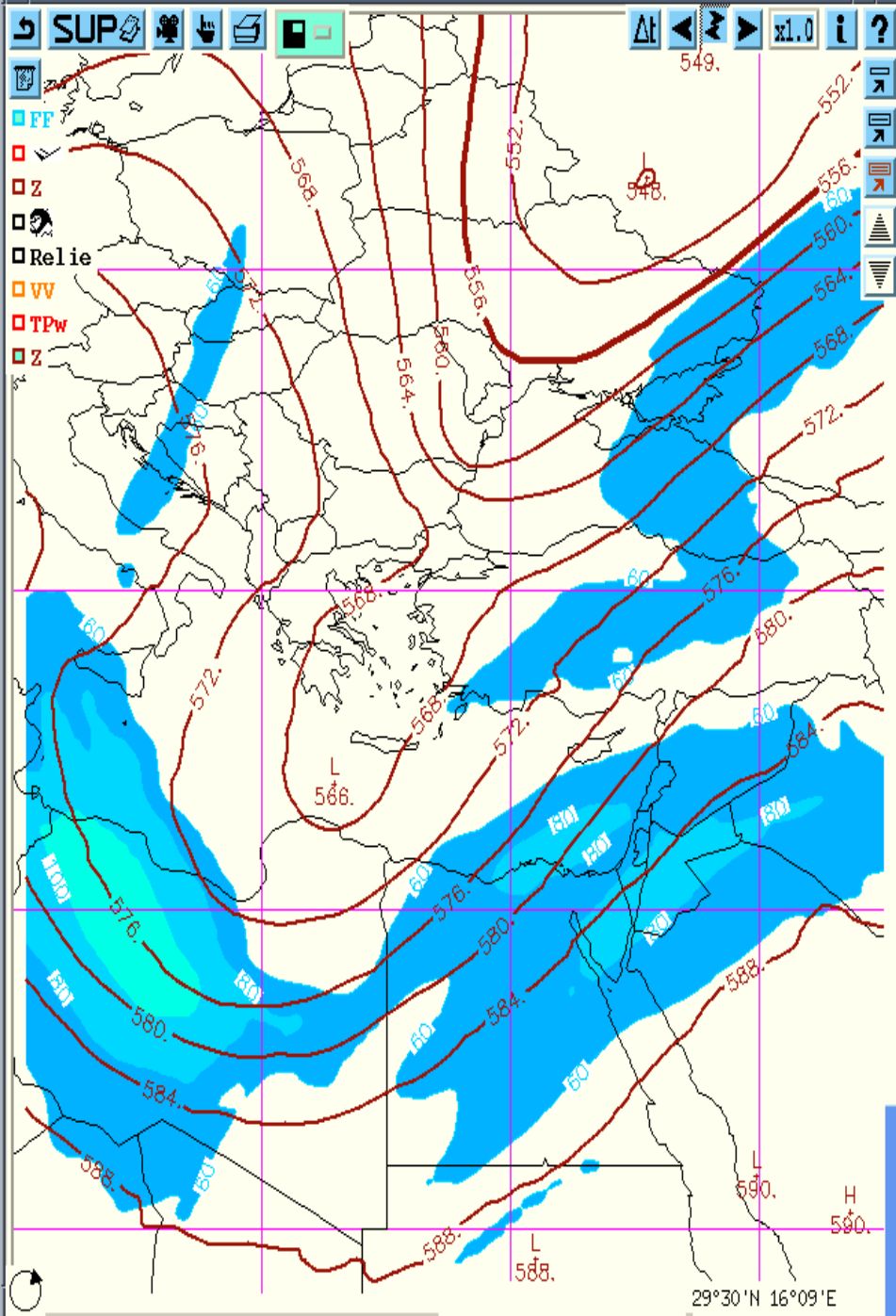
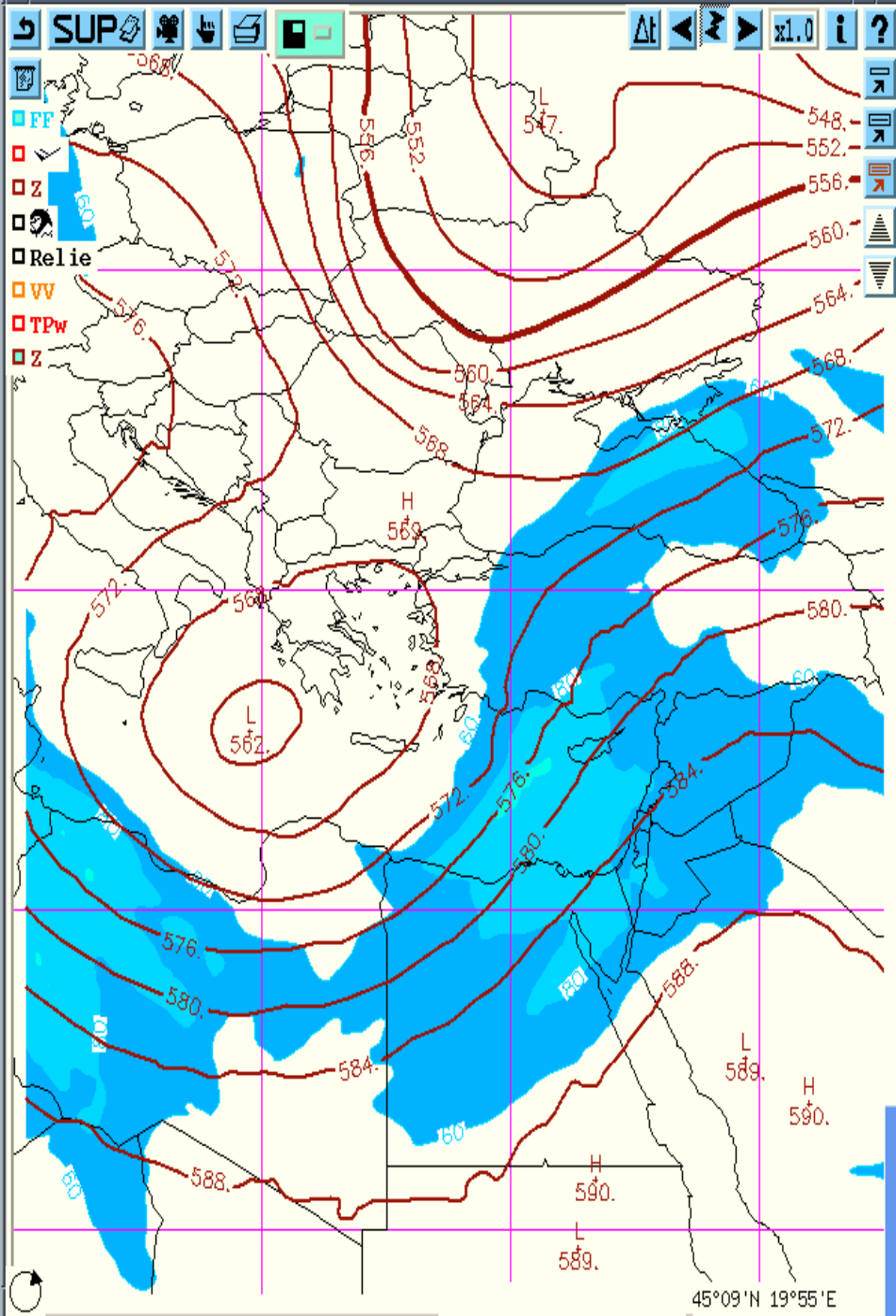
# (Z+T) 500 hpa 25 Oct 2015 (18& 24)UTC

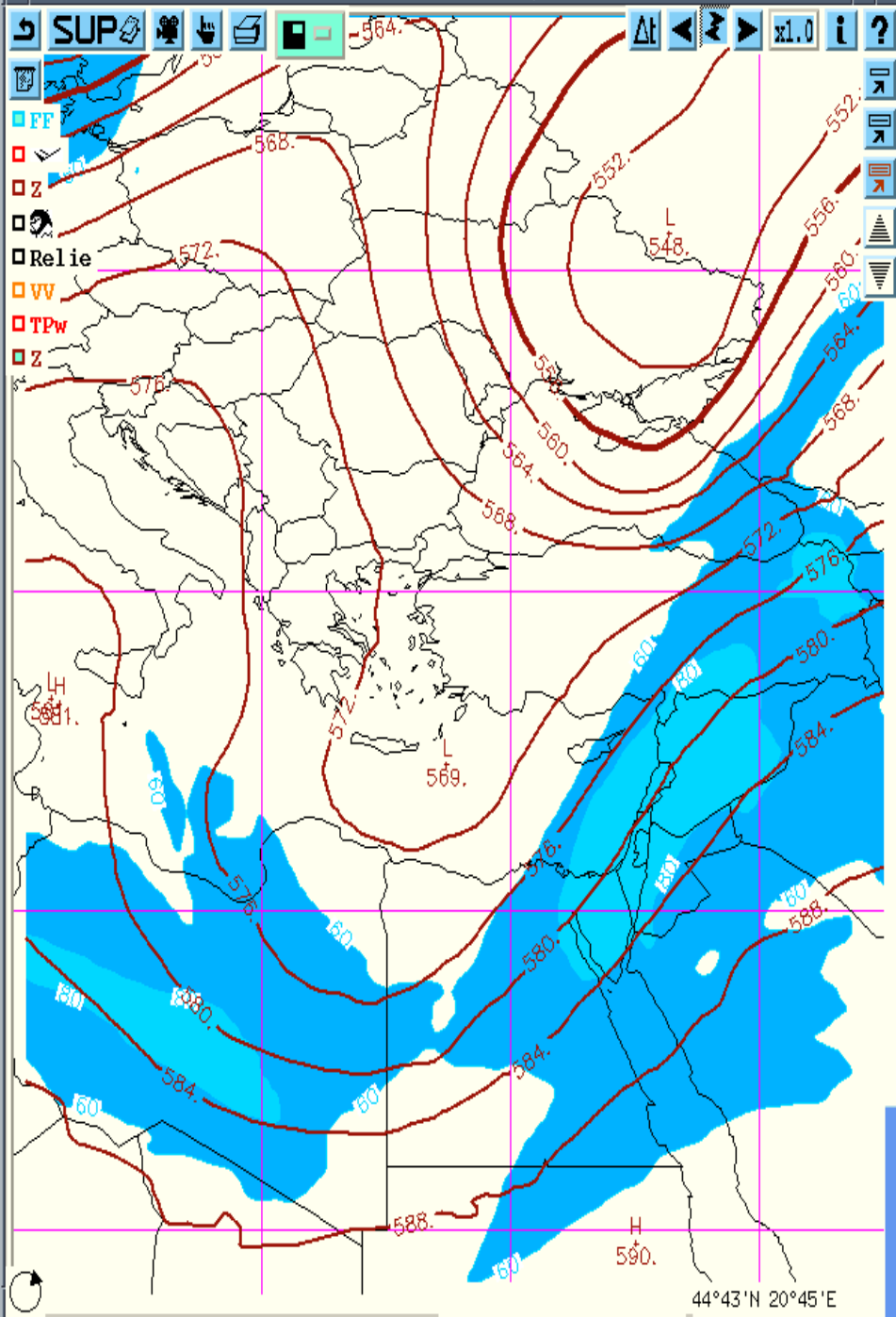
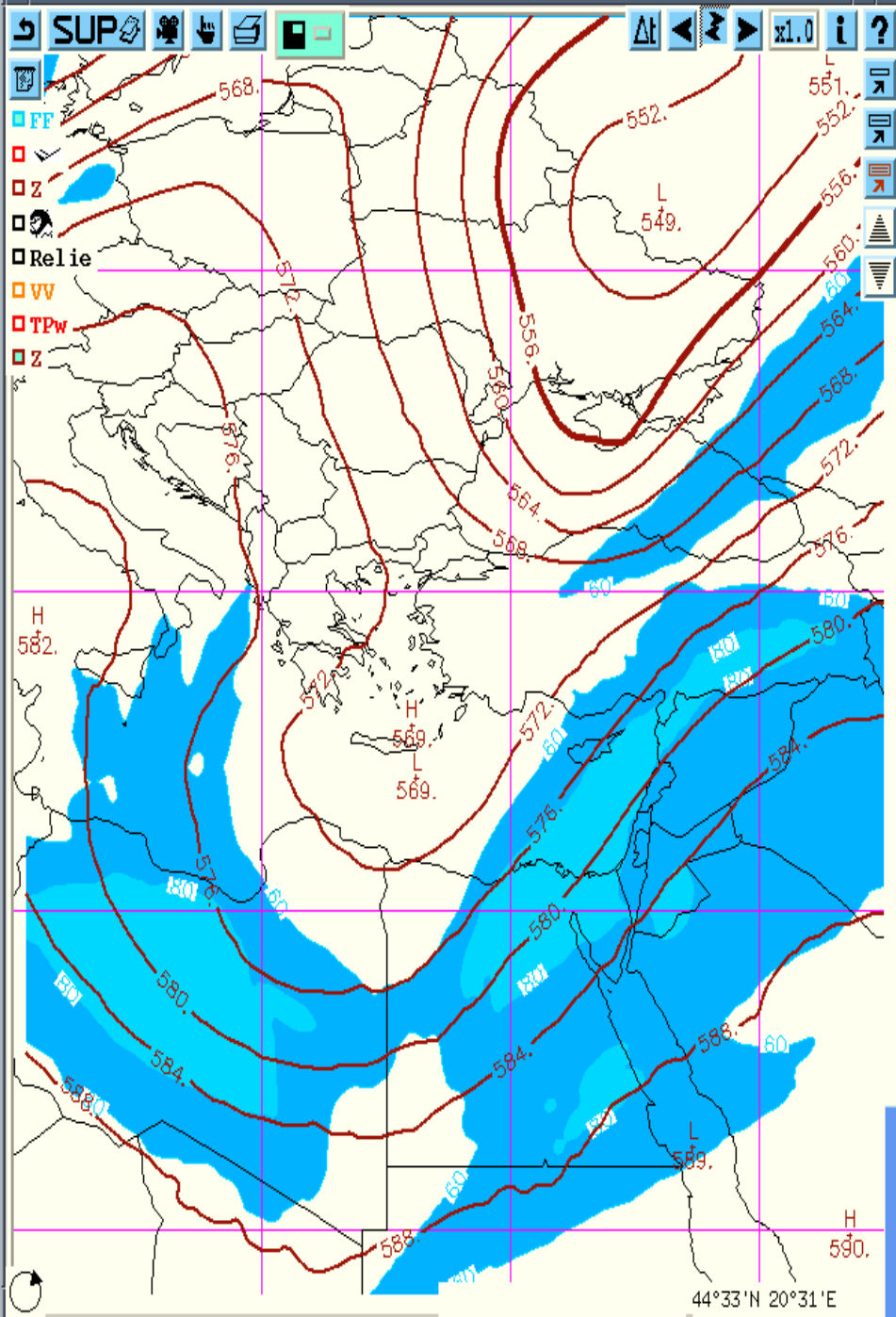


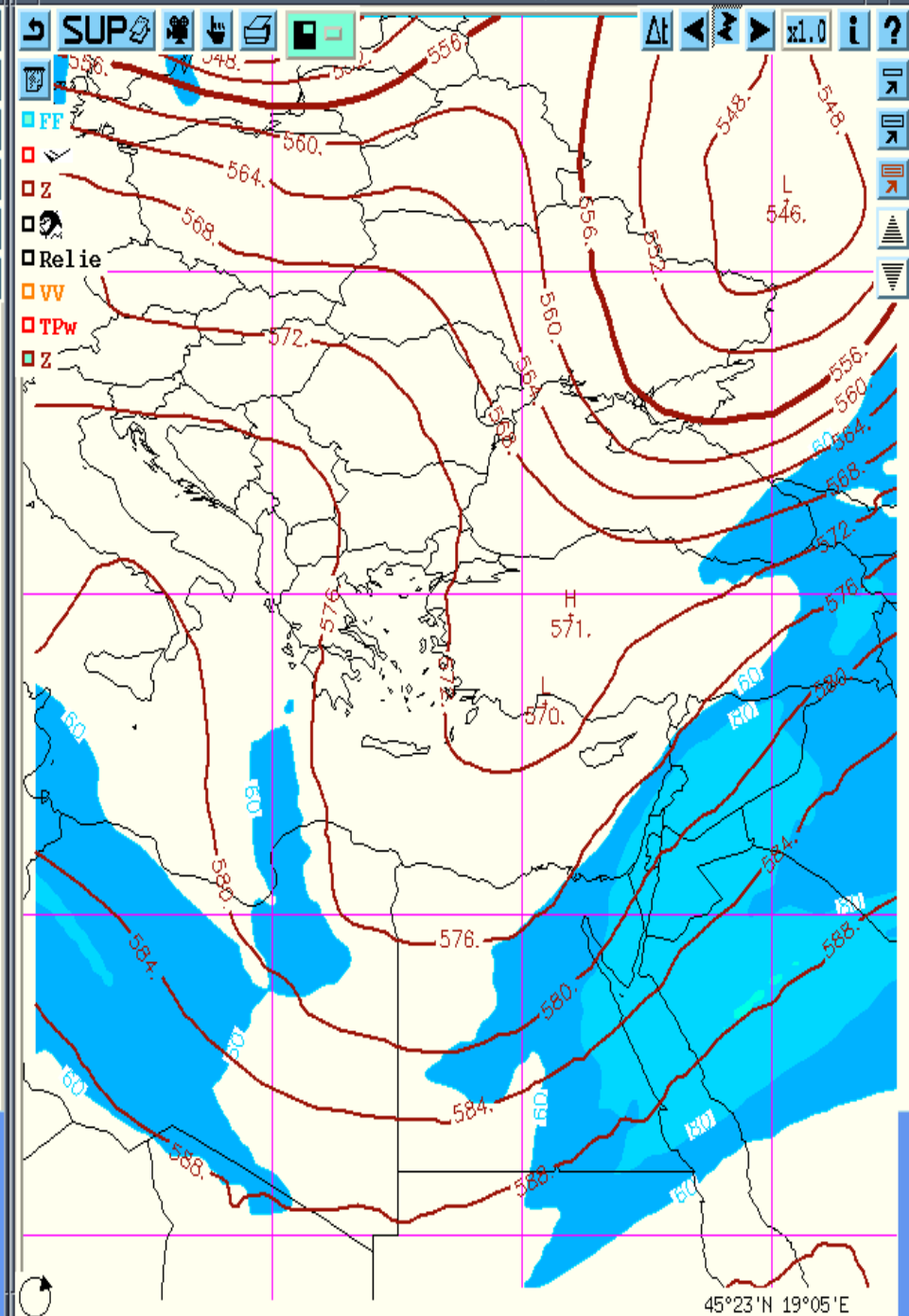
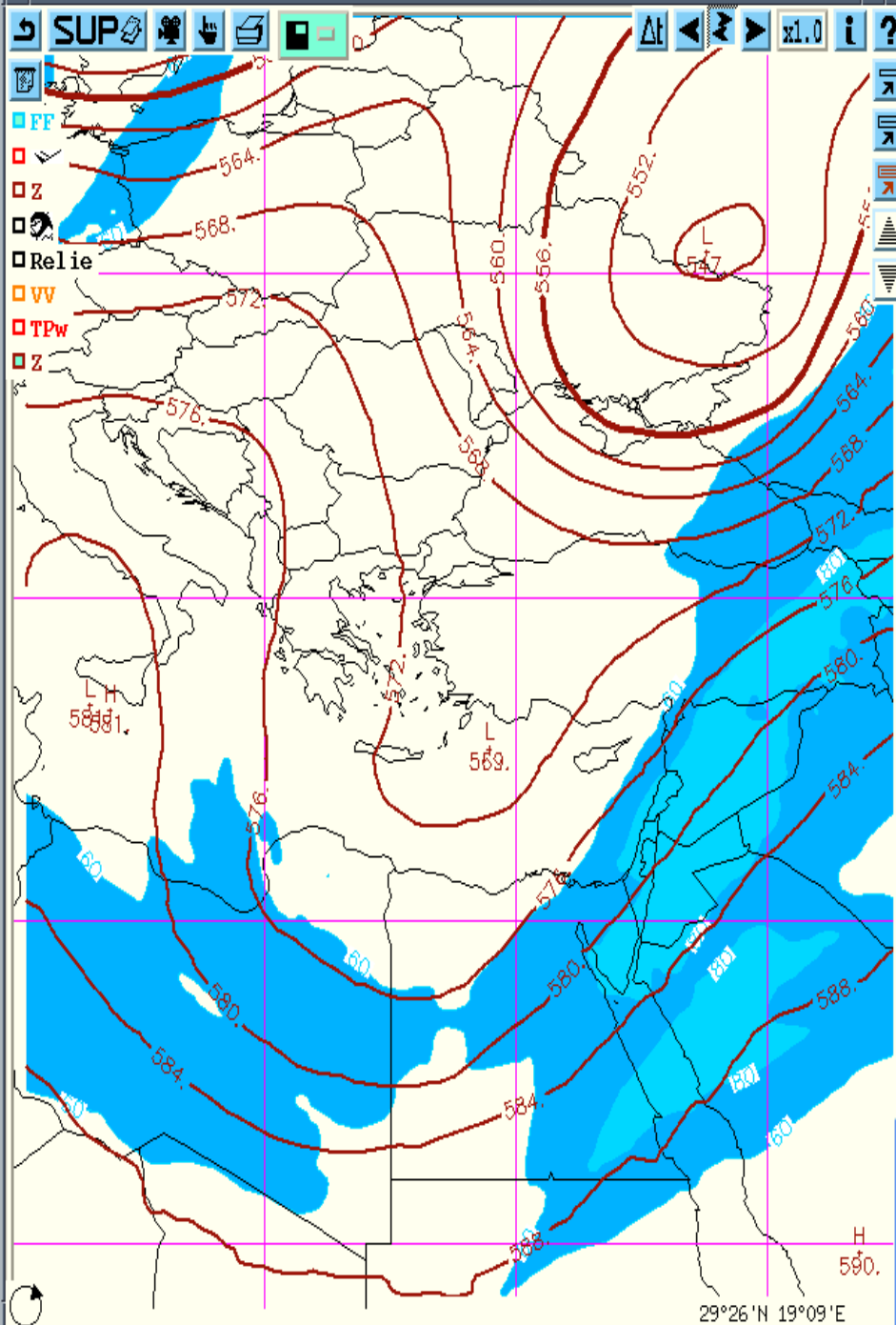
# (Z+T) 500 hpa 26 Oct 2015 (12& 18)UTC

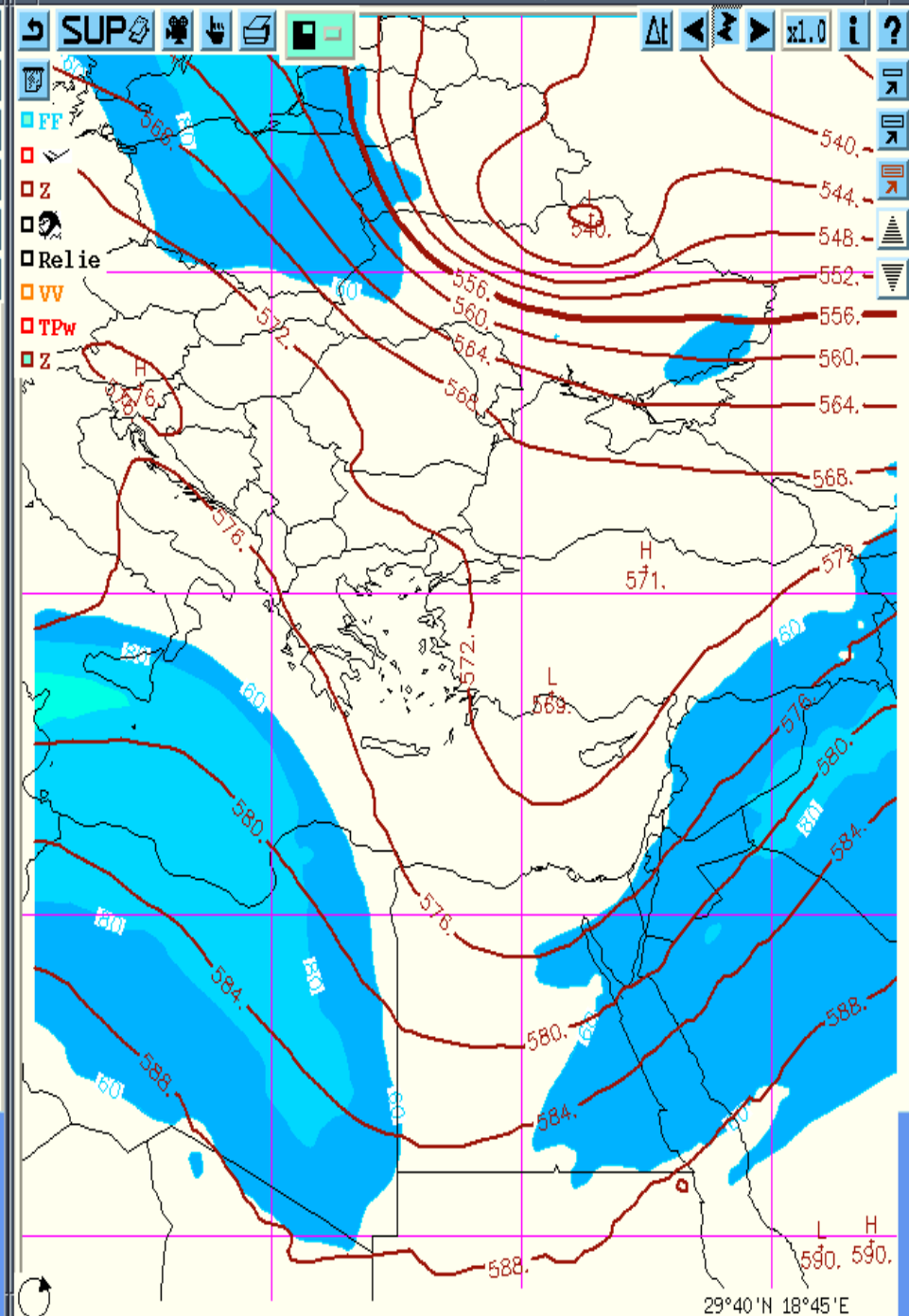
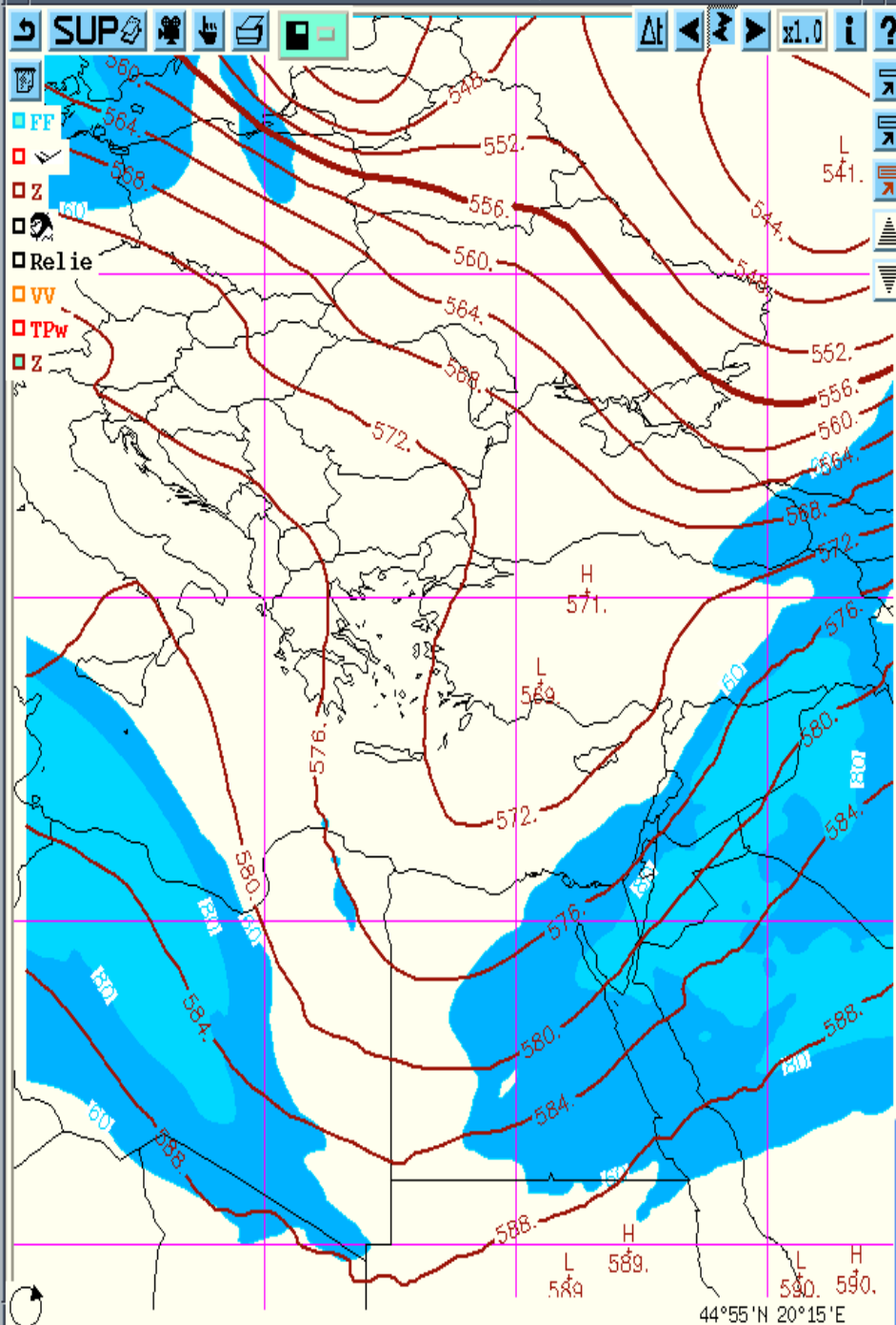






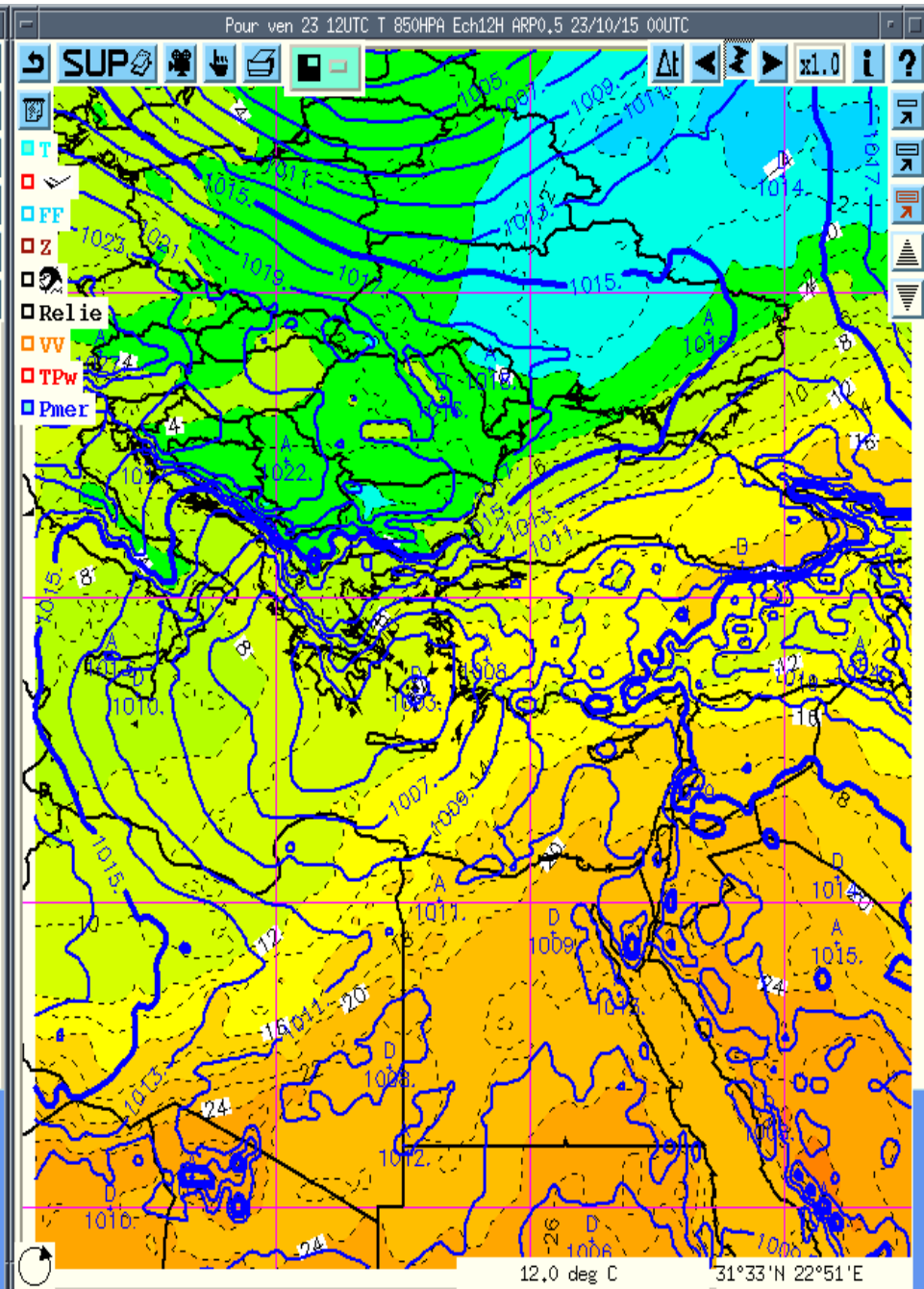
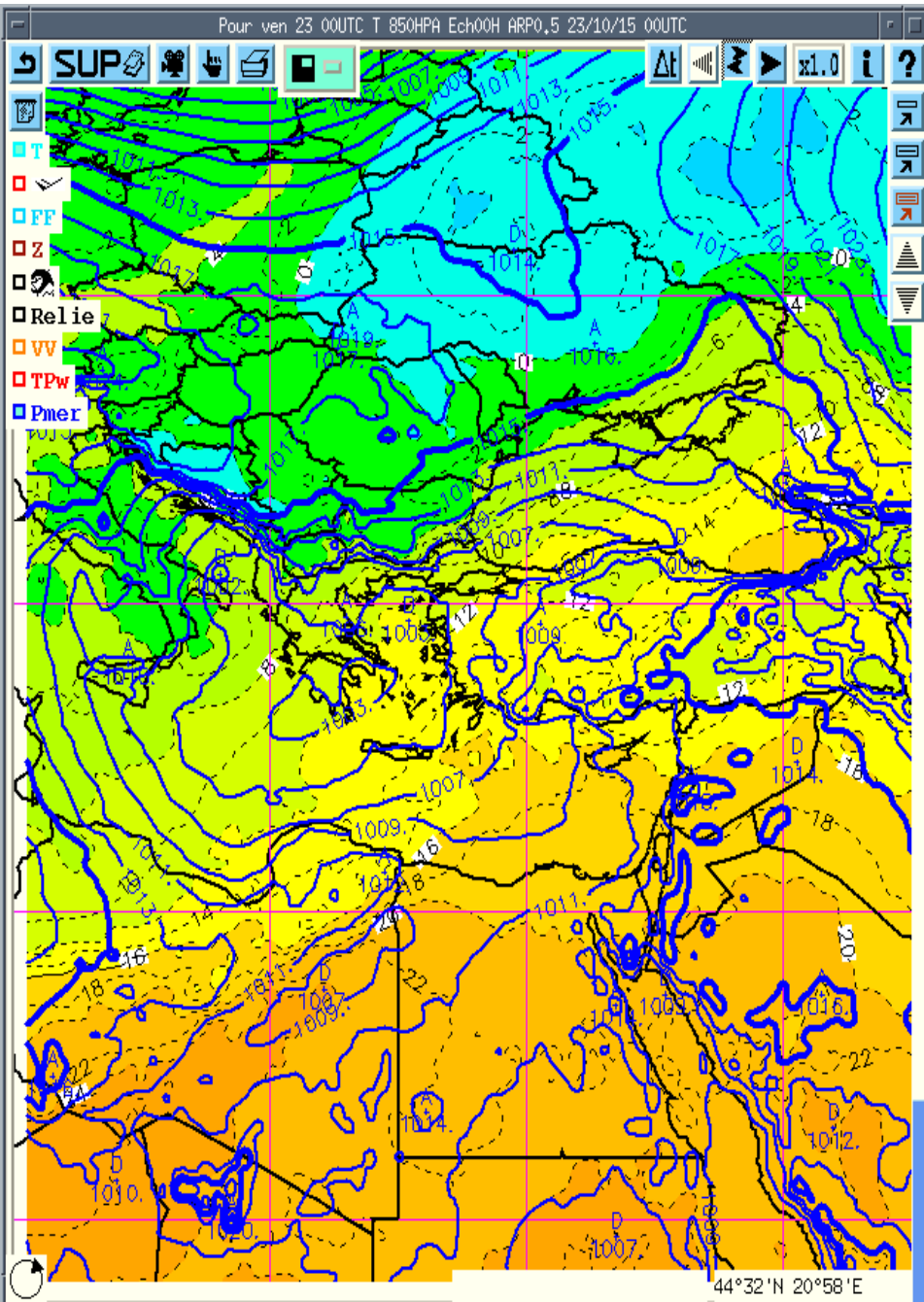


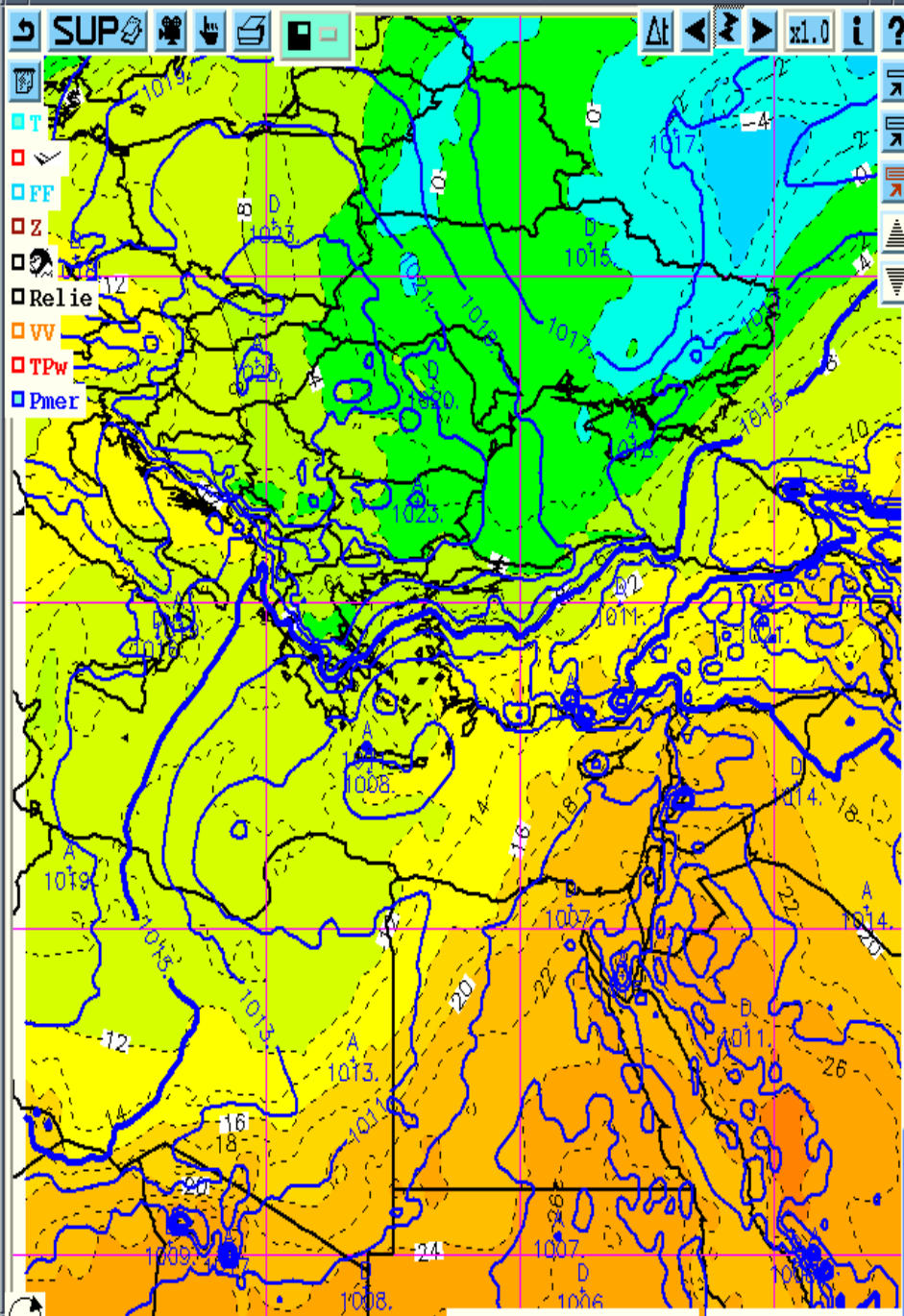
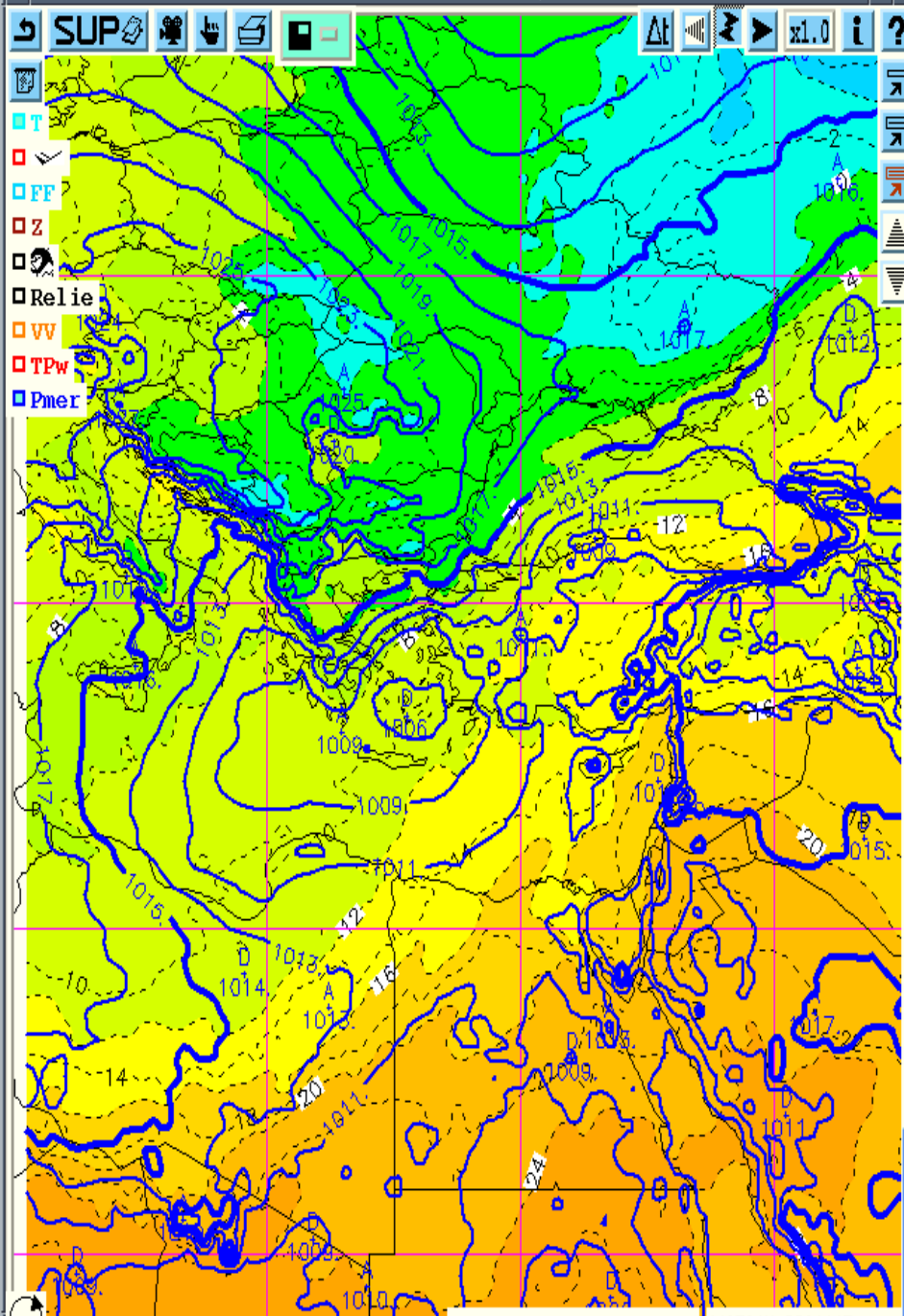


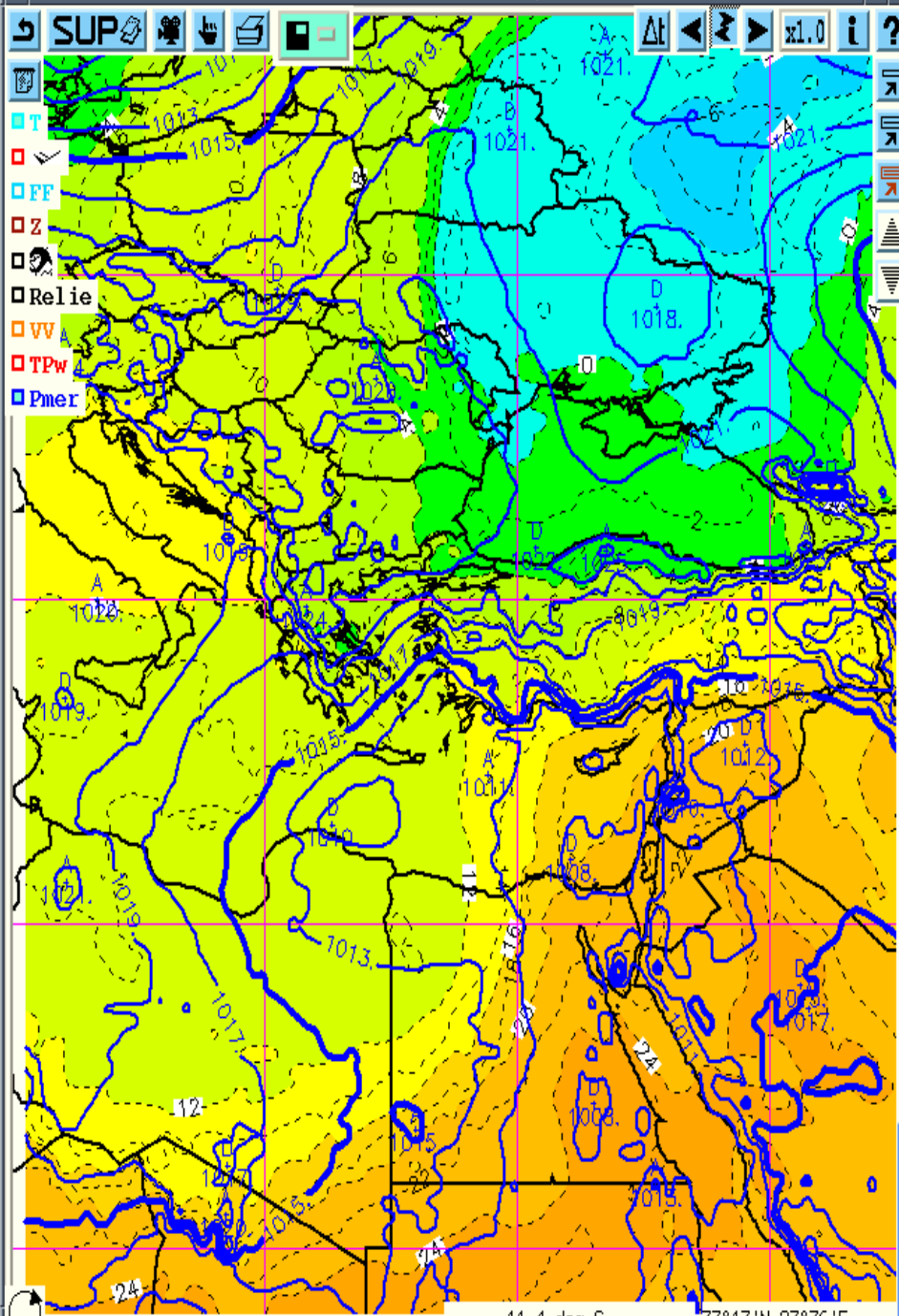
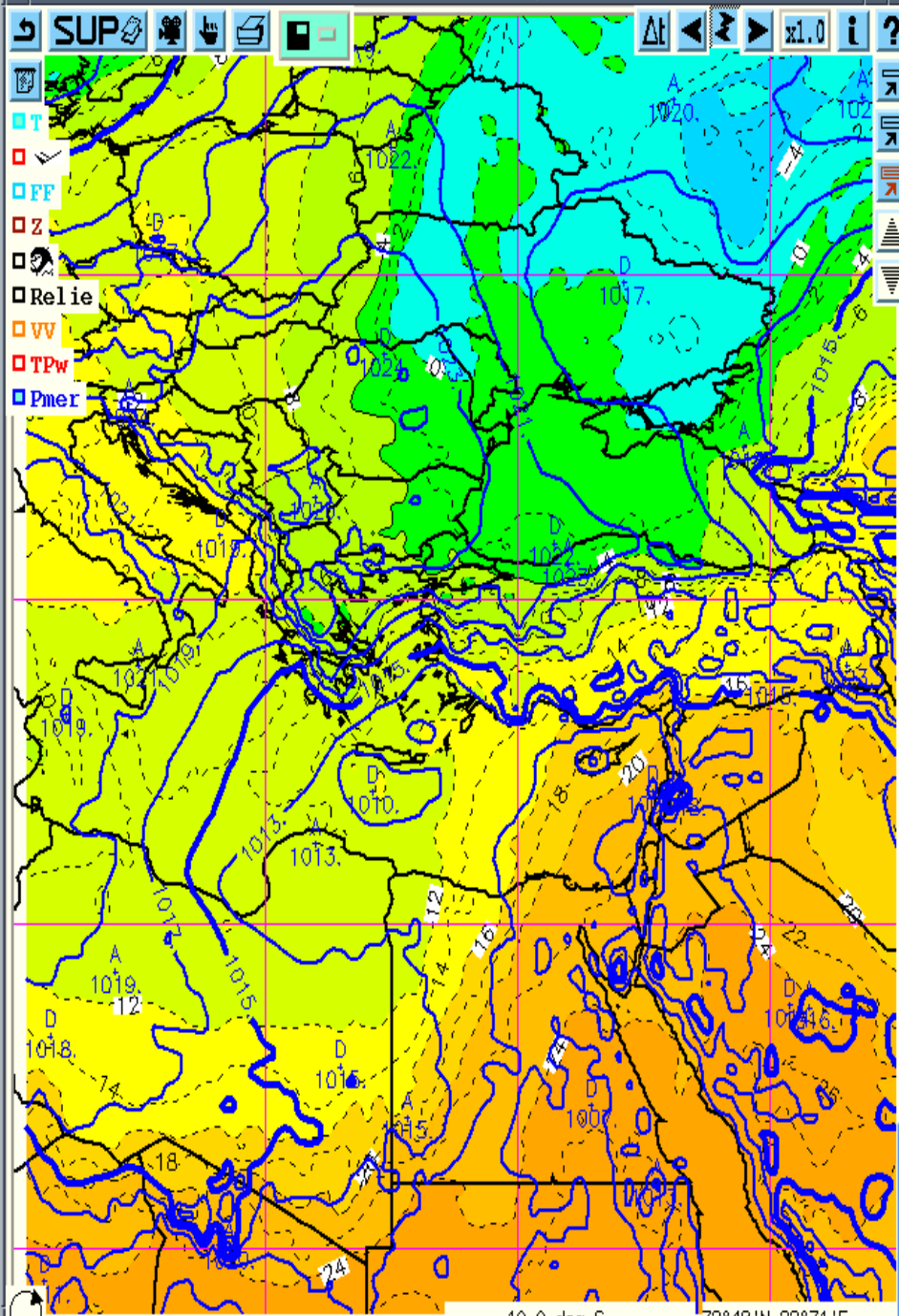


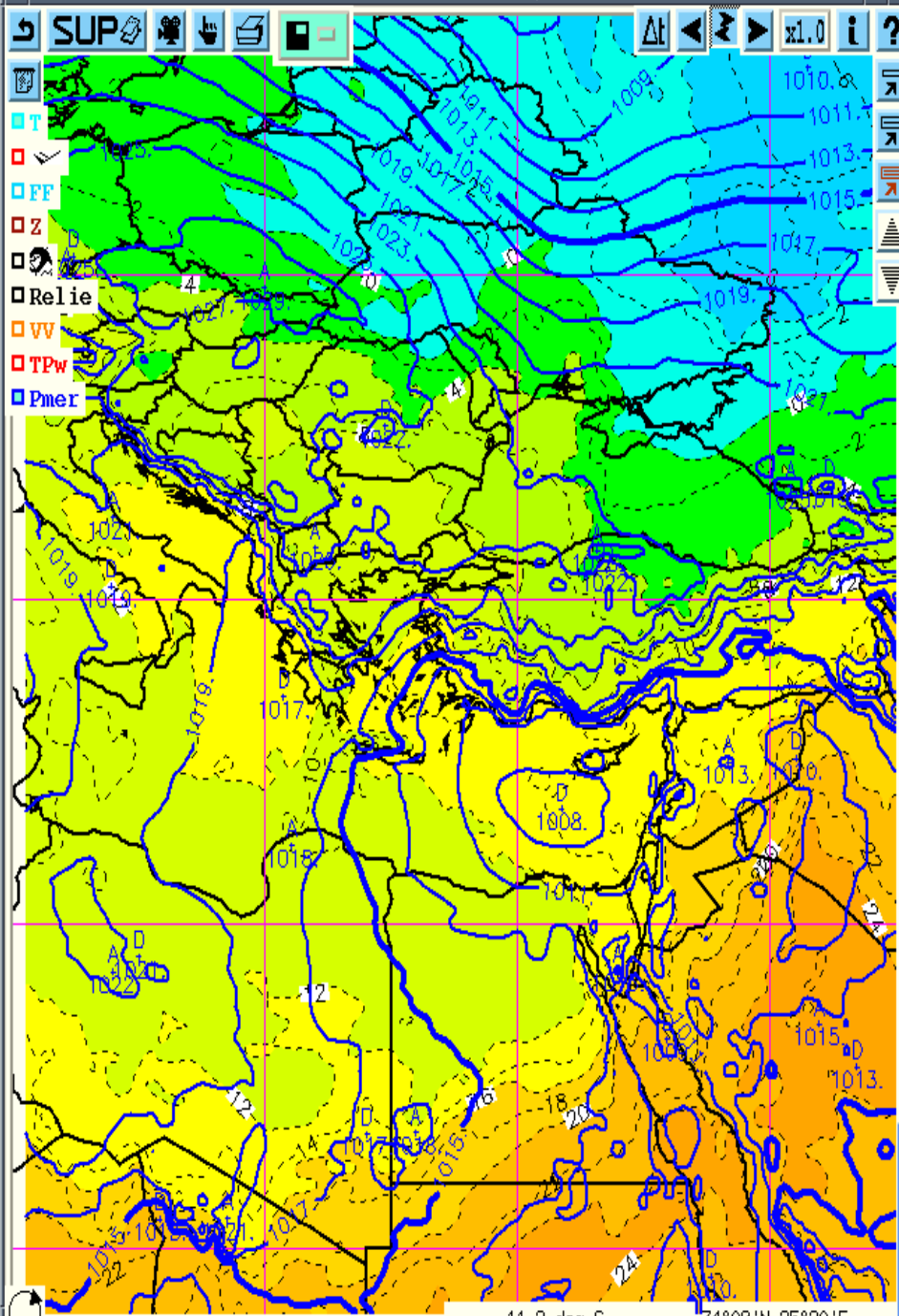
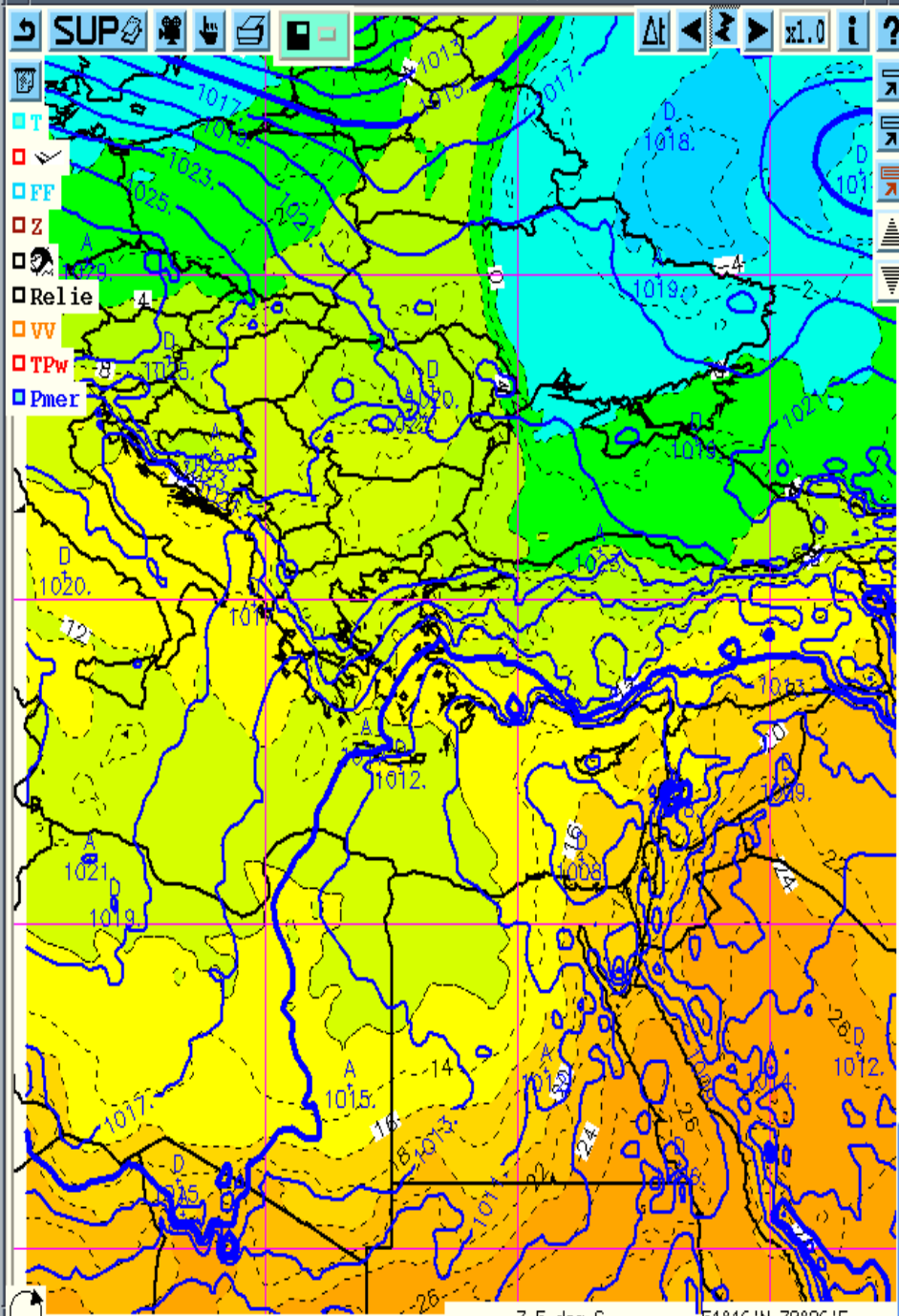


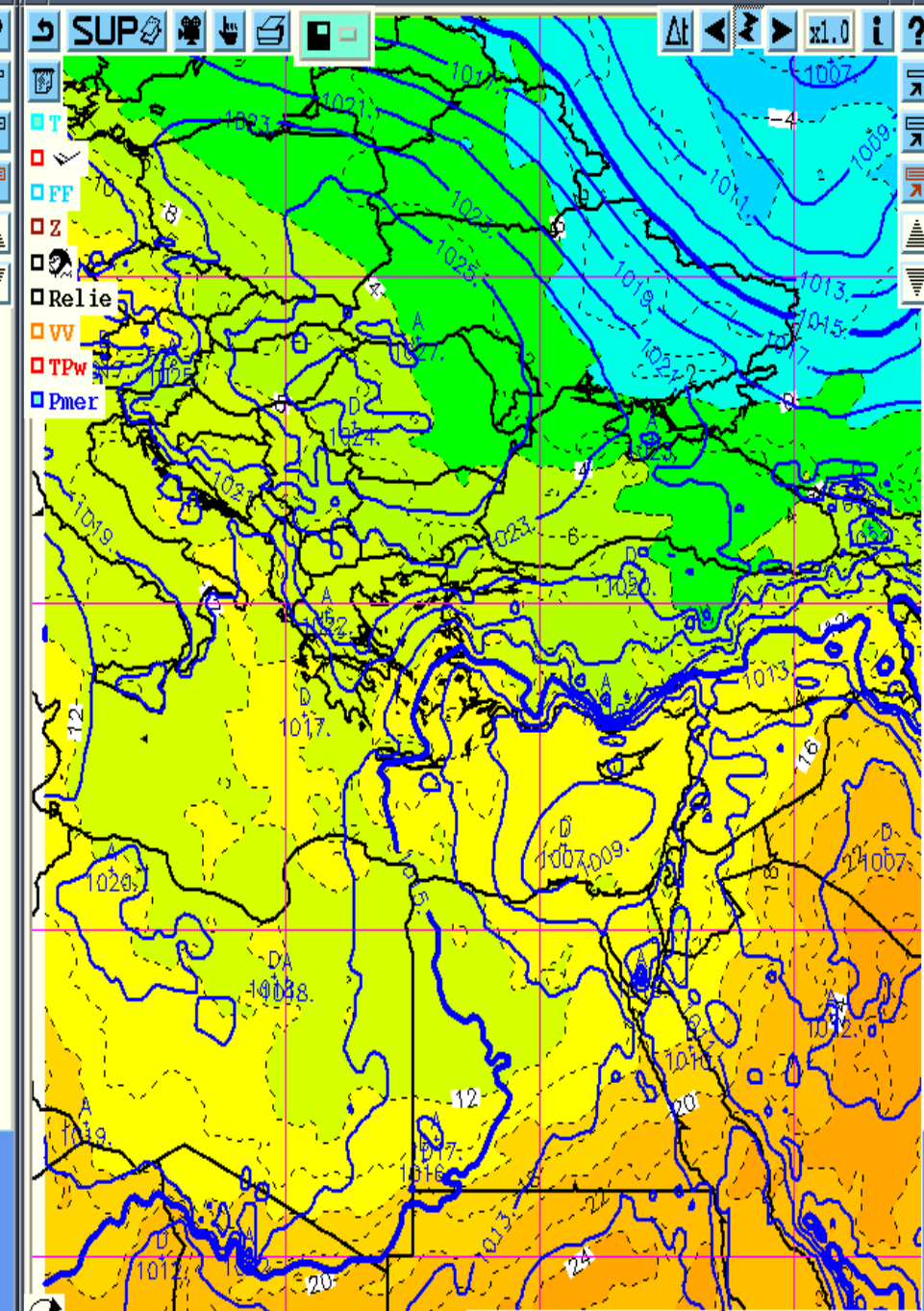
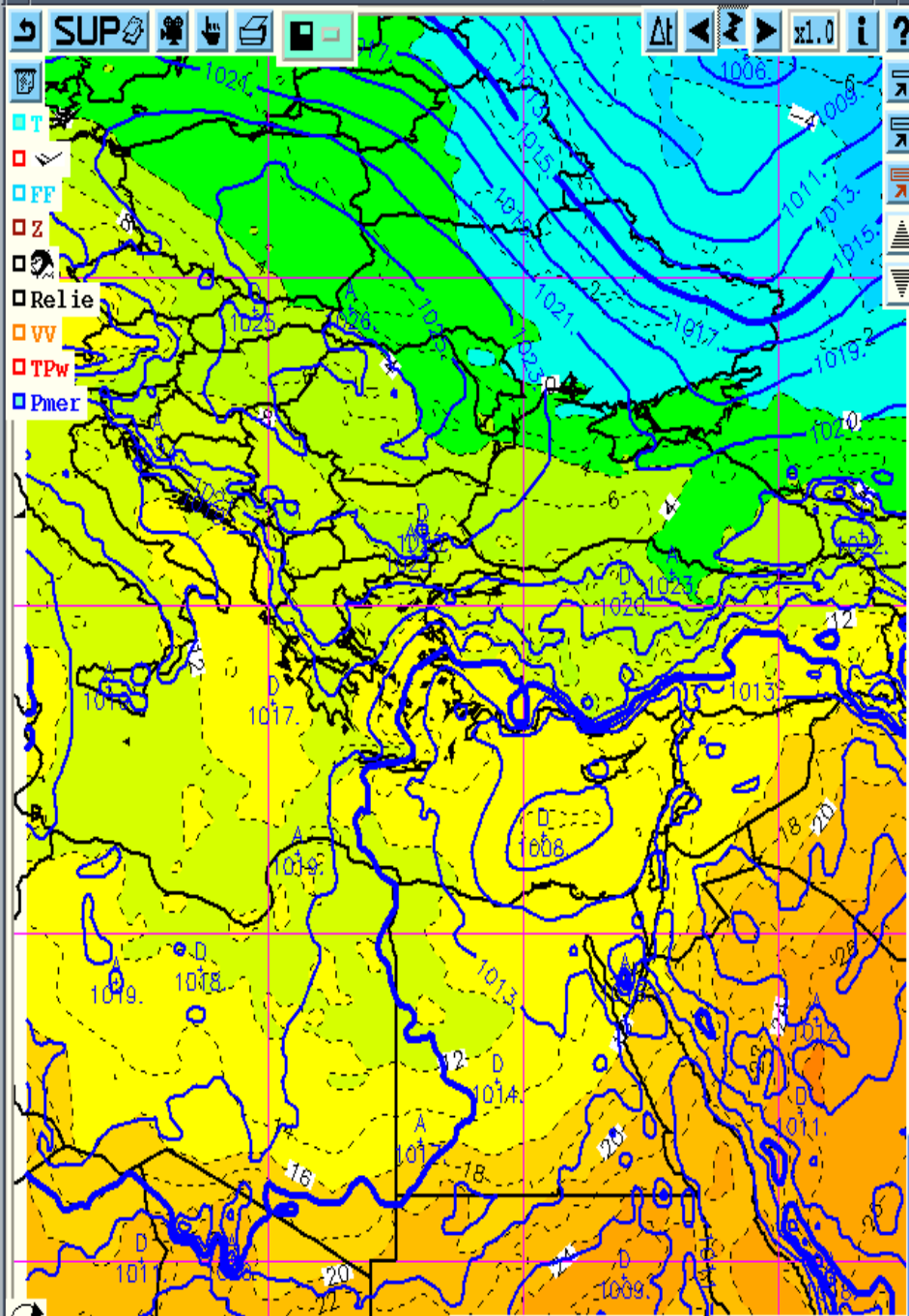
# Pmer +T 850hpa (23-26)Oct 2015

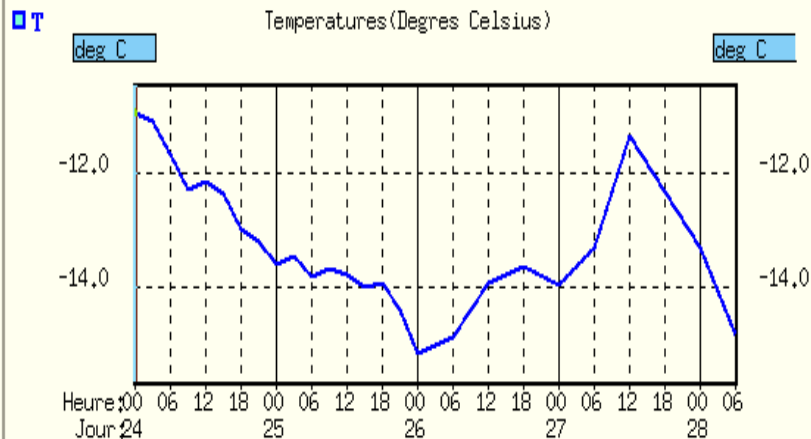
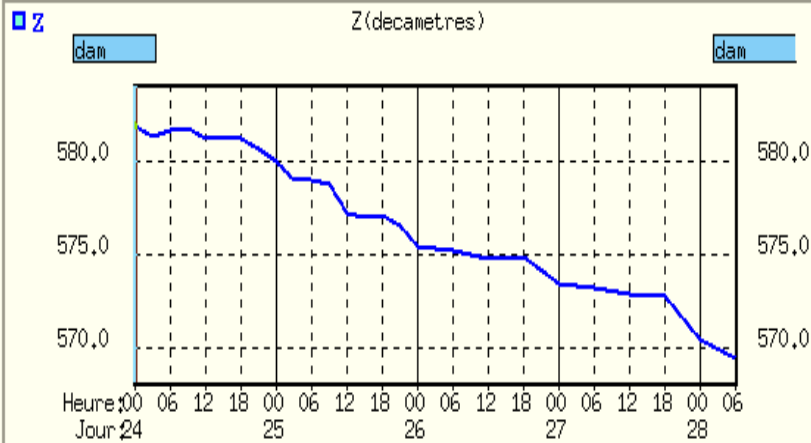








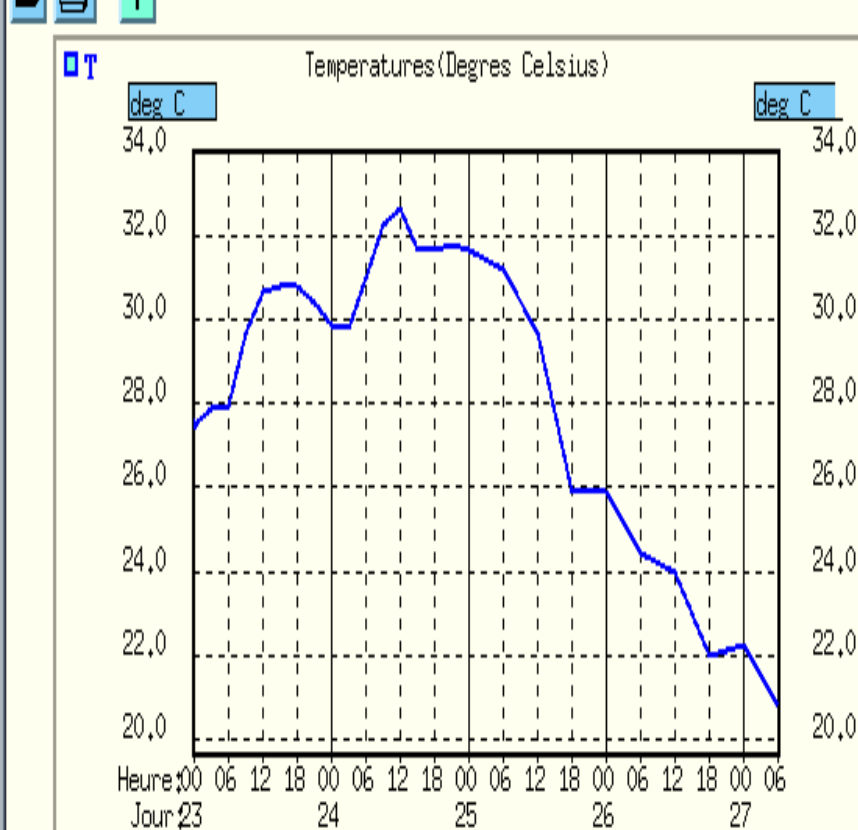




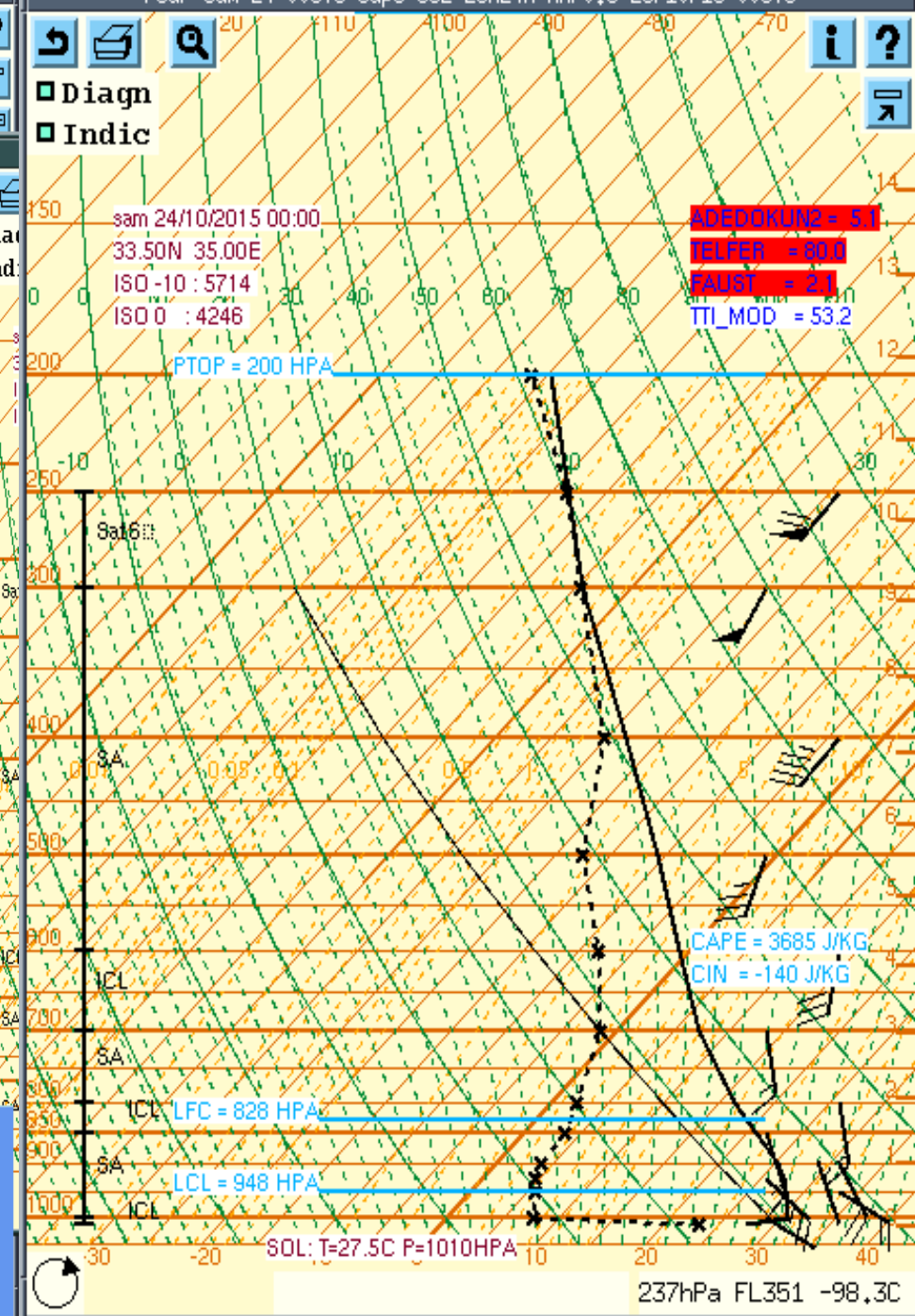
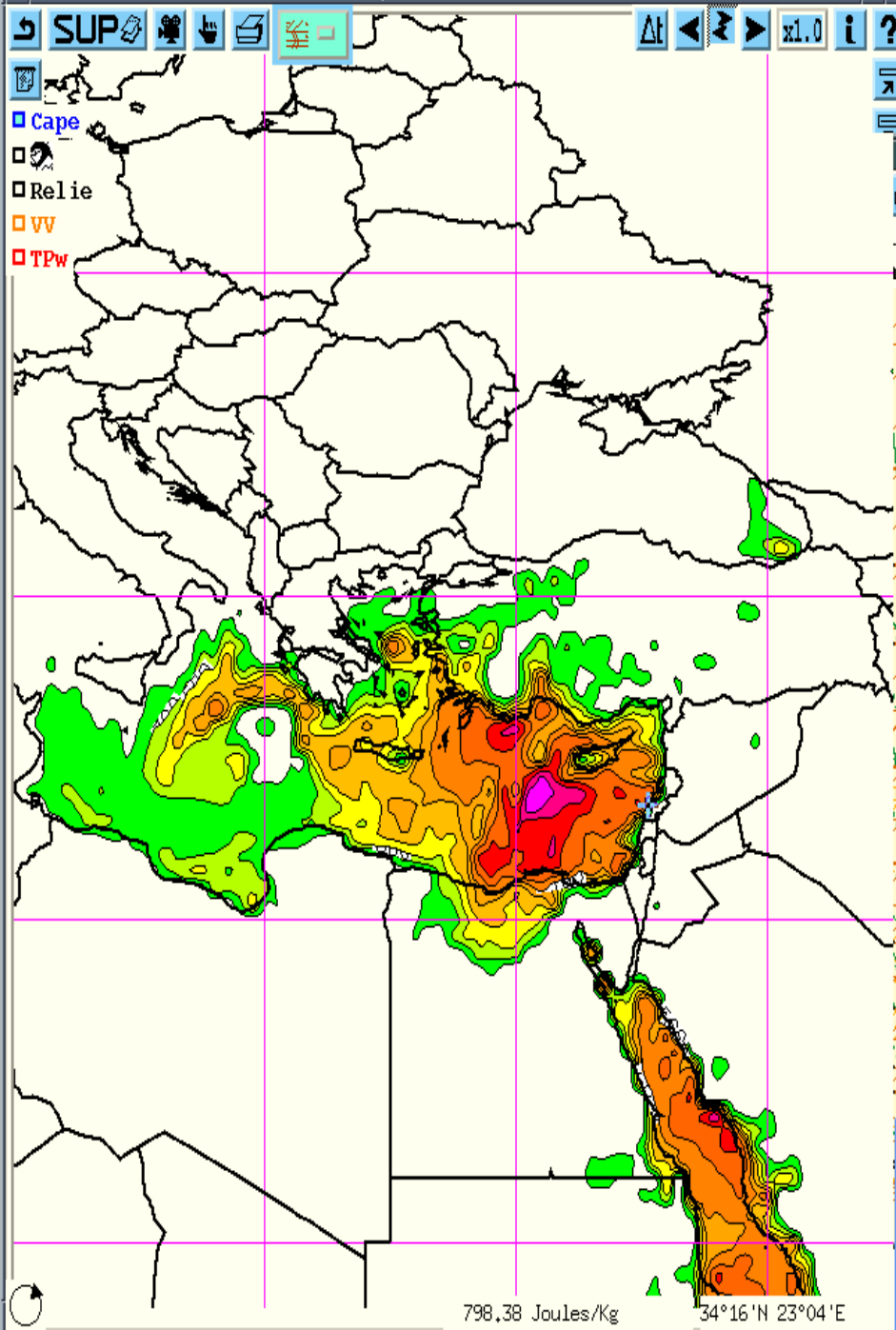
Graphe 1:  
33°55'N 35°30'E :(dam) Z102 500HPA ARP0,5

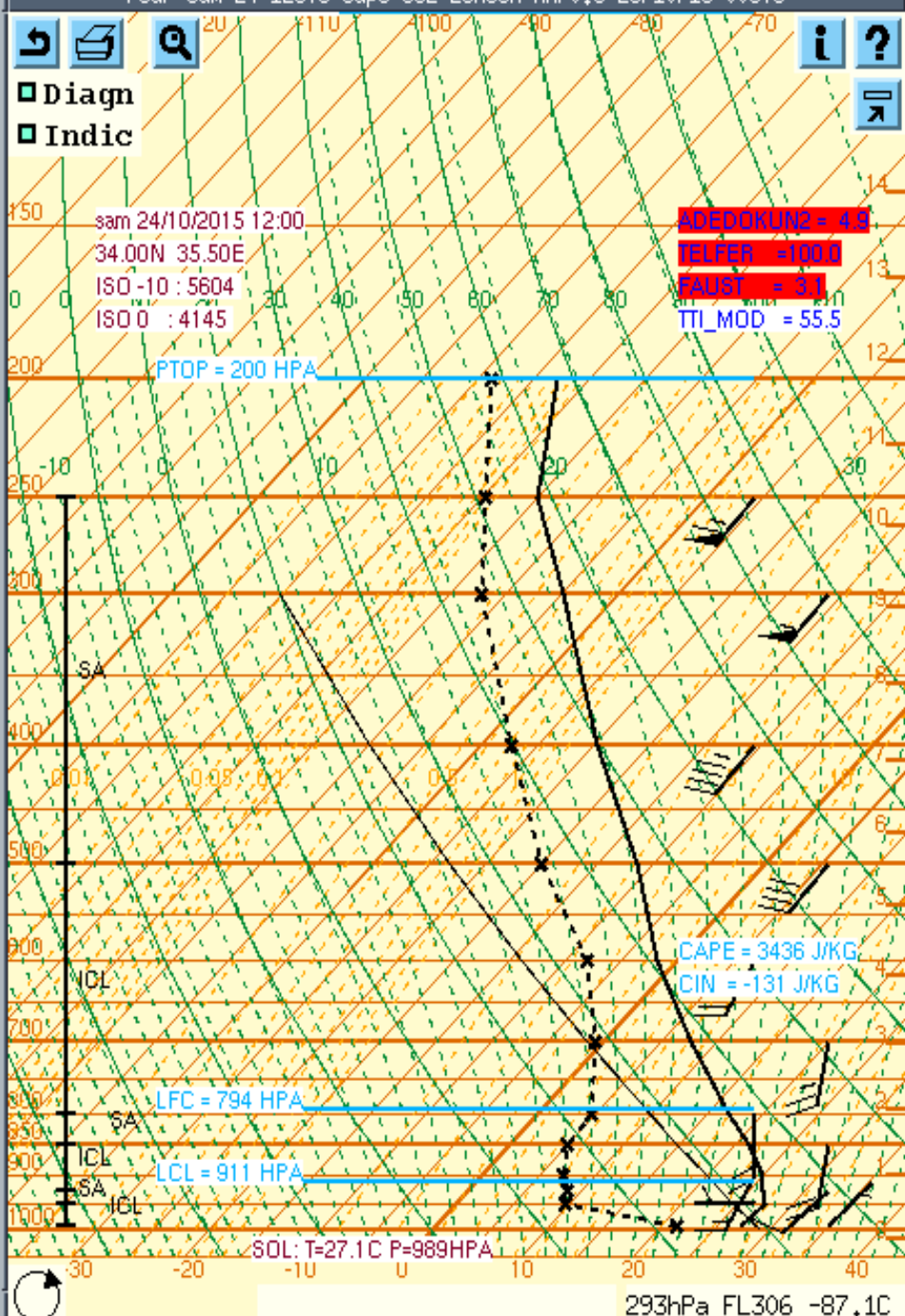
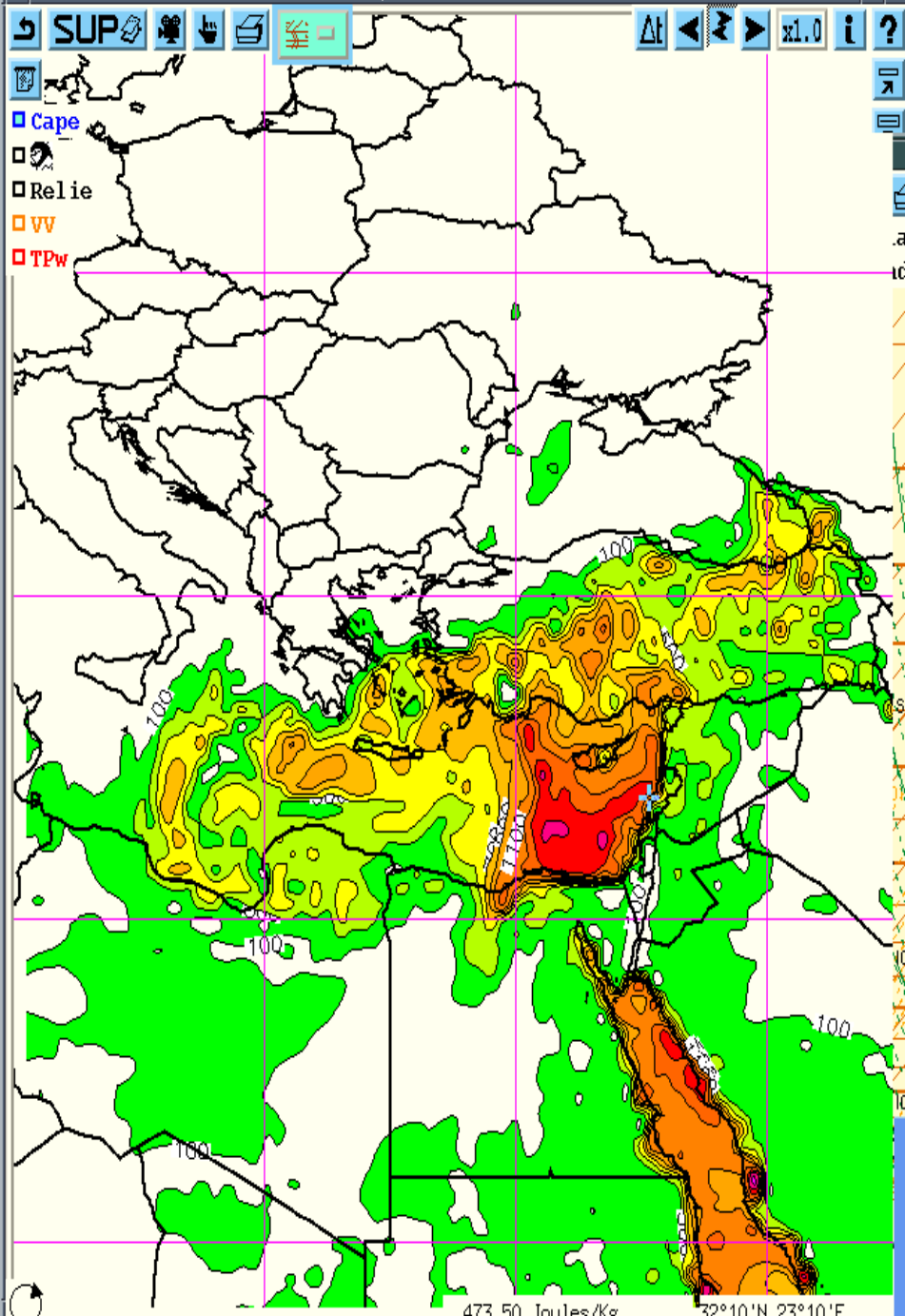
Graphe 2:  
33°55'N 35°30'E :(deg C) T102 500HPA ARP0,5

Regle: 24/10/2015 00:00 Ecart:

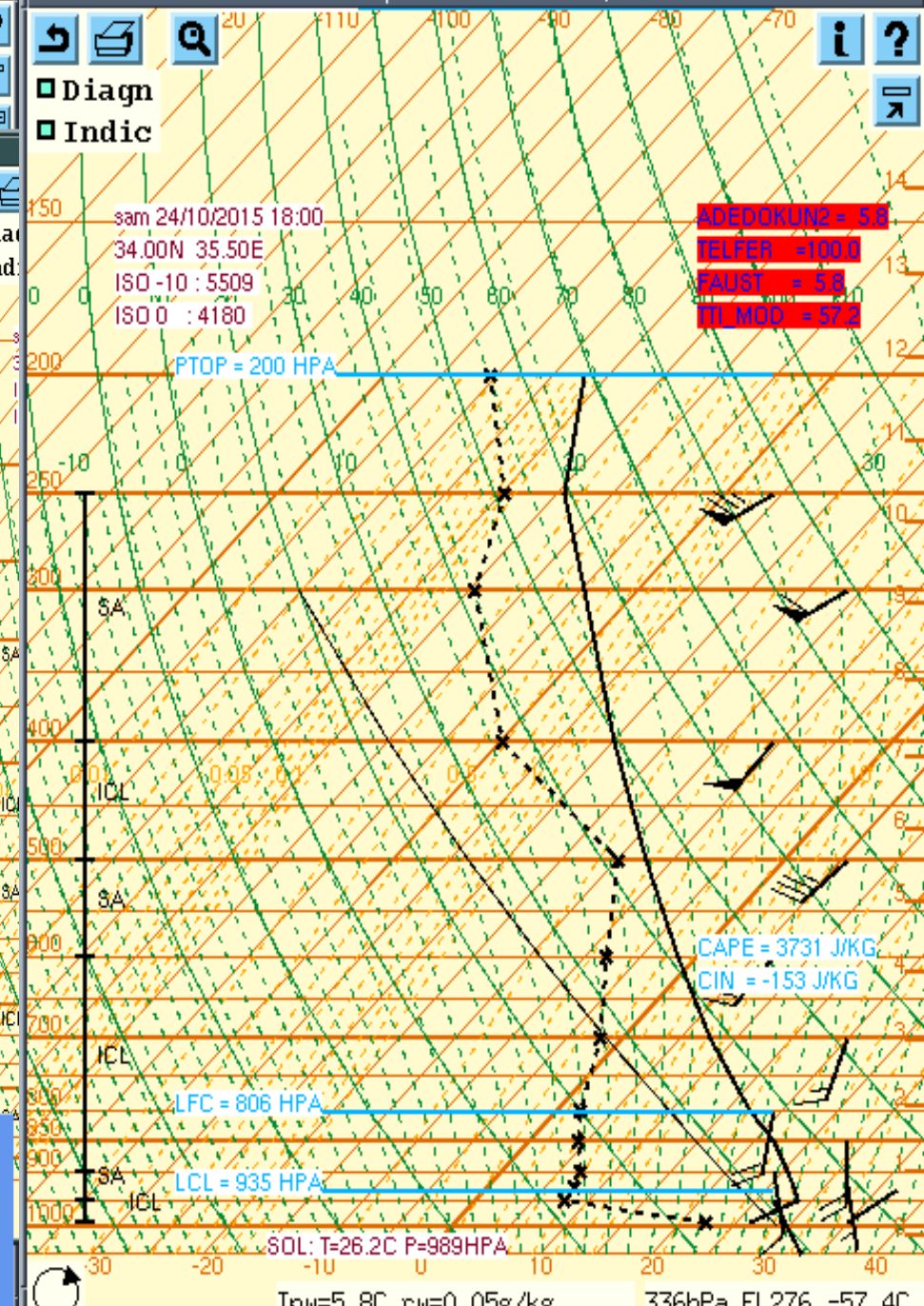
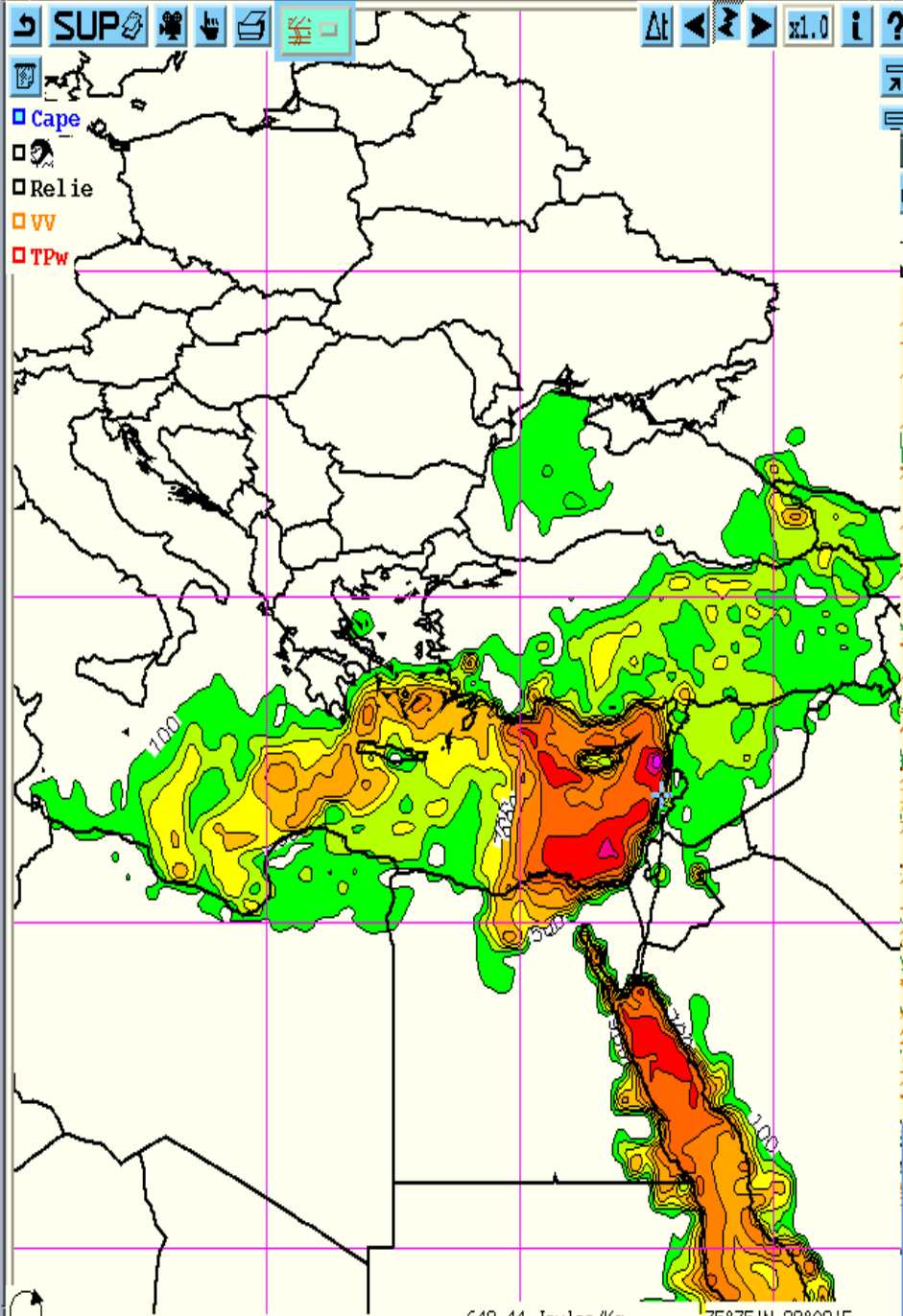


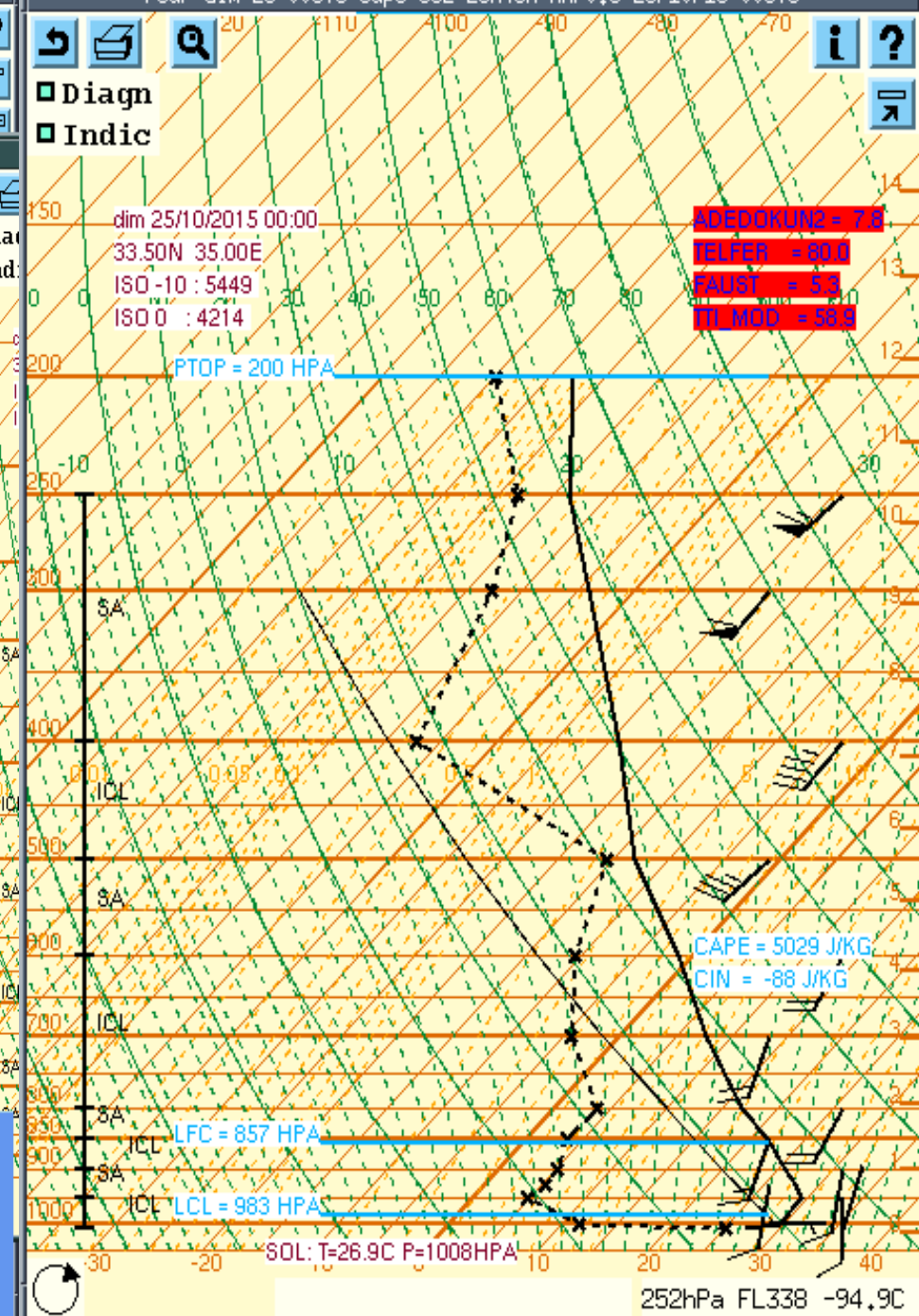
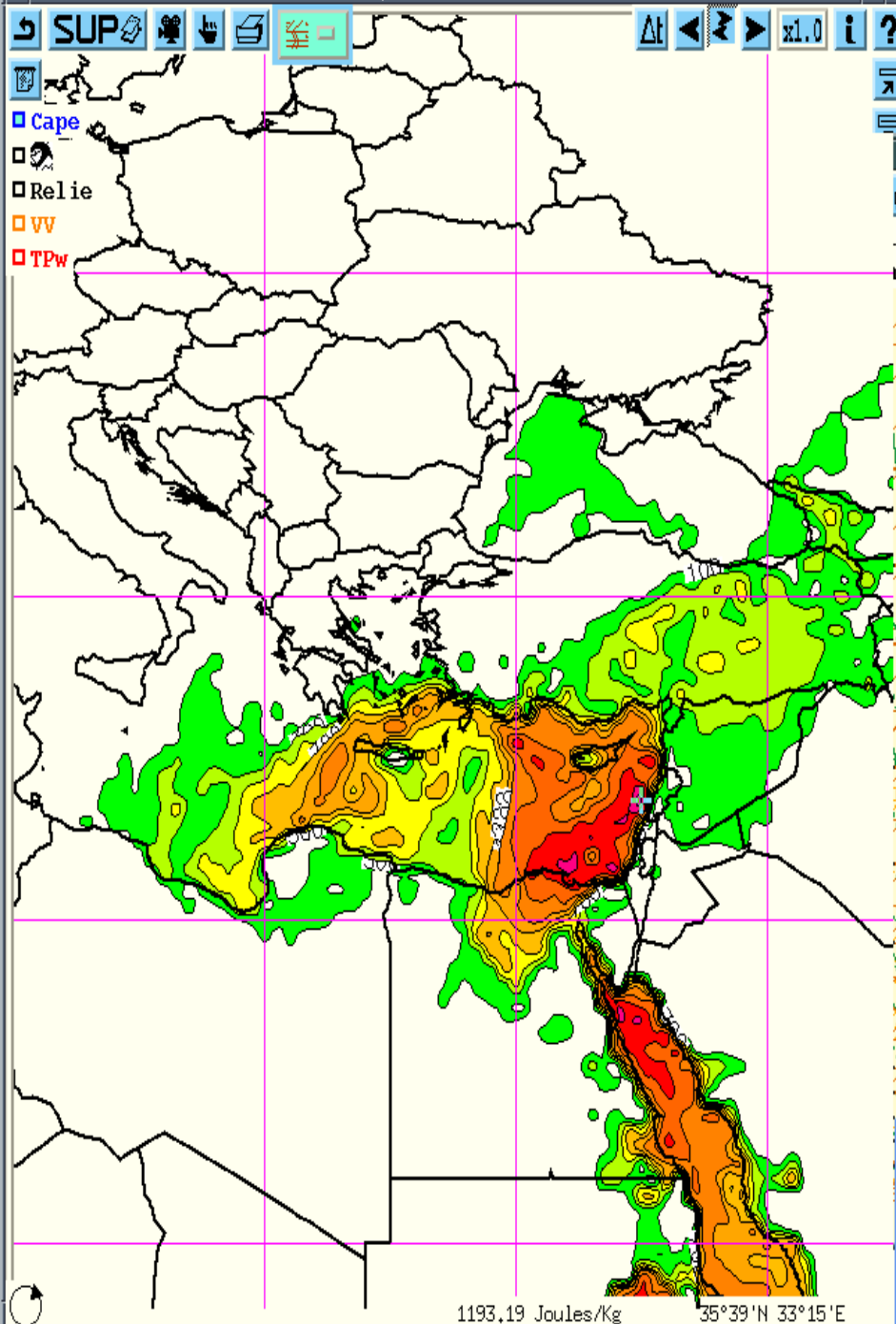
Graphe 1:  
33°19'N 35°24'E :(deg C) T102 1000HPA ARP0,5

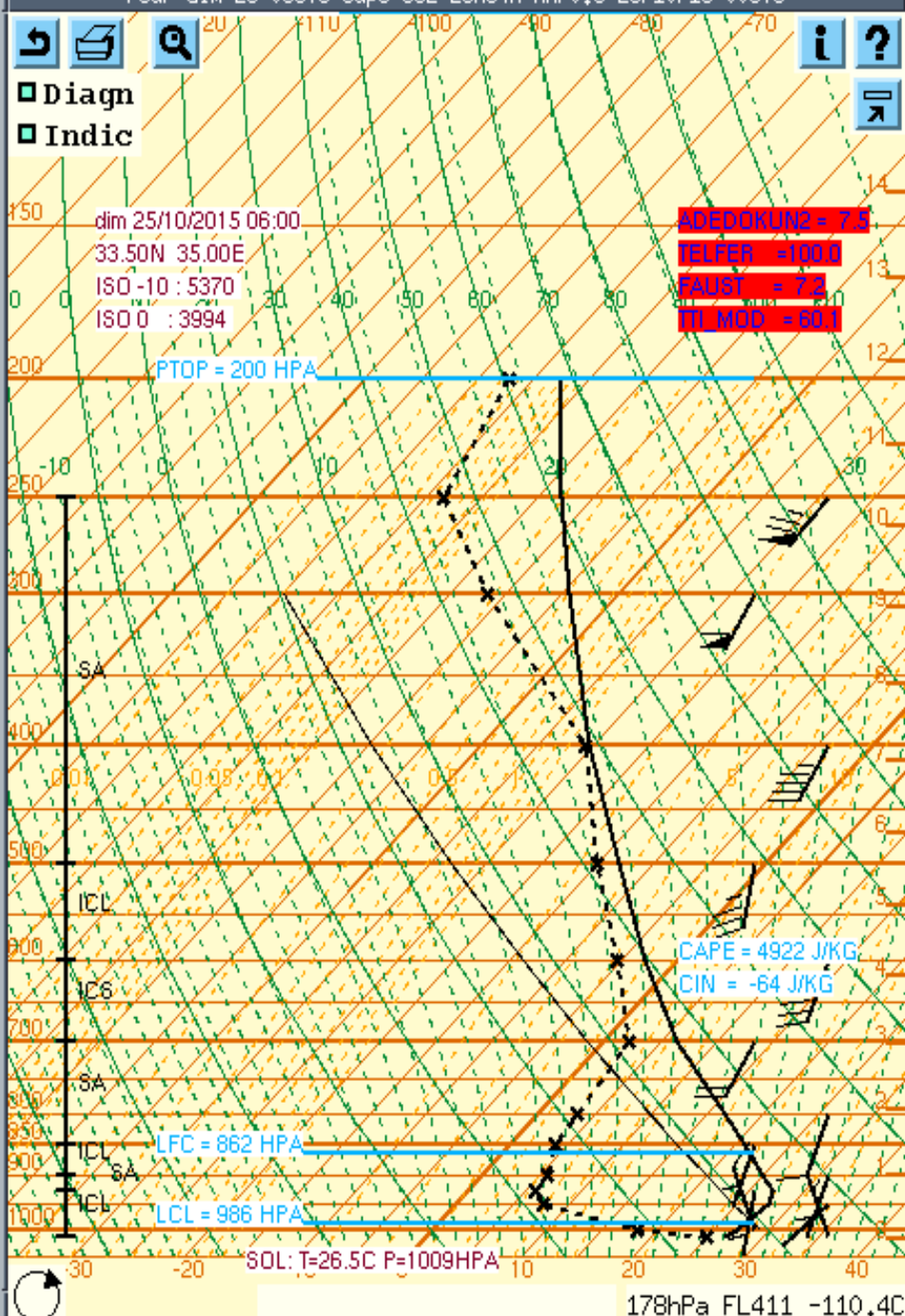
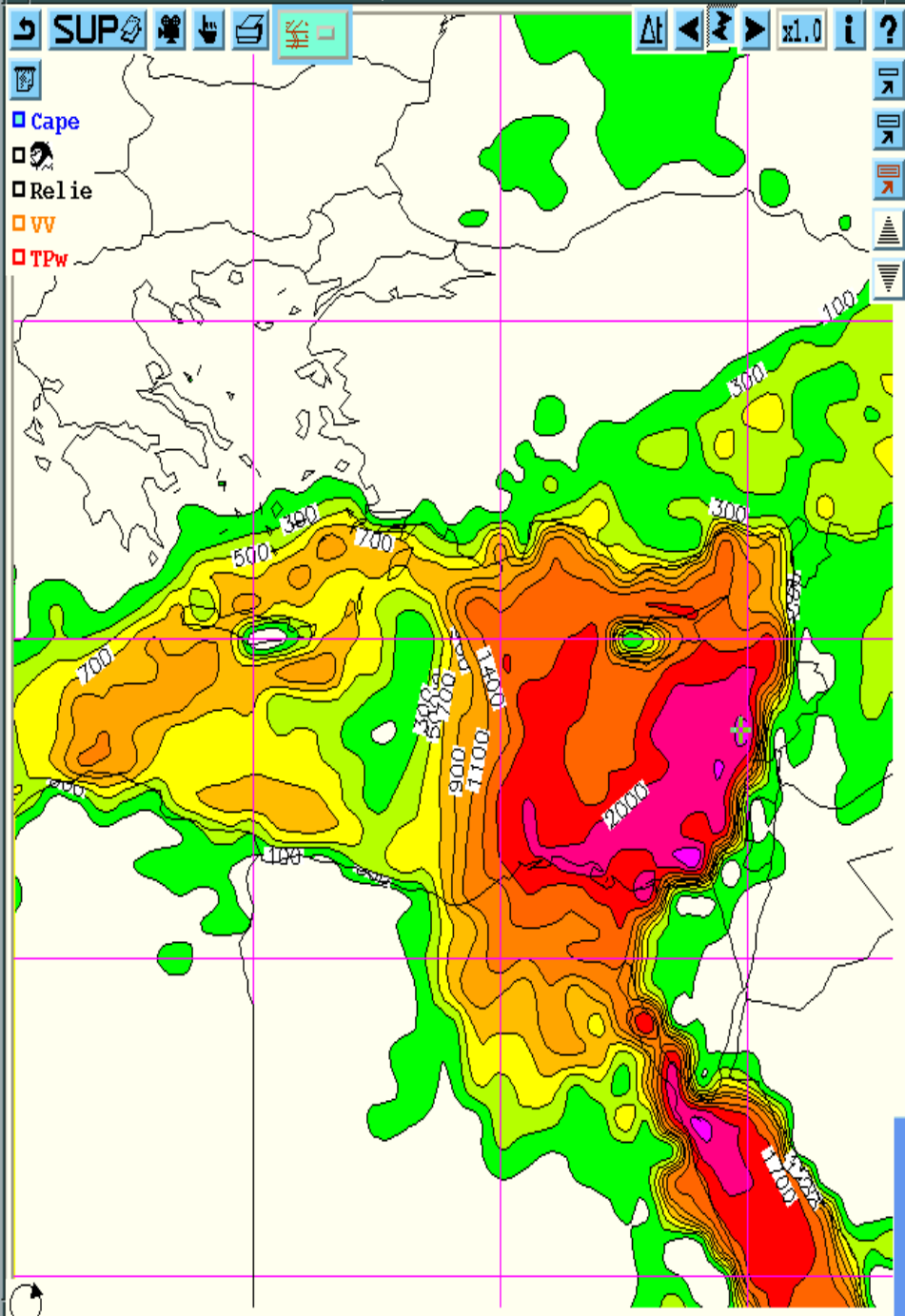


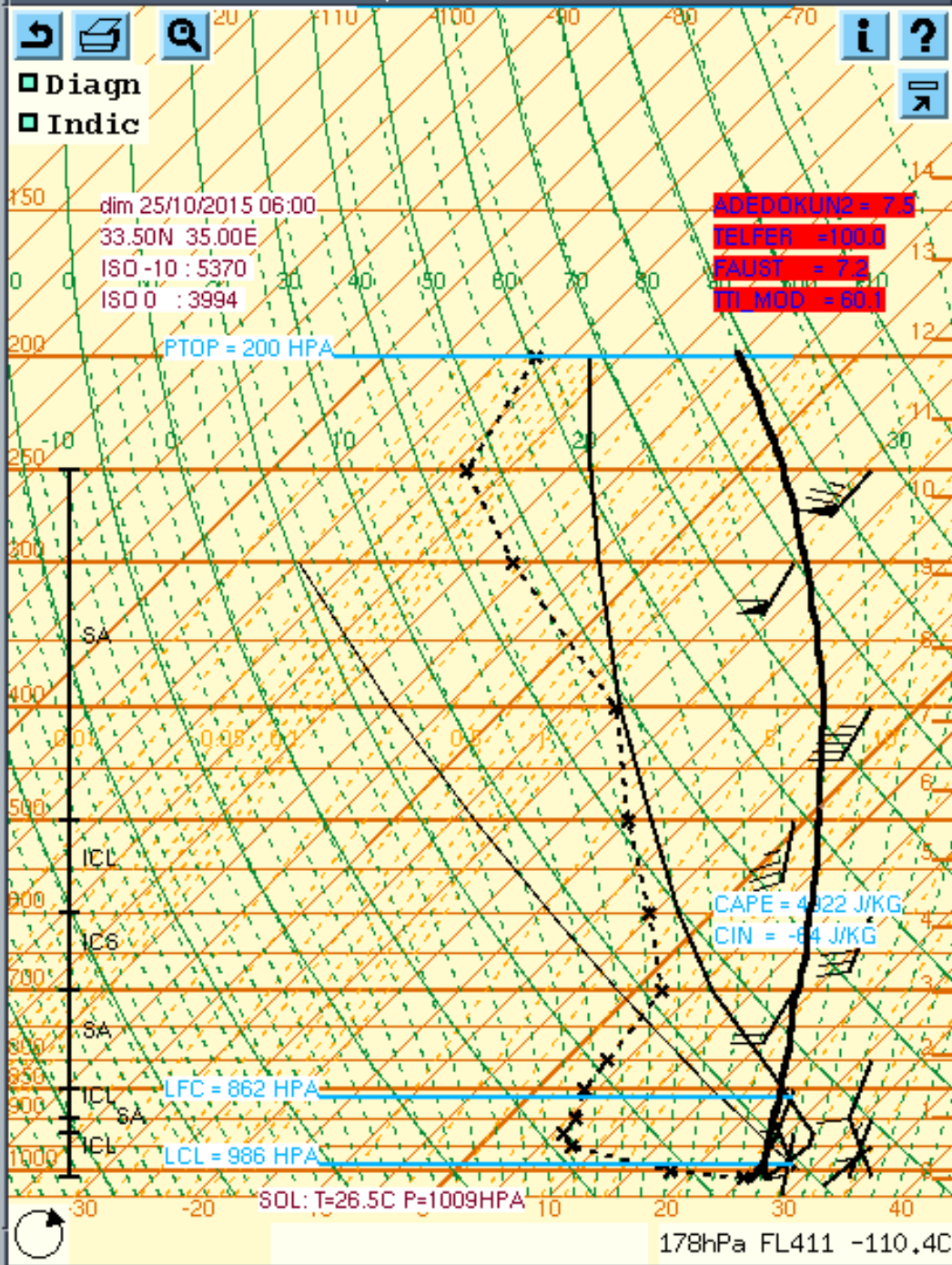




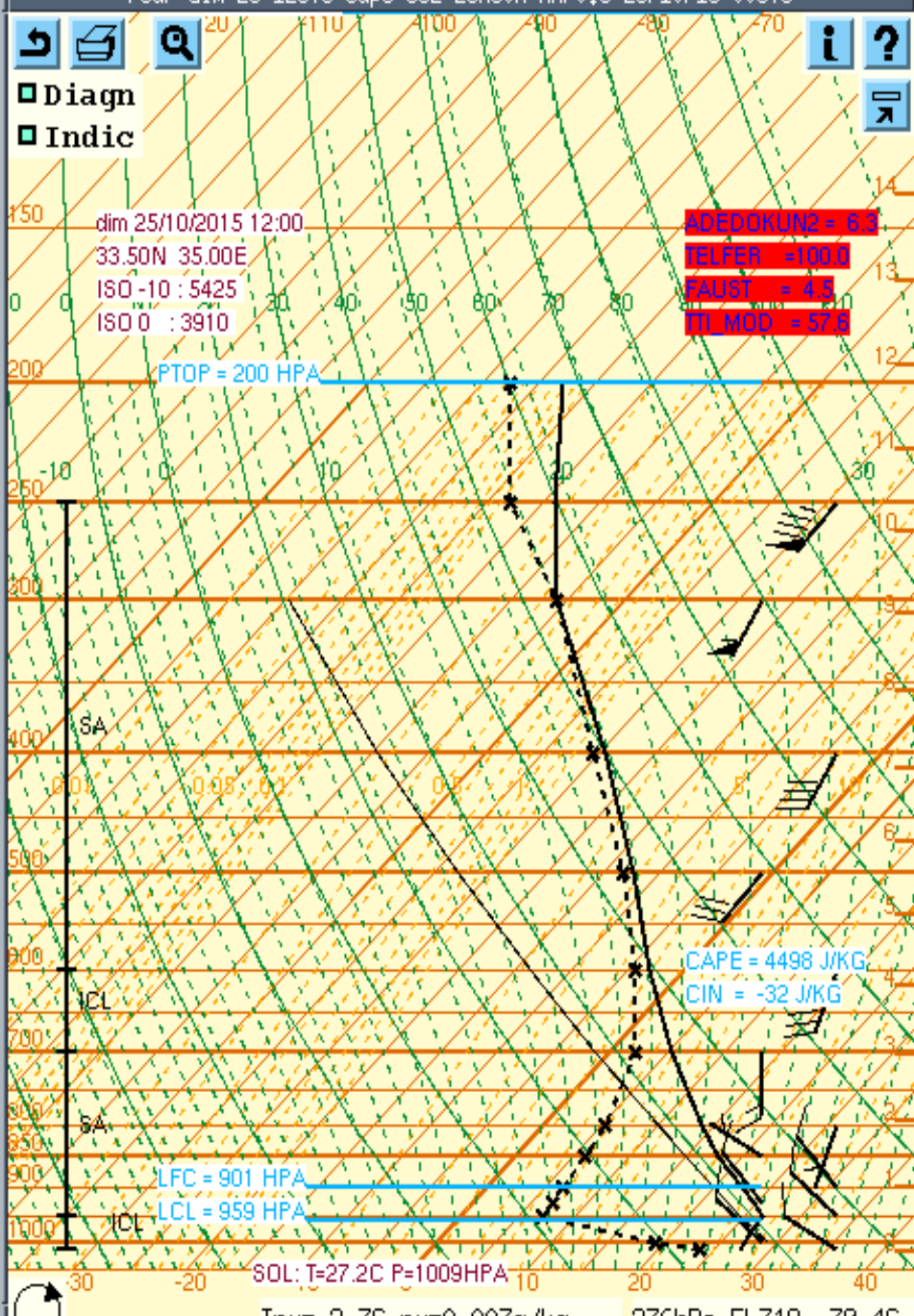
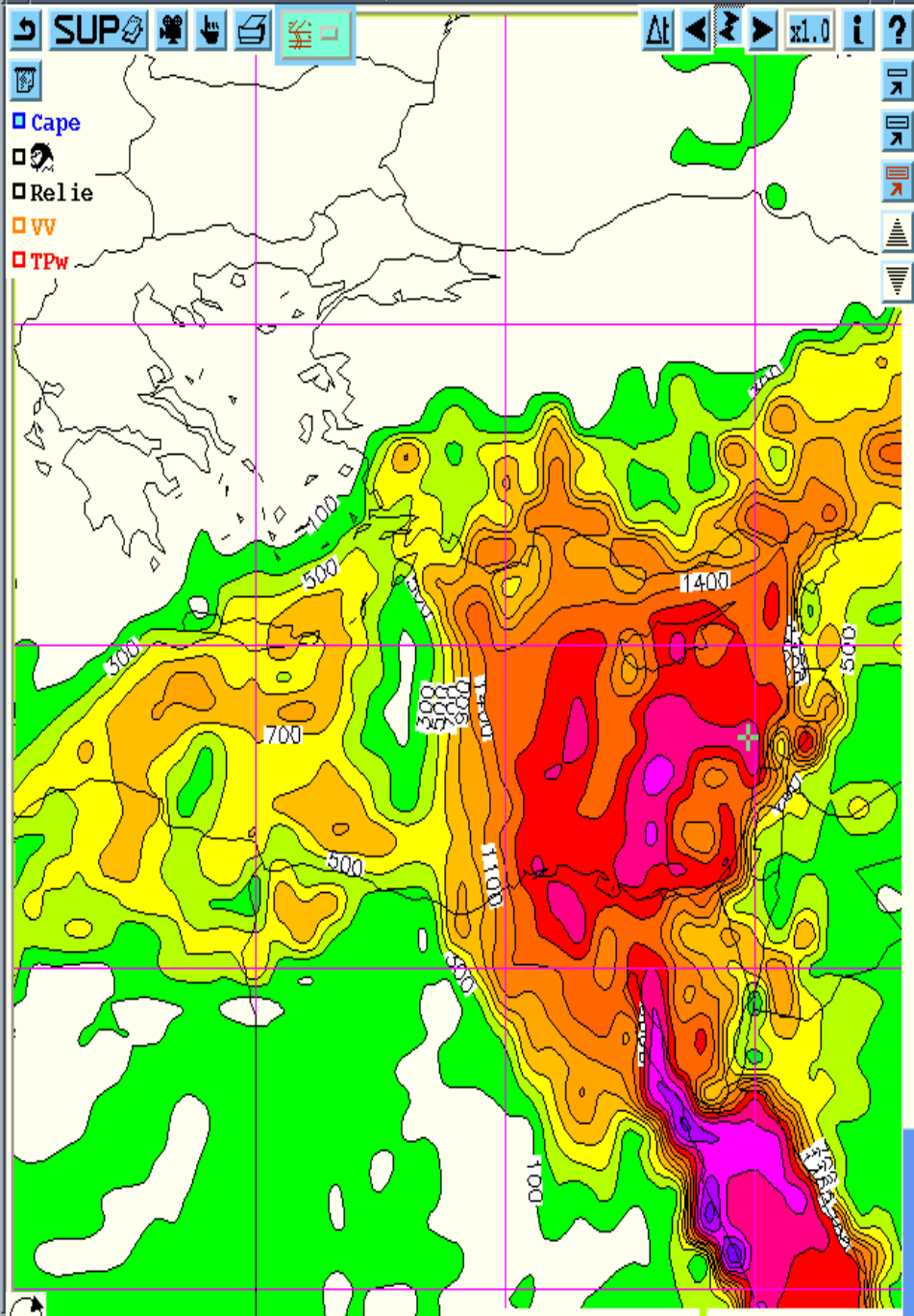


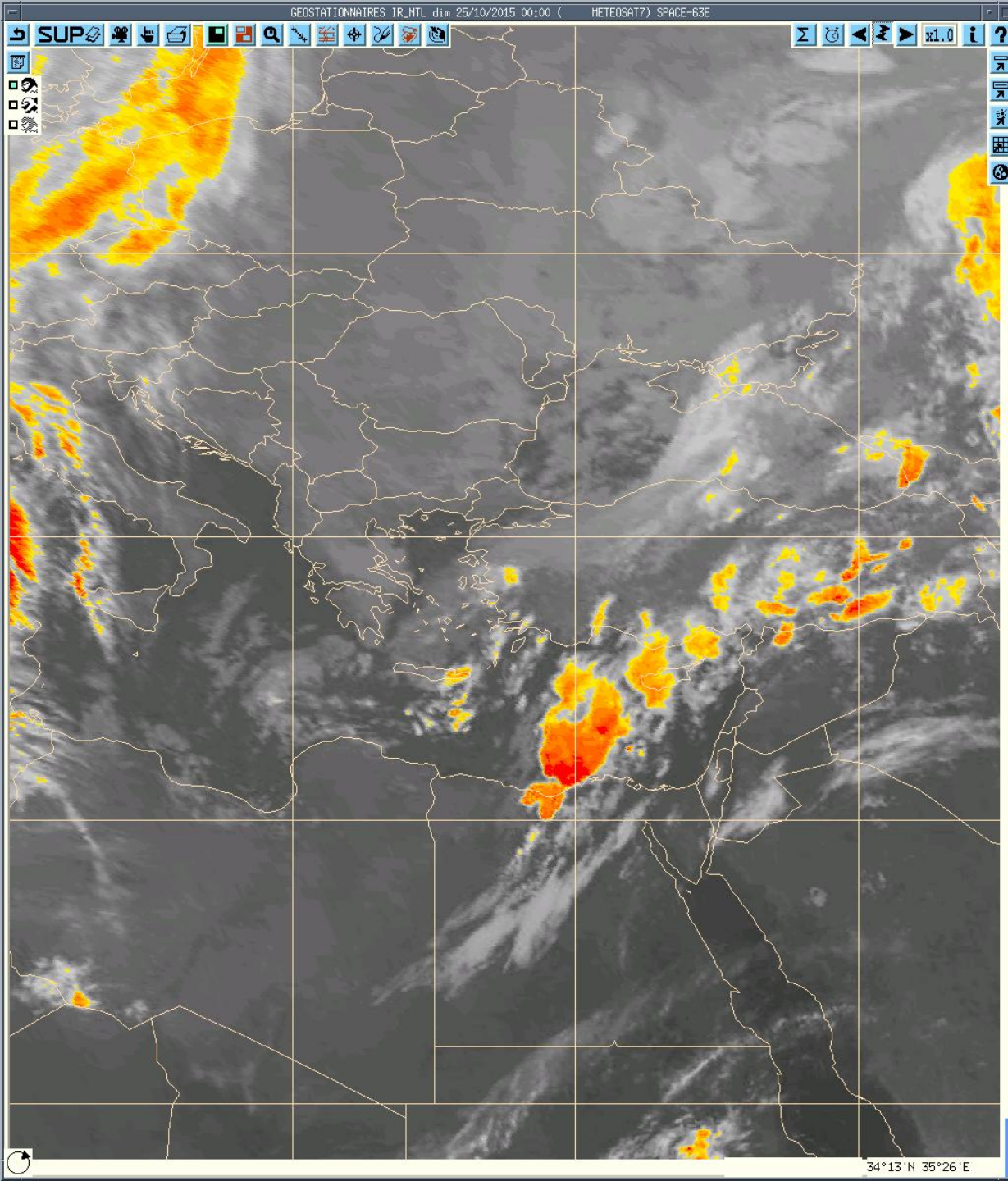




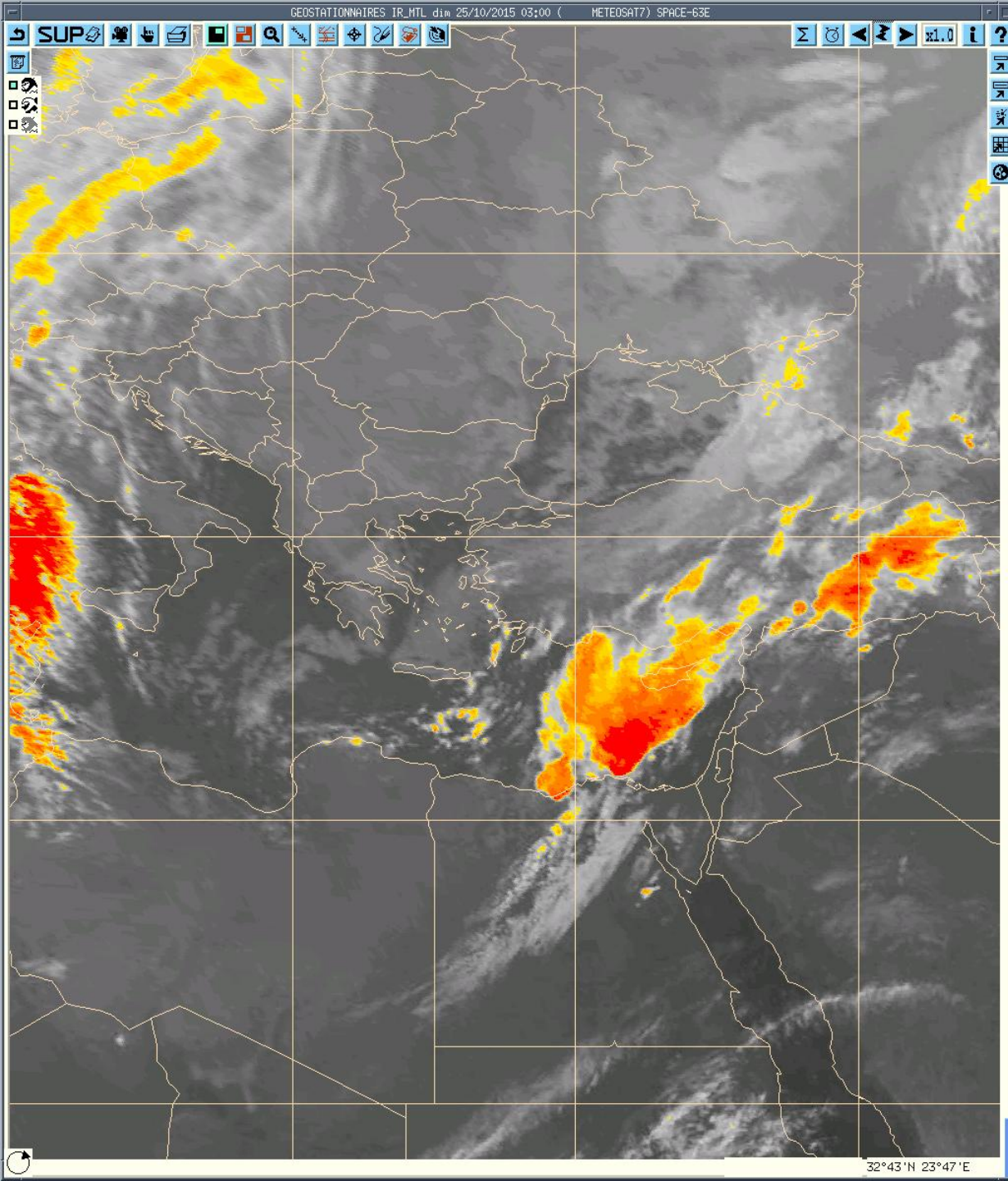


- $L57 = 7 - (-13) = 7 + 13 = 20 > 9$  means incredibly Unstable.
- $LI = -13 - 2 = -15 < -11$  also extreme ridiculous instability.
- $TT = 22 - (-13) + (5 - (-15)) = 55$  means widely scattered severe storms.
- $KI = (22 + 13) + (5 - (6 - 2)) = 36$  large potential for convection.
- $CAPE = 4922 \text{ j/kg}$  extreme.
- $MUVV = 99 \text{ m/s}$ . Updraft Speed.

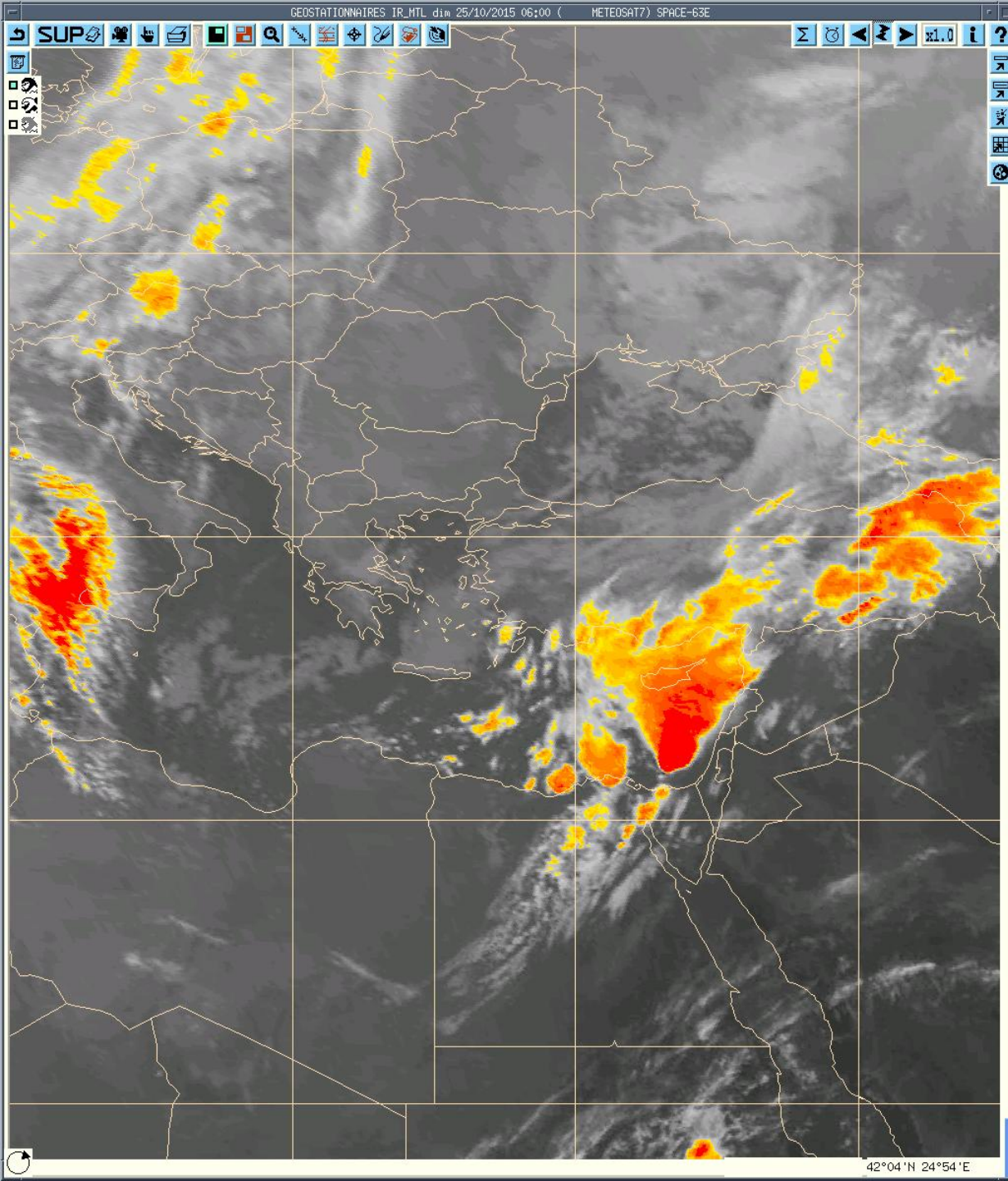




Satellite Image  
2015-10-25  
00UTC

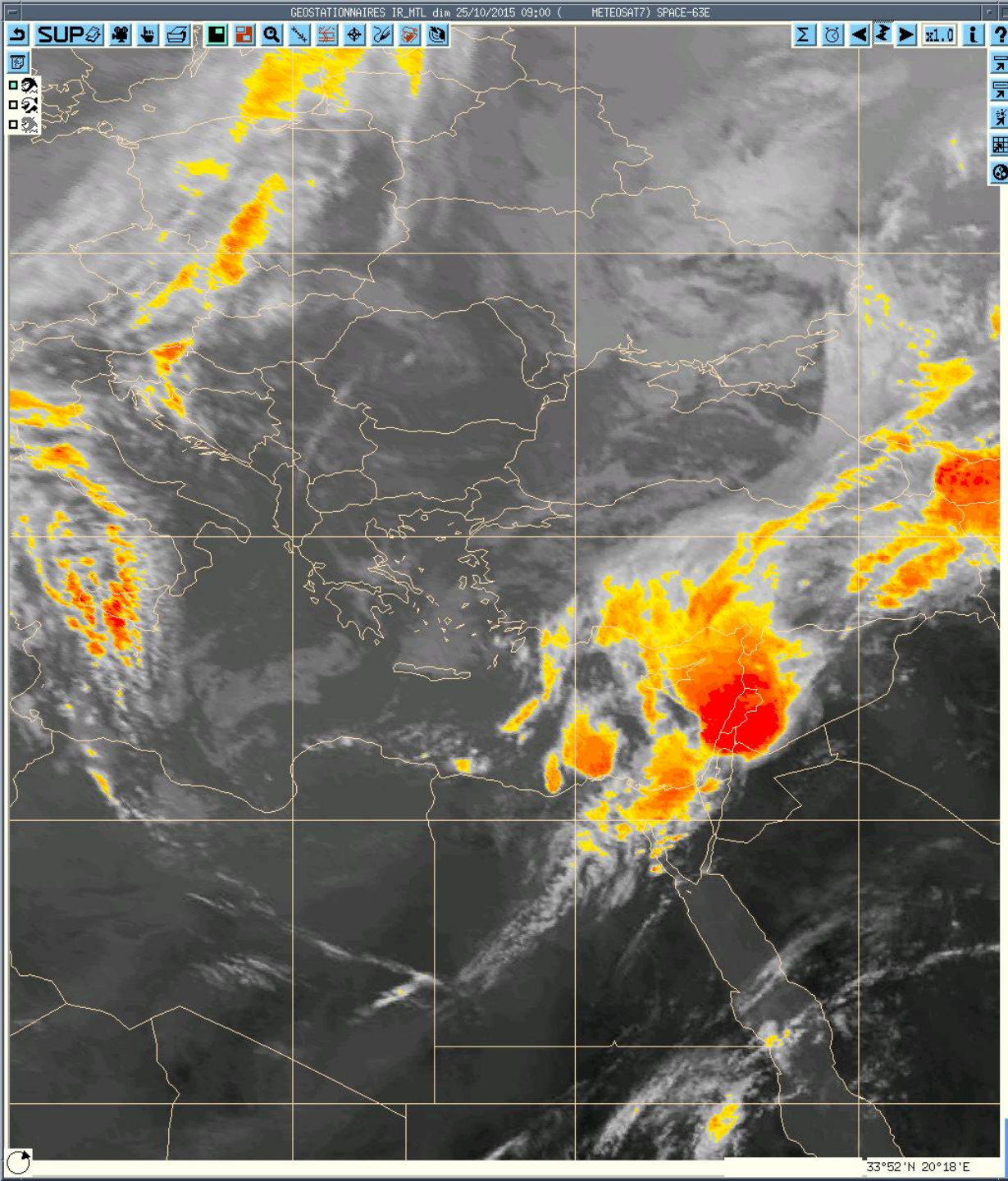


Satellite Image  
2015-10-25  
03UTC

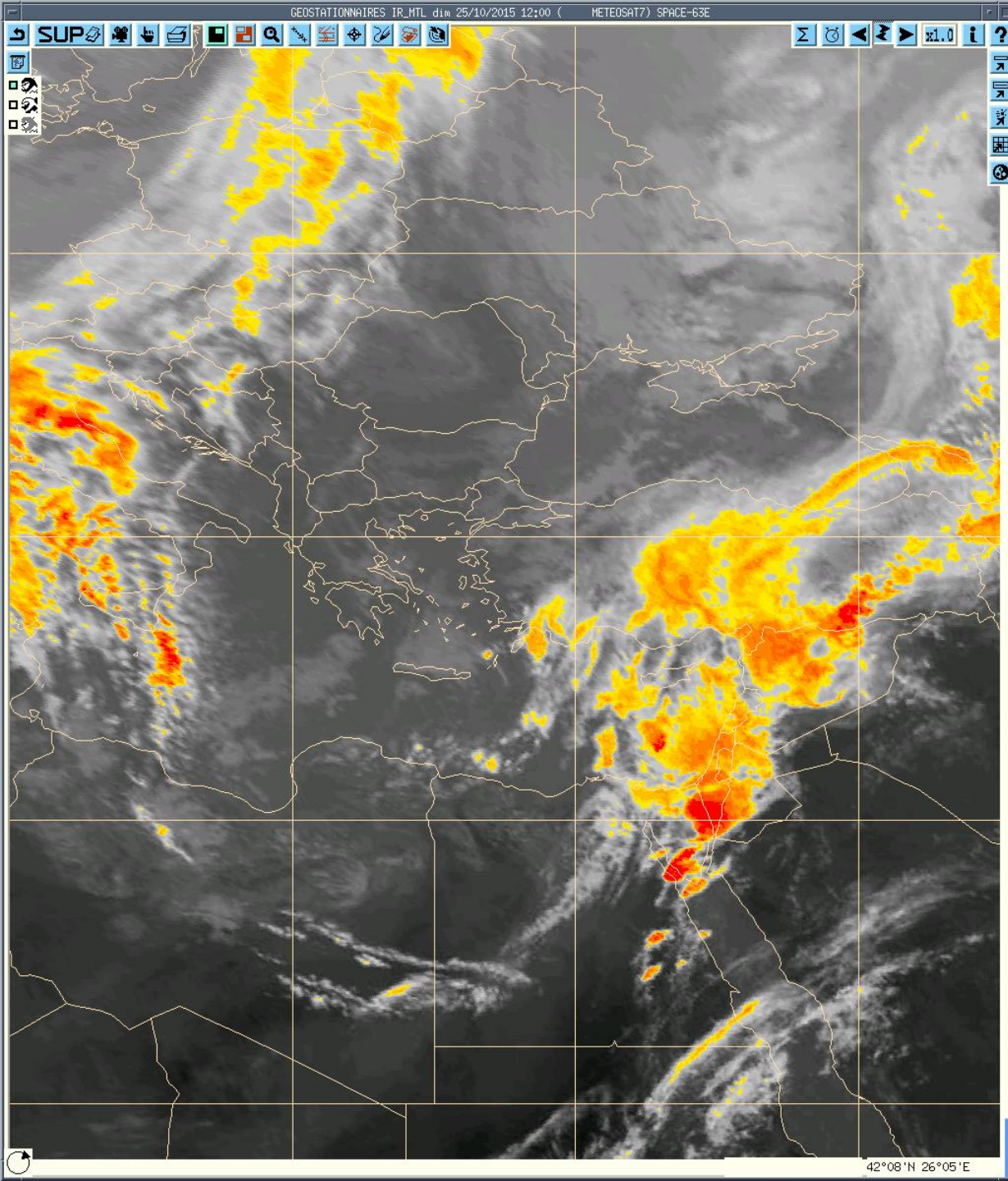


Satellite Image  
2015-10-25  
06UTC

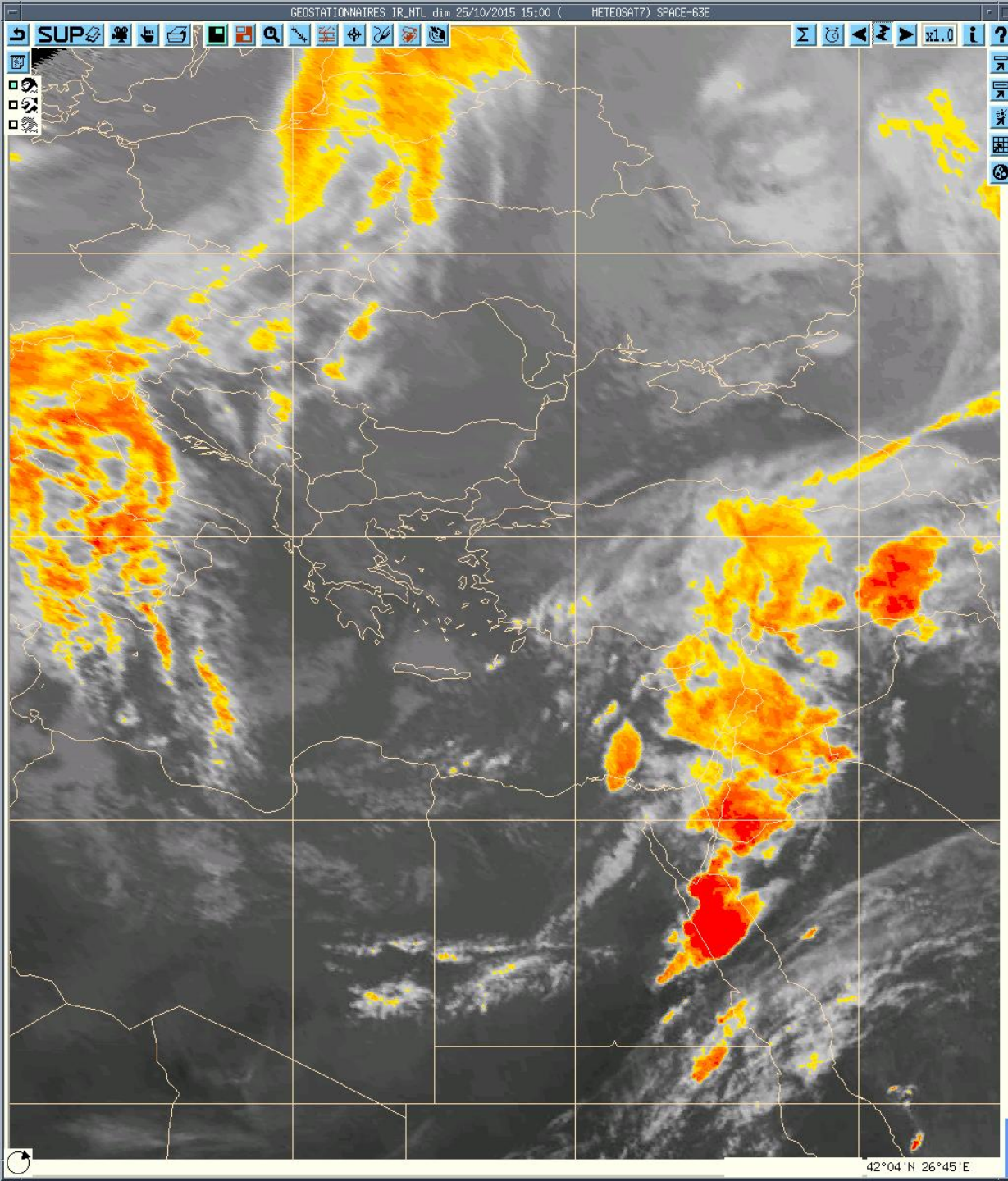




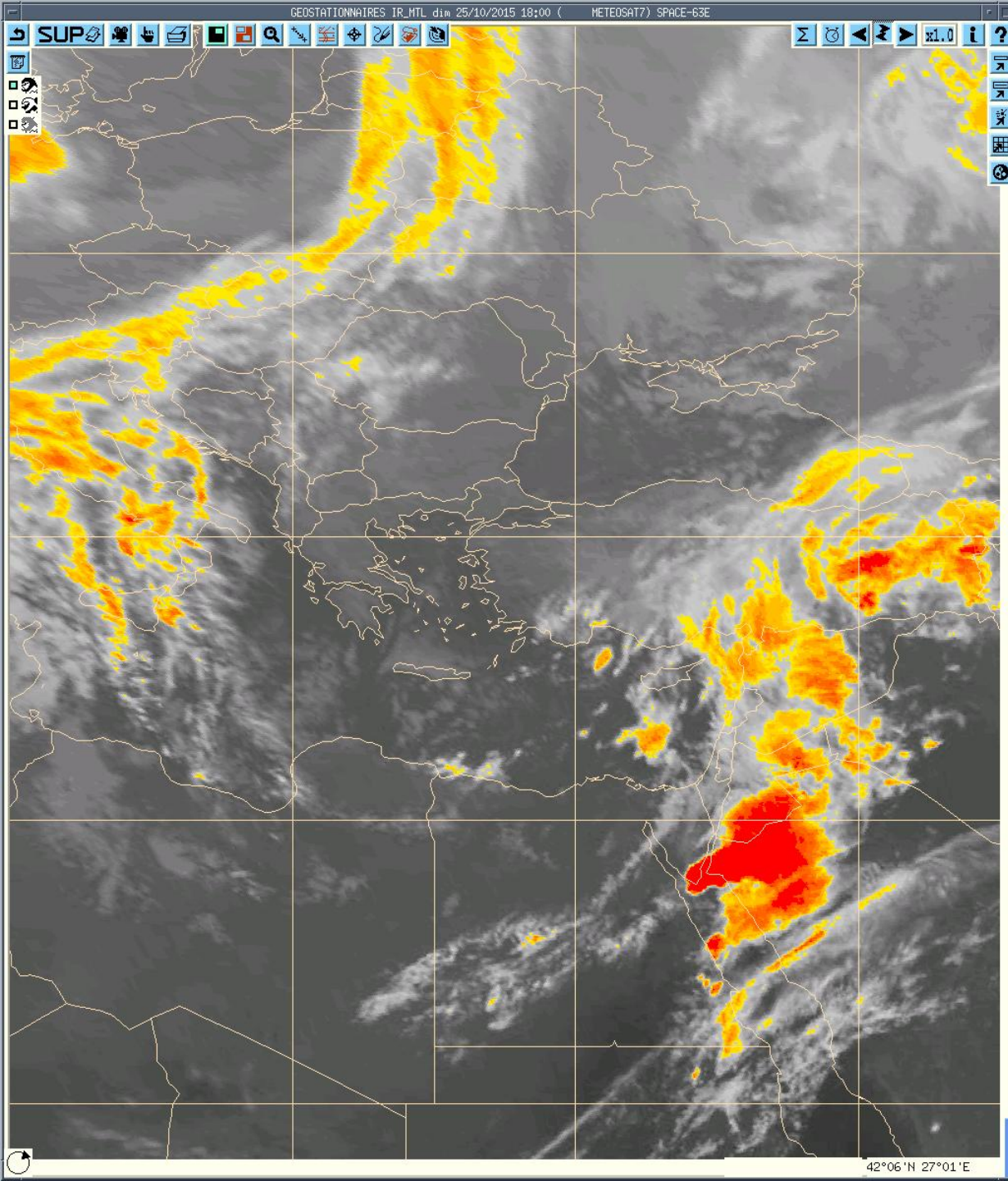
Satellite Image  
2015-10-25  
09UTC



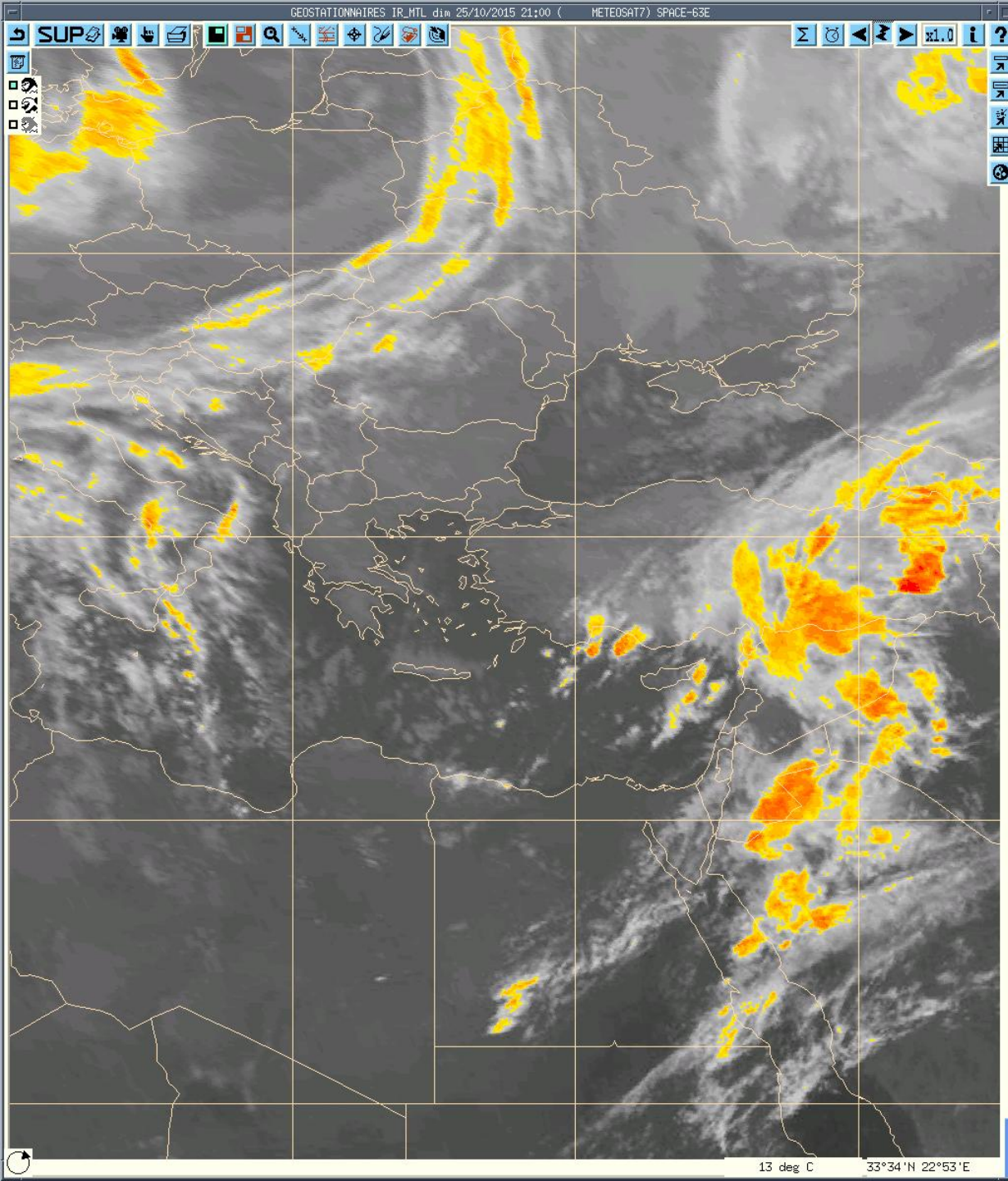
Satellite Image  
2015-10-25  
12UTC



Satellite Image  
2015-10-25  
15UTC



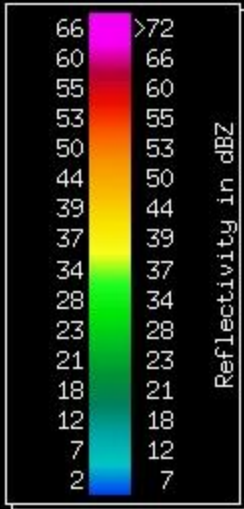
Satellite Image  
2015-10-25  
18UTC



Satellite Image  
2015-10-25  
21UTC



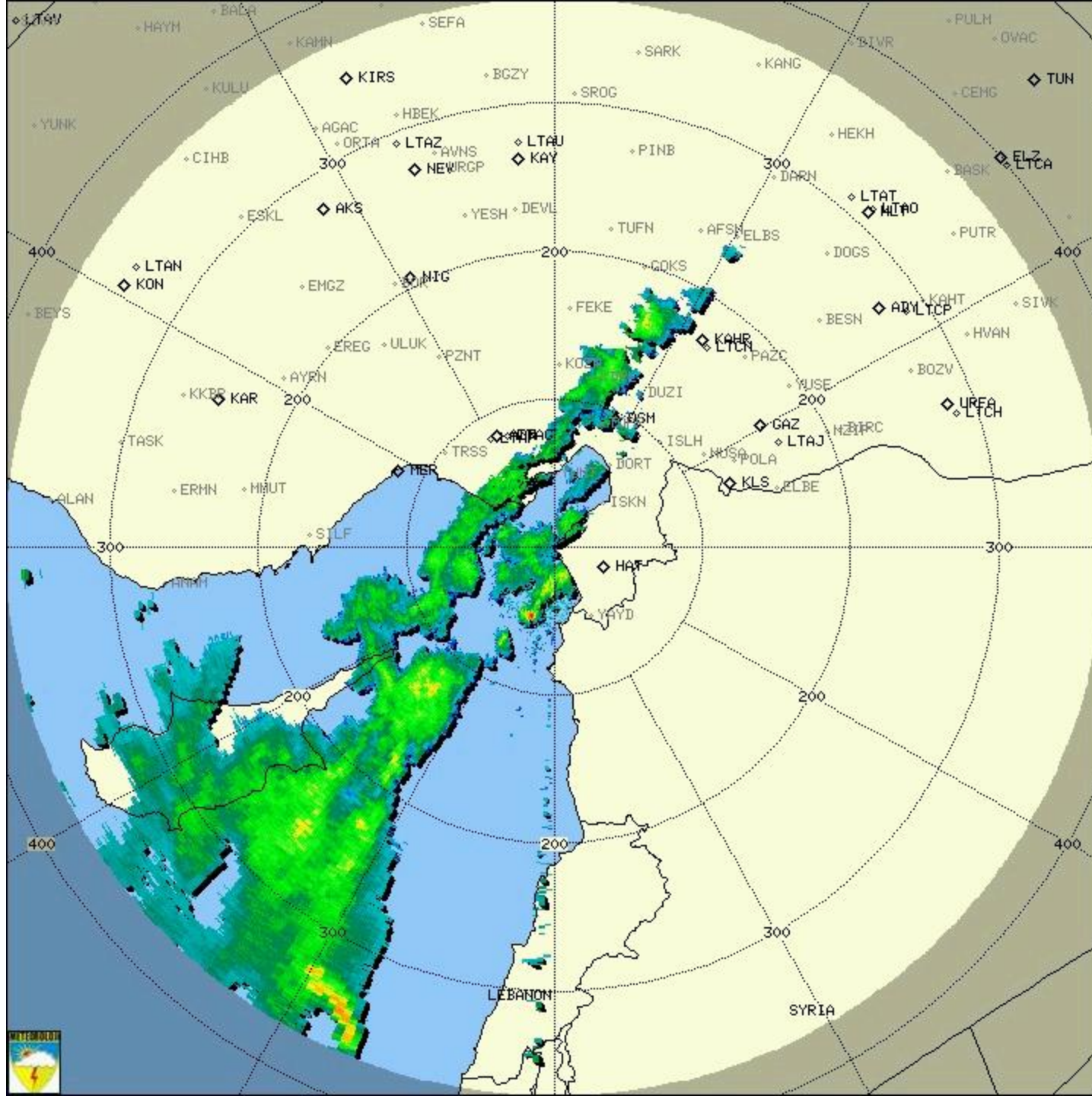
Hatay Radar  
 PPI  
 Z\_000\_370  
 Task: SURVEILLANC  
 PRF: 400Hz  
 Elevation:0.0  
 Max Range:370 km  
**06:37:38Z**  
 24 OCT 2015 UTC



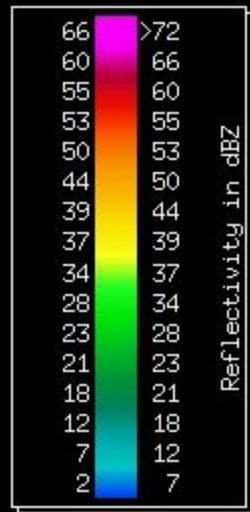


Composite  
 PPI  
 COMP\_PPI370  
 Task: SURVEILLANC  
 PRF: 400Hz  
 Elevation:0.0  
 Max Range:1000 km  
**03:15:20Z**  
**25 OCT 2015 UTC**

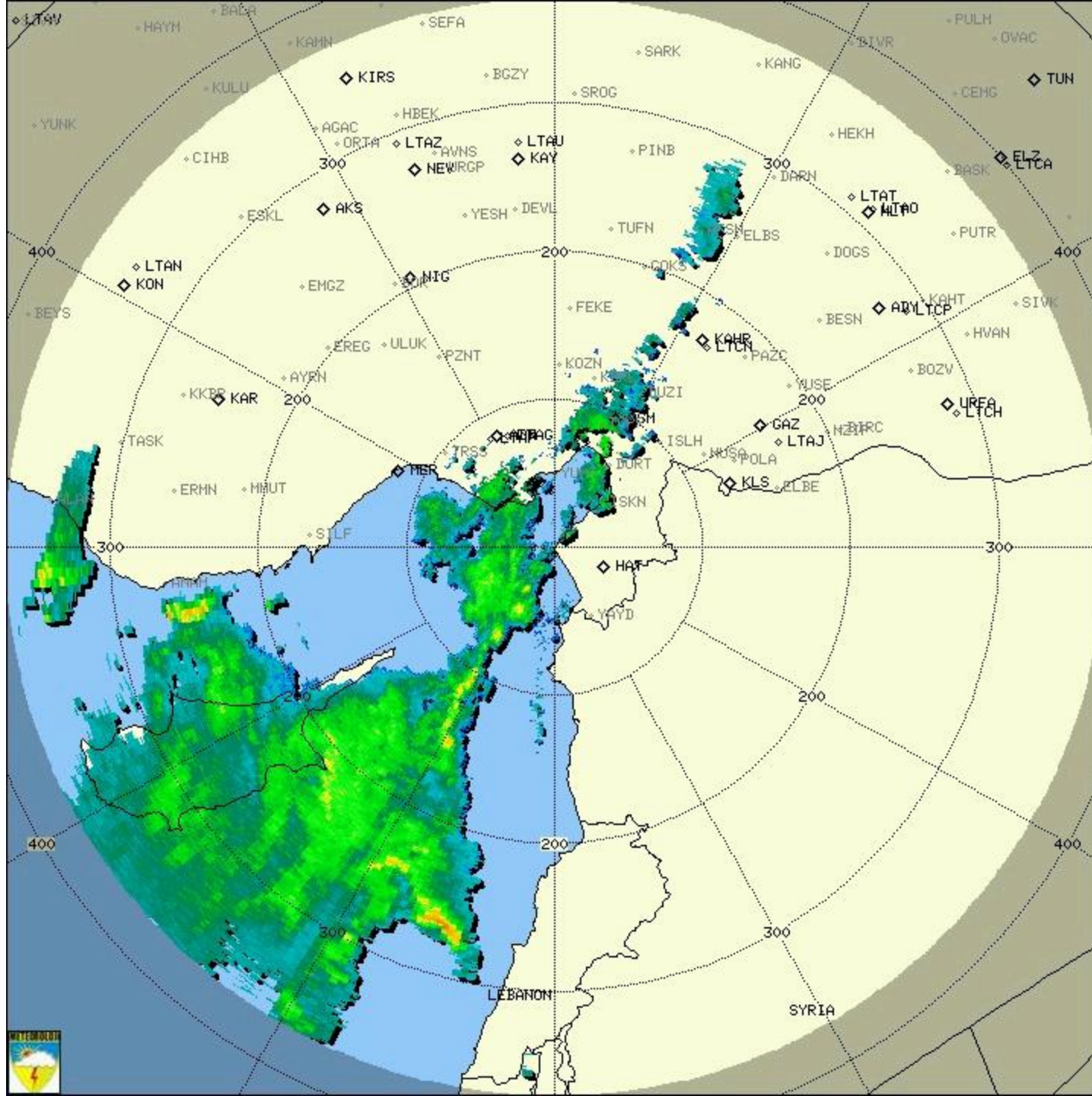




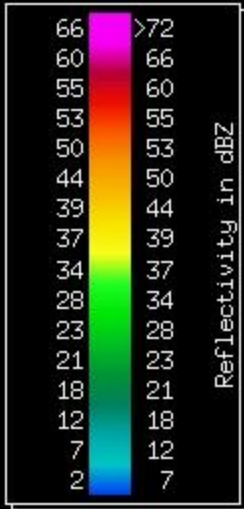
Hatay Radar  
 PPI  
 Z\_000\_370  
 Task: SURVEILLANC  
 PRF: 400Hz  
 Elevation:0.0  
 Max Range:370 km  
**03:22:38Z**  
 25 OCT 2015 UTC

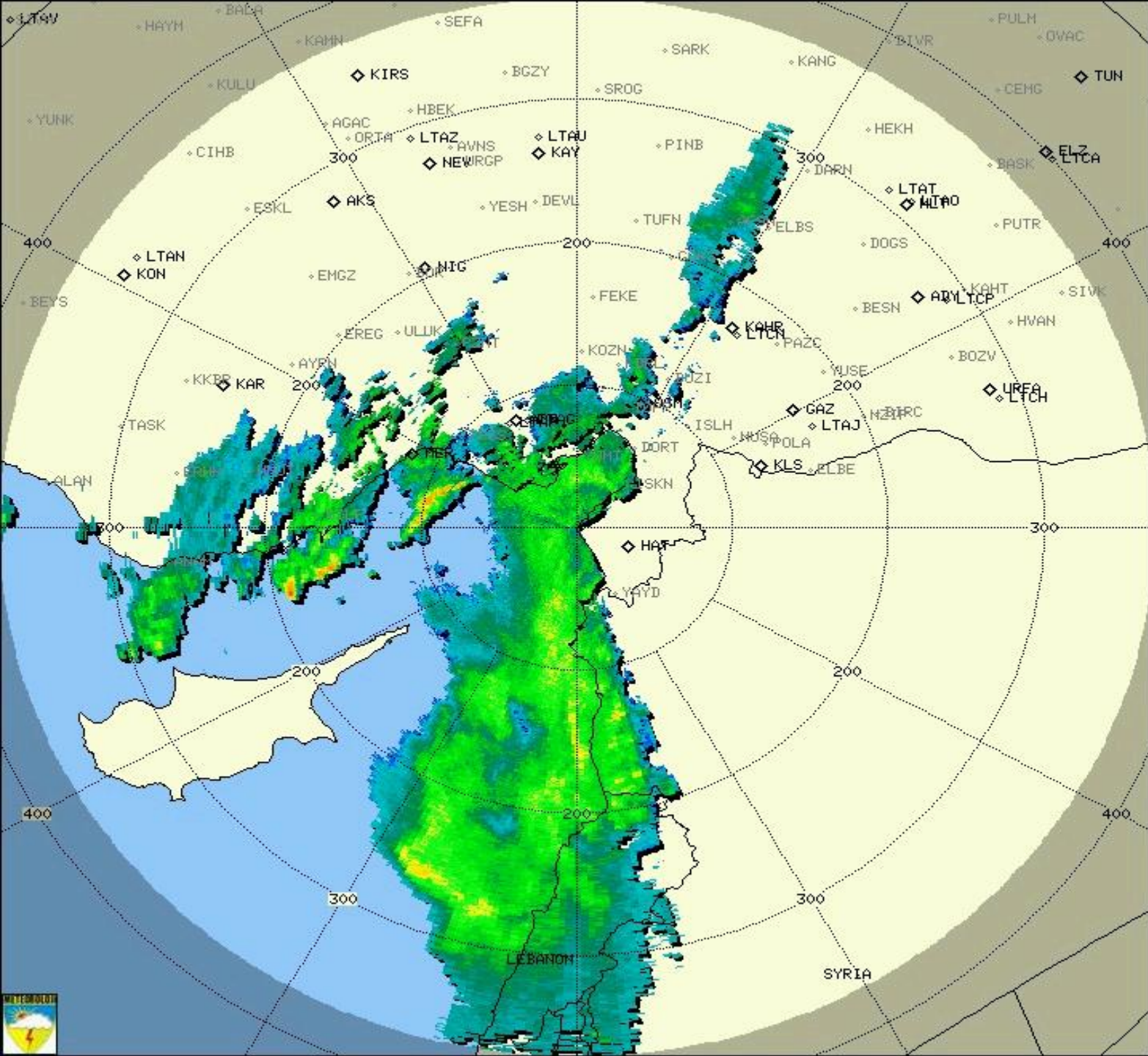




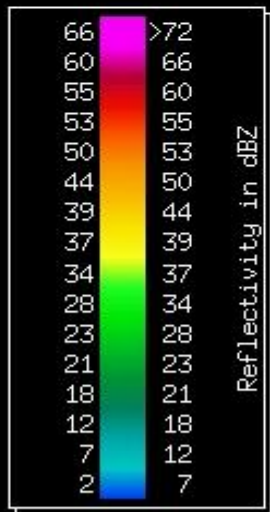


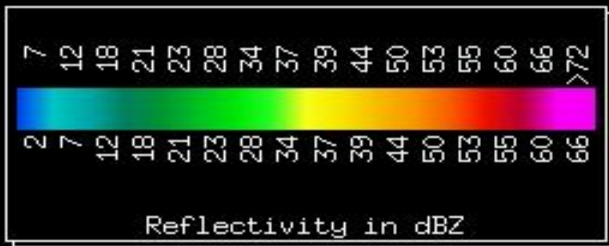
Hatay Radar  
 PPI  
 Z\_000\_370  
 Task: SURVEILLANC  
 PRF: 400Hz  
 Elevation:0.0  
 Max Range:370 km  
**04:45:07Z**  
**25 OCT 2015 UTC**



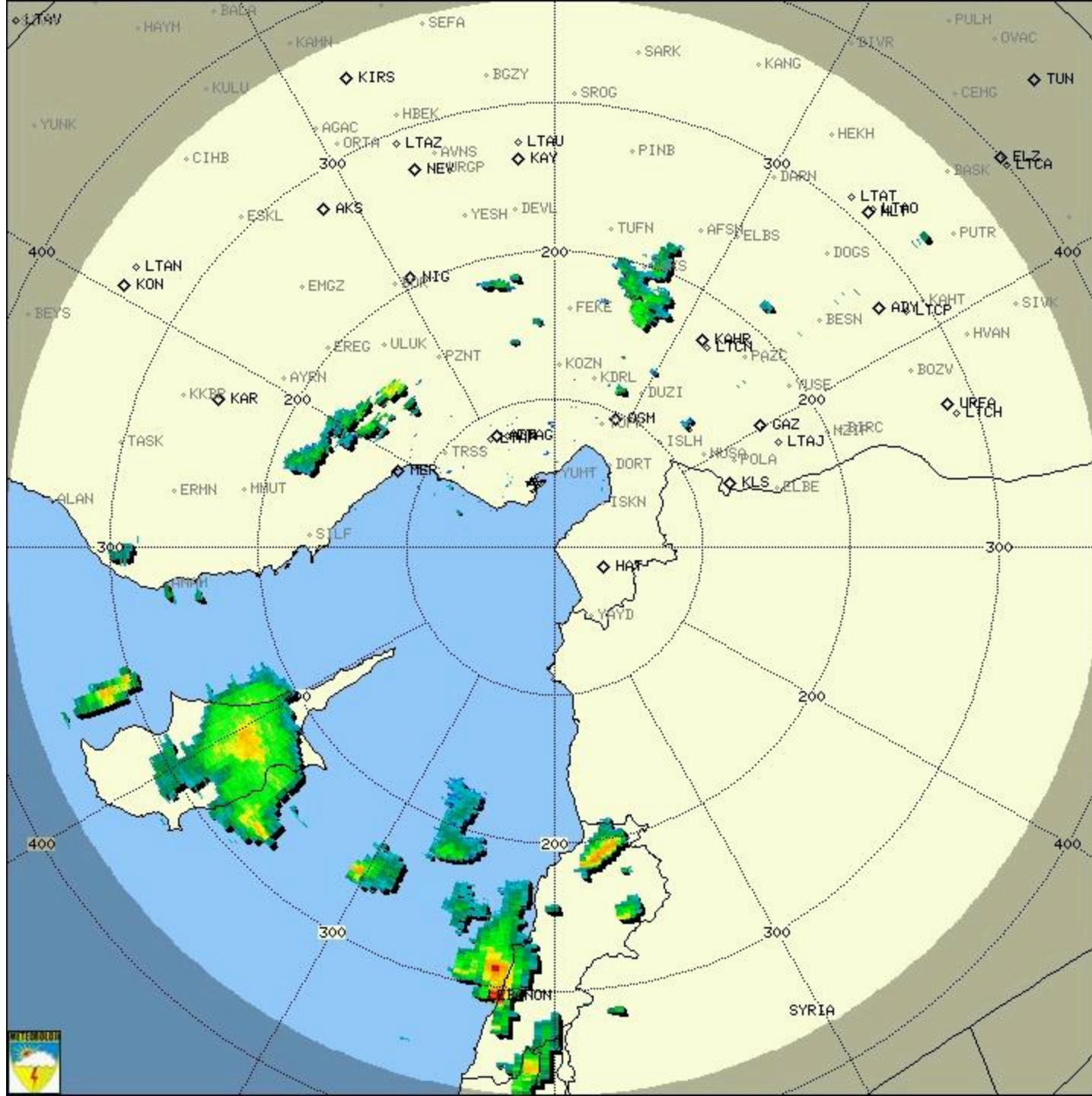


Hatay Radar  
 PPI  
 Z\_000\_370  
 Task: SURVEILLANC  
 PRF: 400Hz  
 Elevation: 0.0  
 Max Range: 370 km  
**09:15:09Z**  
**25 OCT 2015 UTC**

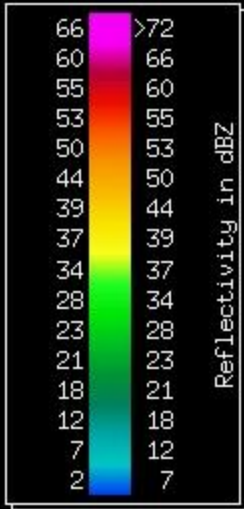




Composite  
 PPI  
 COMP\_PPI370  
 Task: SURVEILLANC  
 PRF: 400Hz  
 Elevation:0.0  
 Max Range:1000 km  
**09:07:49Z**  
**25 OCT 2015 UTC**

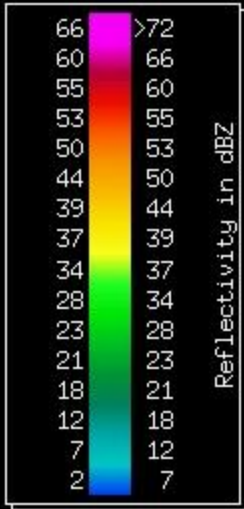


Hatay Radar  
 PPI  
 Z\_000\_370  
 Task: SURVEILLANC  
 PRF: 400Hz  
 Elevation: 0.0  
 Max Range: 370 km  
**15:45:08Z**  
**26 OCT 2015 UTC**

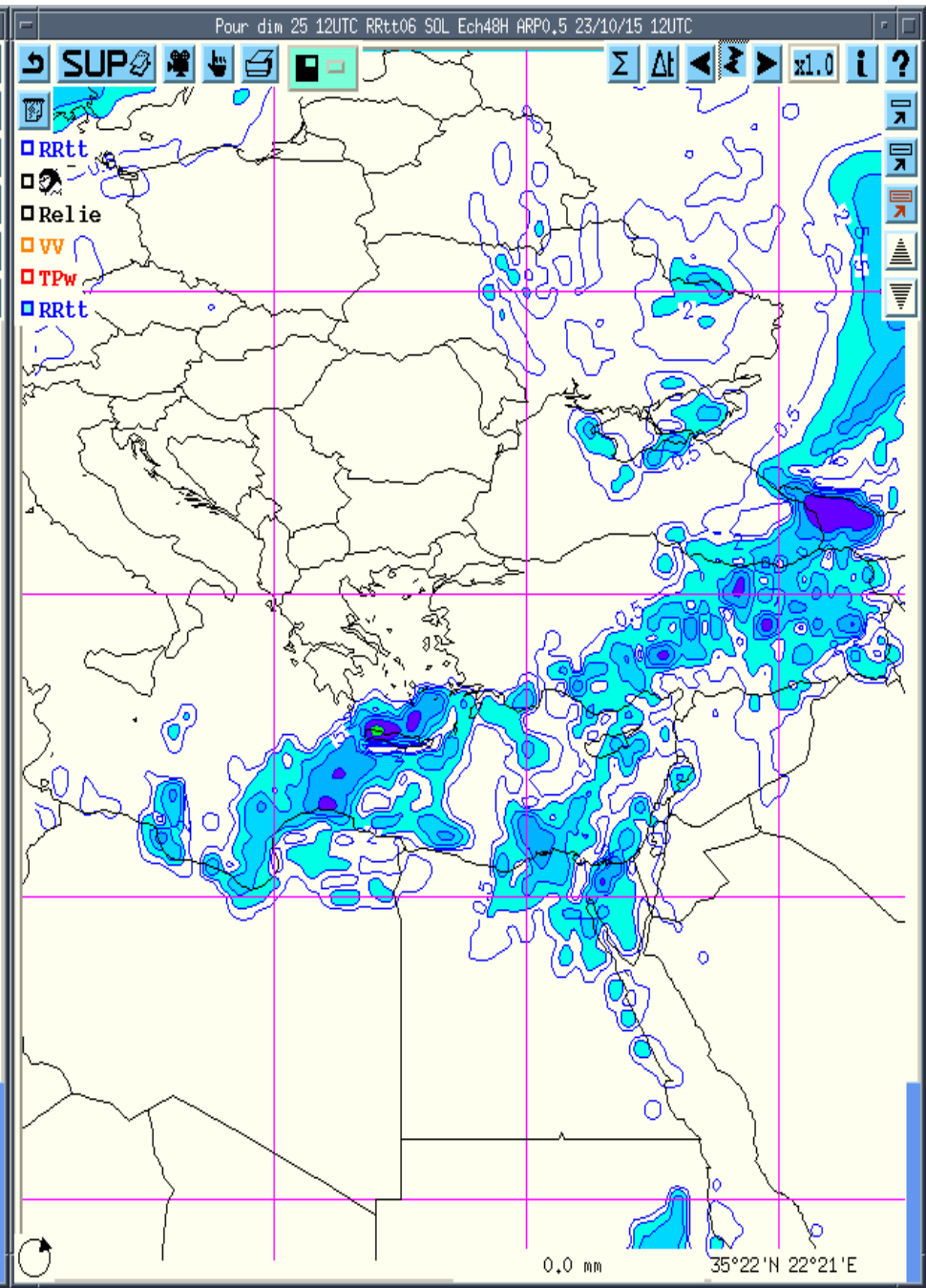
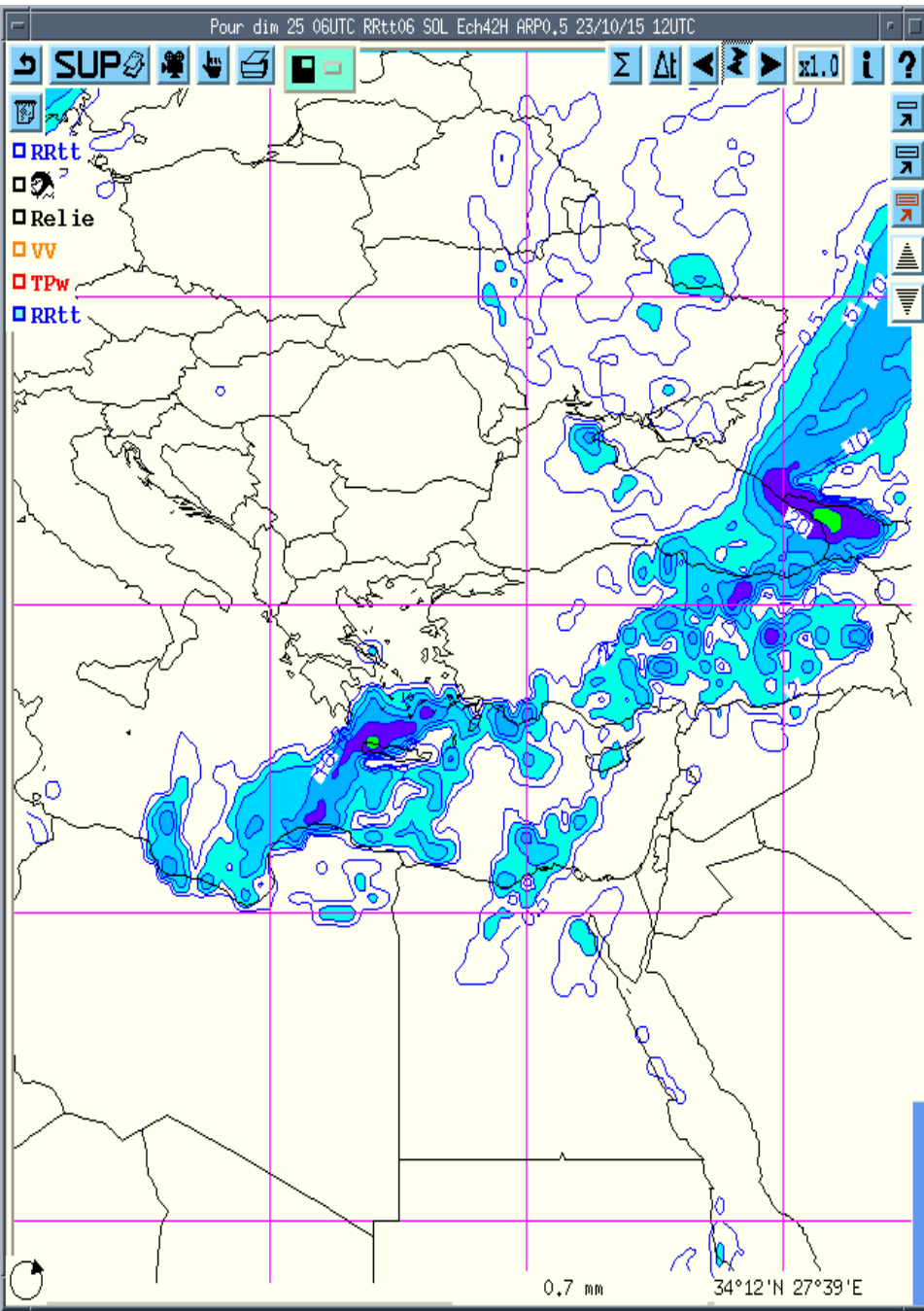


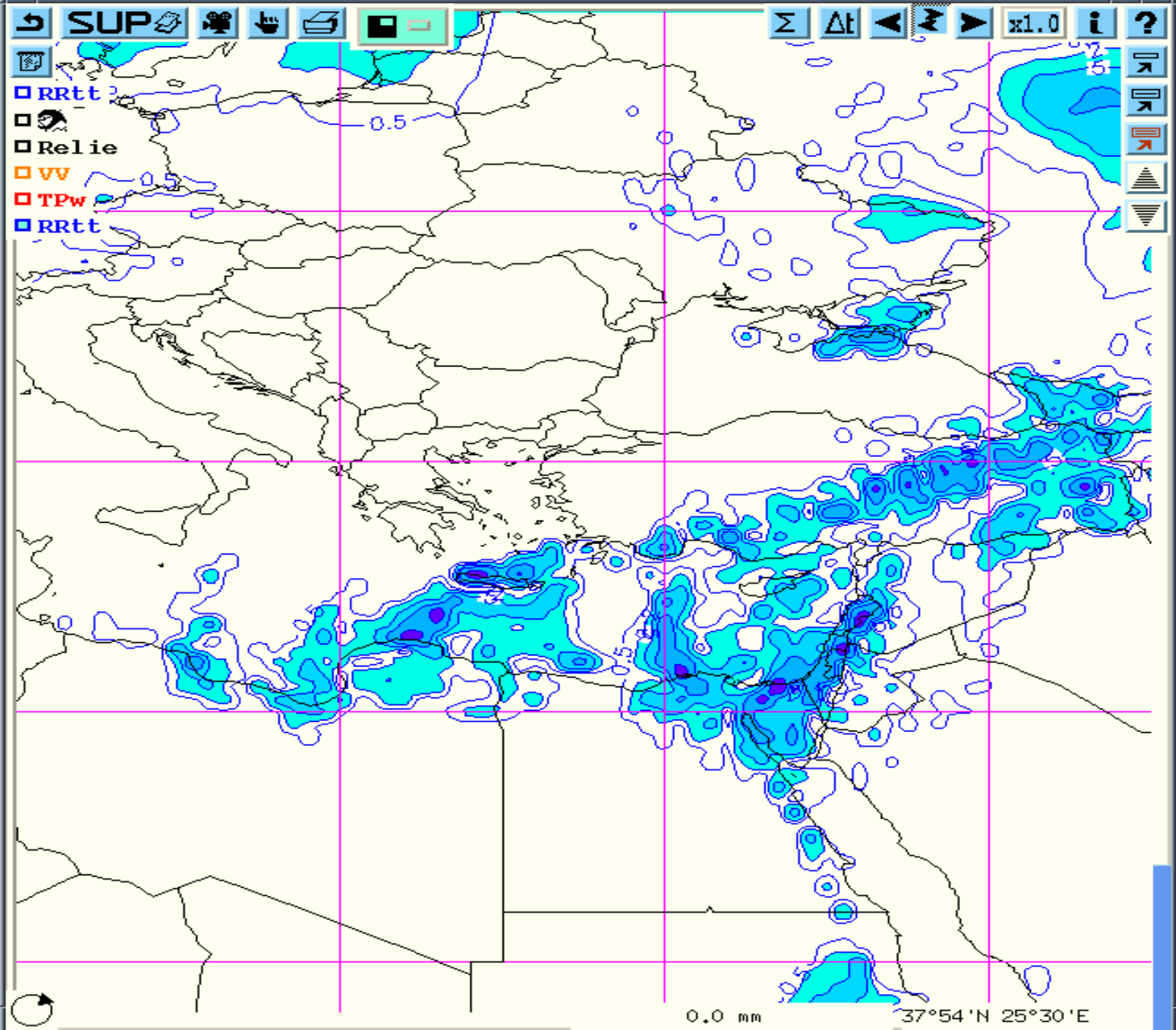


Hatay Radar  
 PPI  
 Z\_000\_370  
 Task: SURVEILLANC  
 PRF: 400Hz  
 Elevation:0.0  
 Max Range:370 km  
**22:22:37Z**  
**26 OCT 2015 UTC**



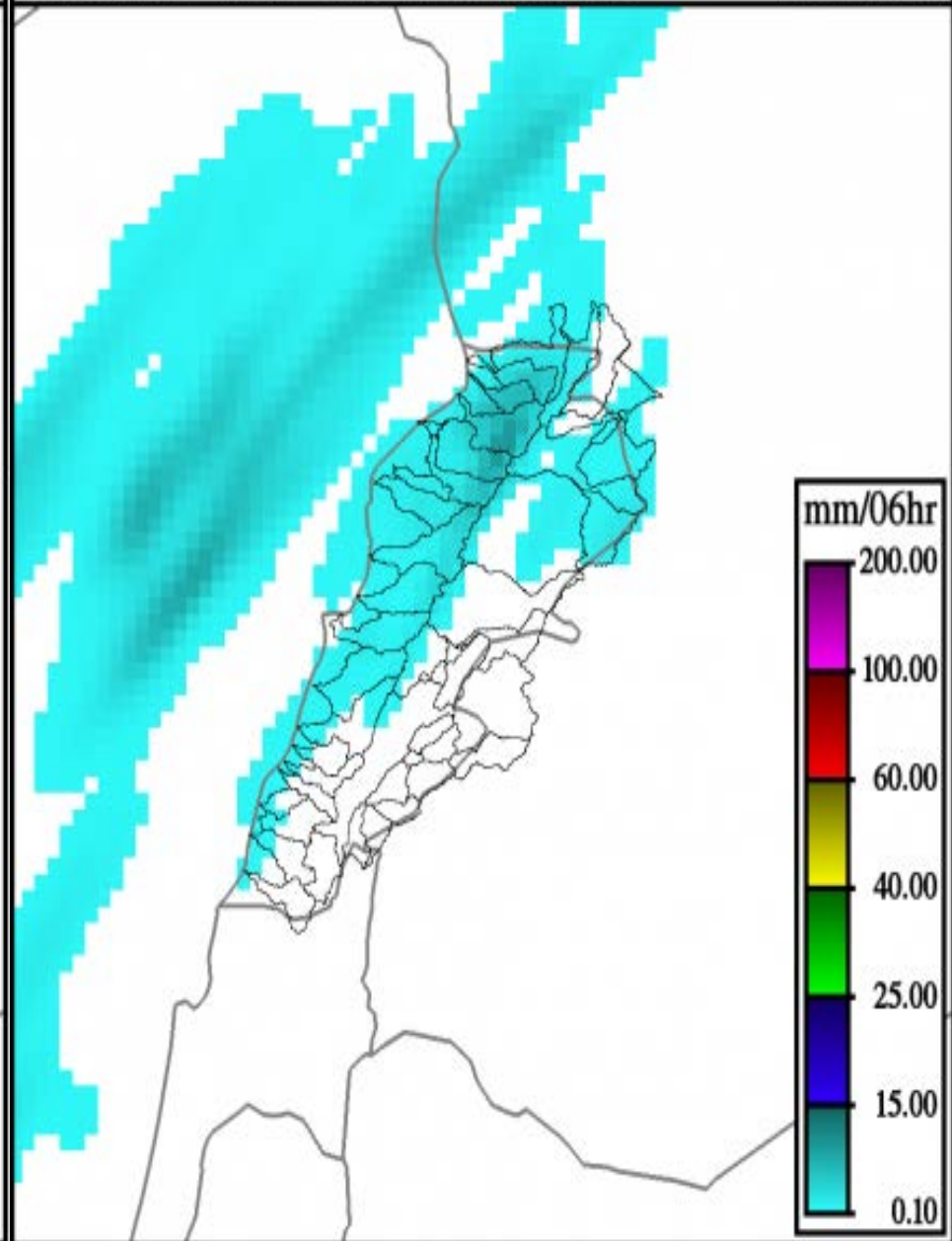
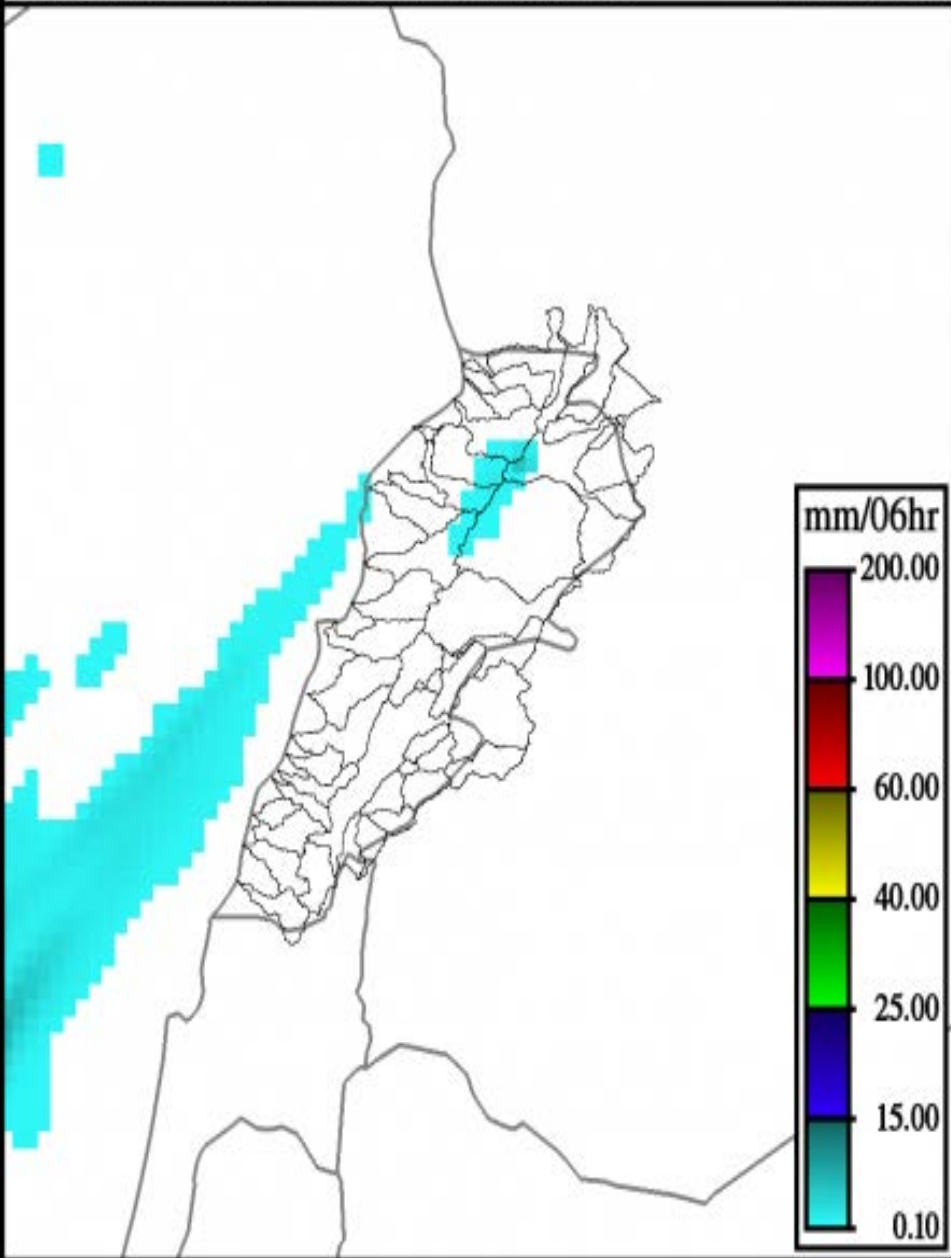
# Arp 0.5





# ALARO 6hrs

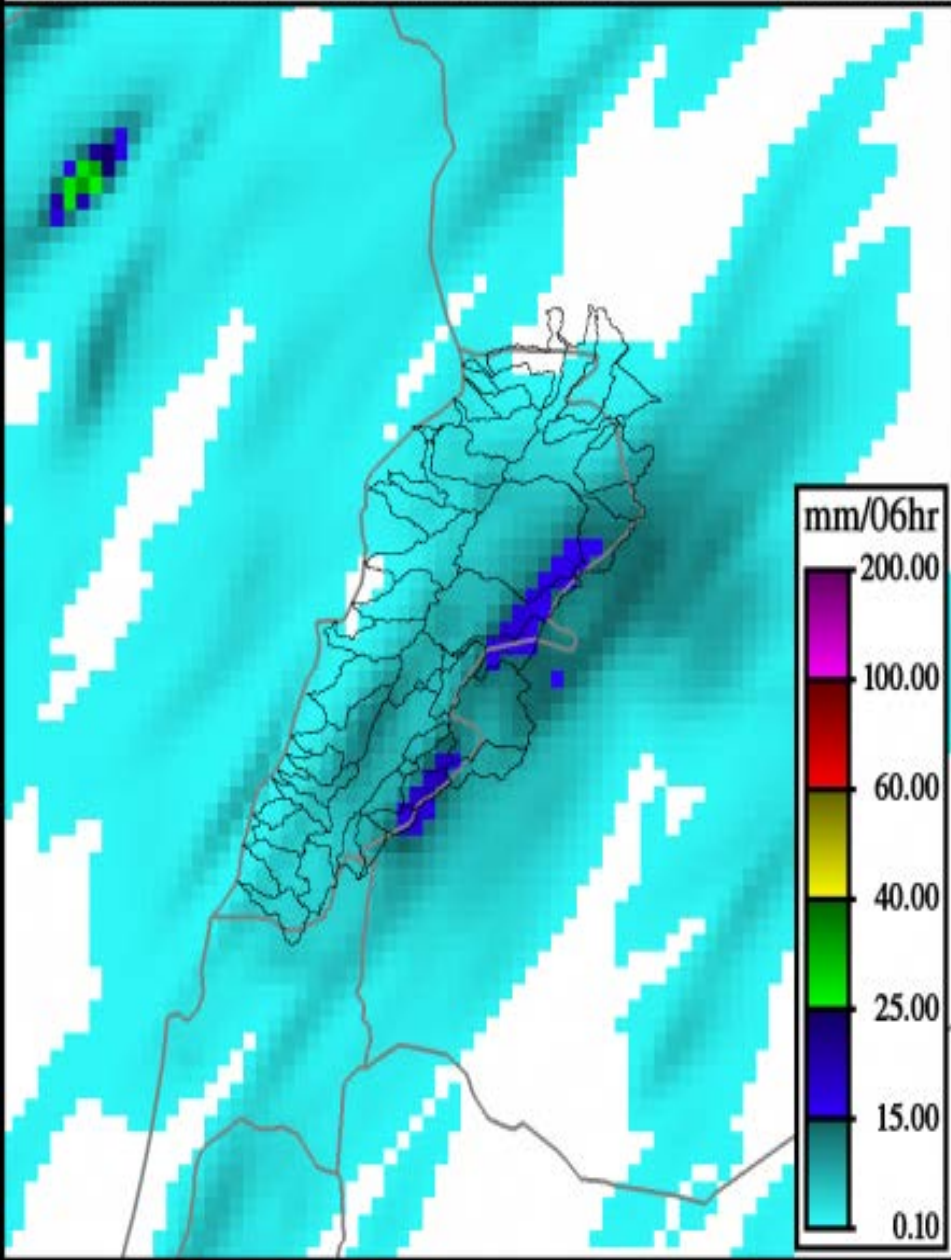
FORECAST - 06 hr 2015-10-25 00:00 UTC LEBANON FORECAST - 06 hr 2015-10-25 06:00 UTC LEBANON



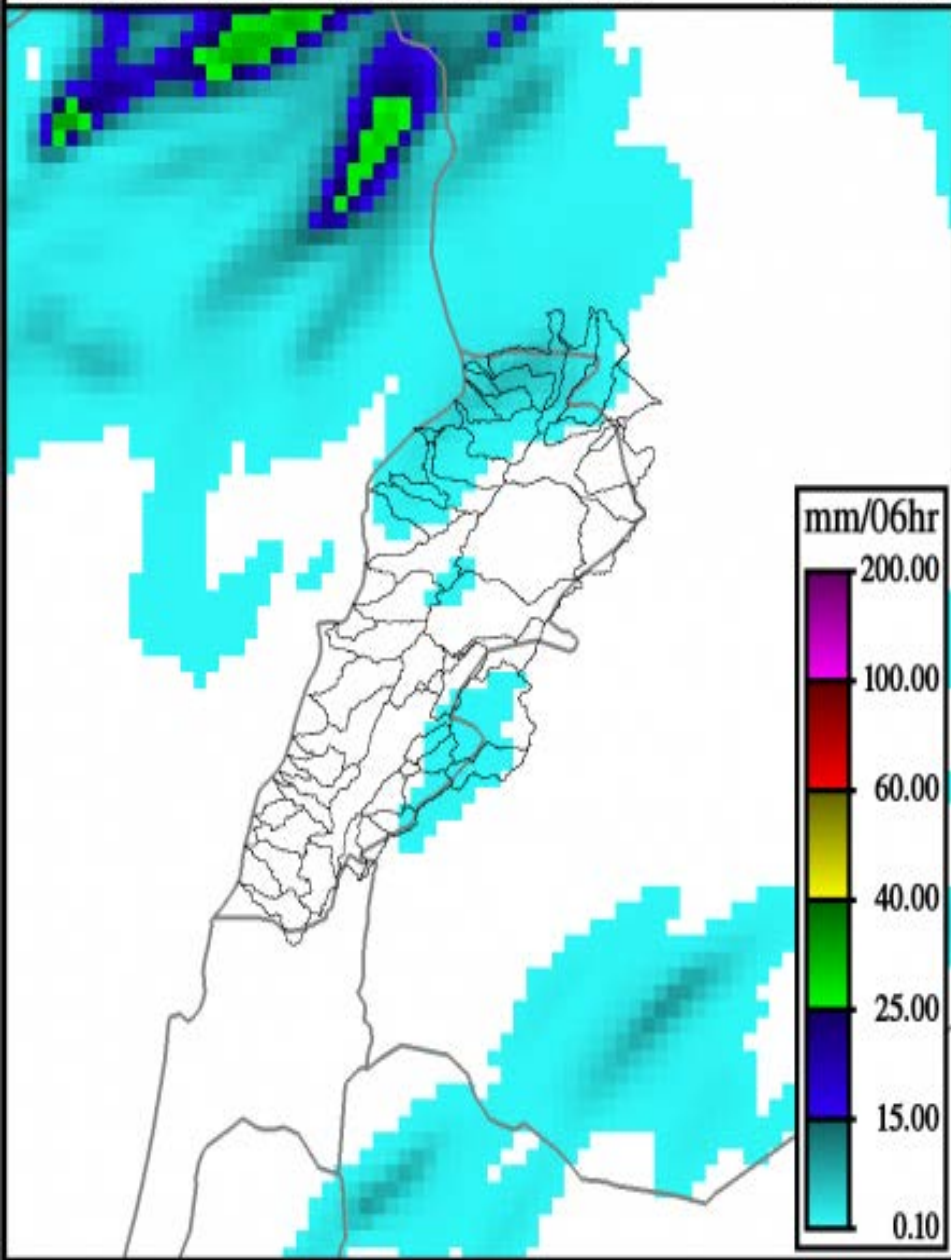


# ALARO 6hrs

FORECAST - 06 hr 2015-10-25 12:00 UTC LEBANON

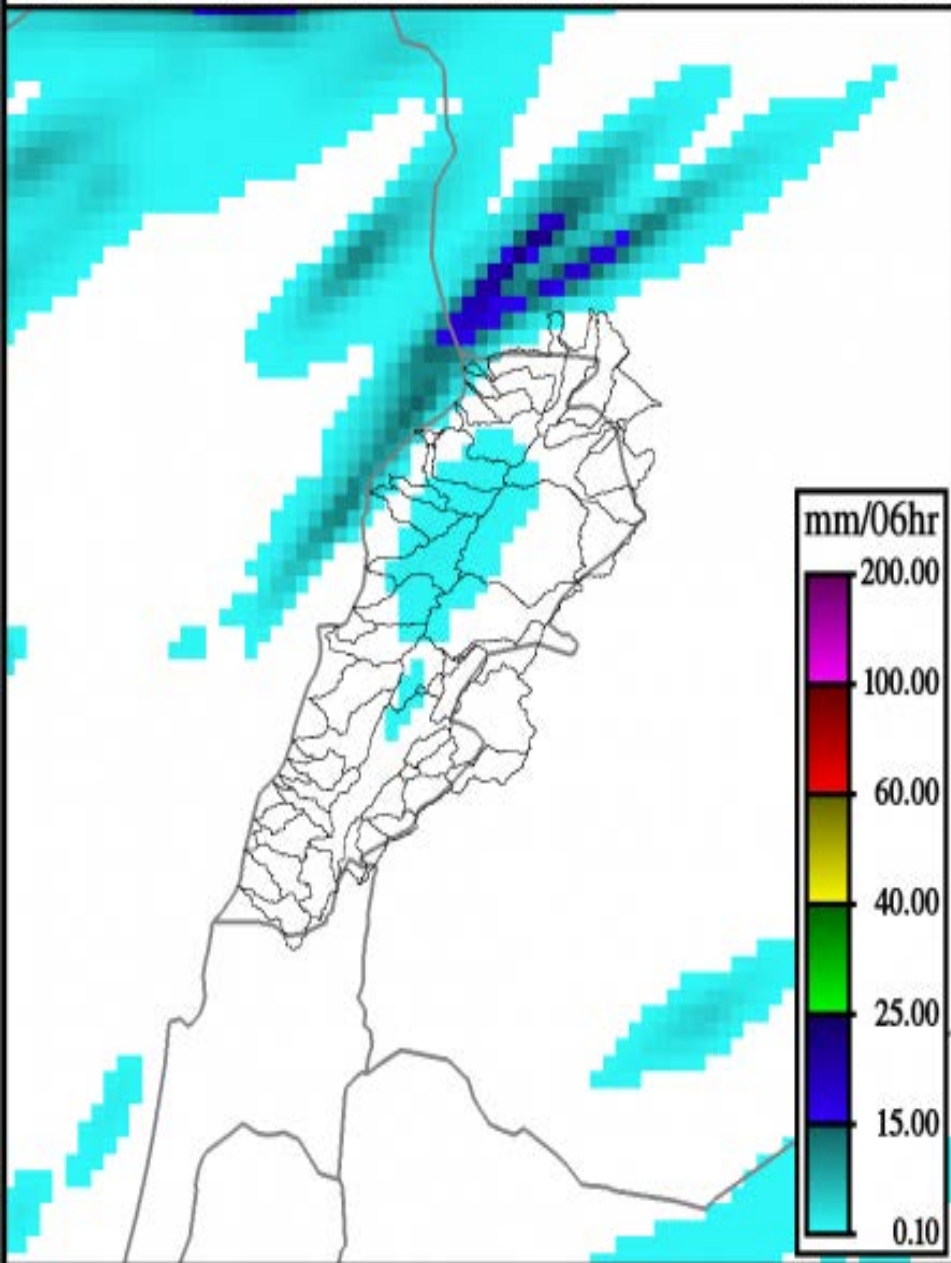


FORECAST - 06 hr 2015-10-25 18:00 UTC LEBANON

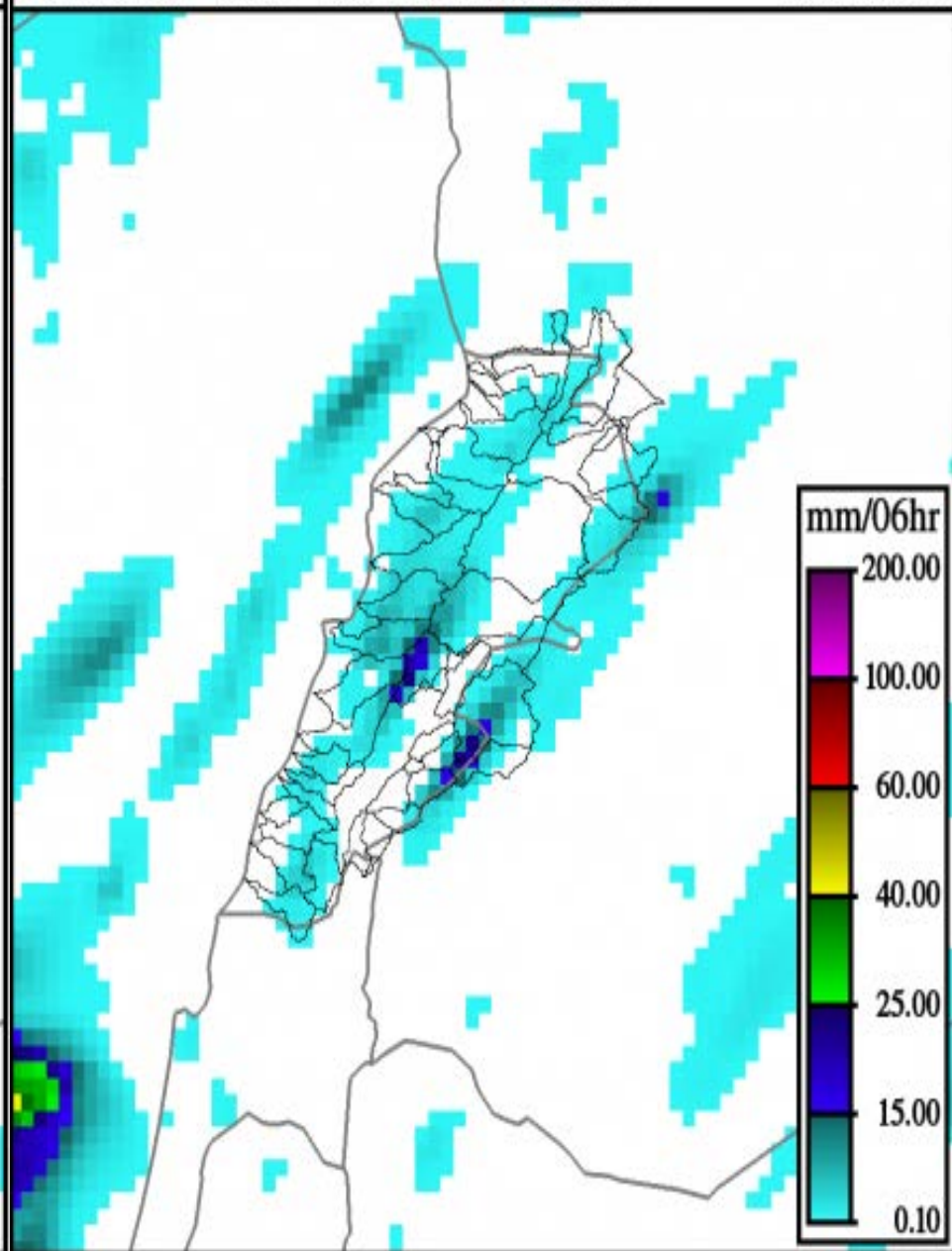


# ALARO 6hrs

FORECAST - 06 hr 2015-10-26 00:00 UTC LEBANON



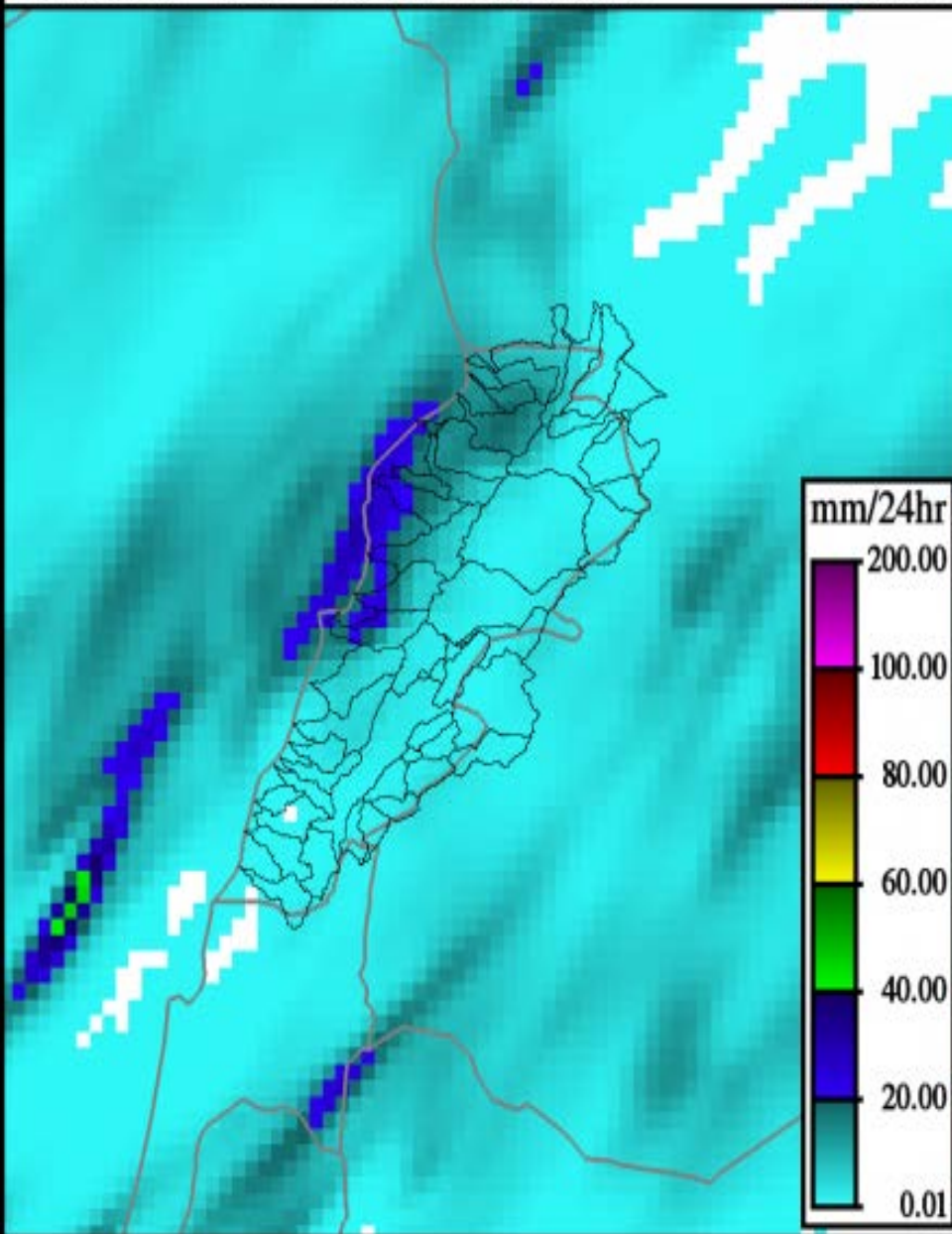
FORECAST - 06 hr 2015-10-26 06:00 UTC LEBANON



# ALARO 6hrs

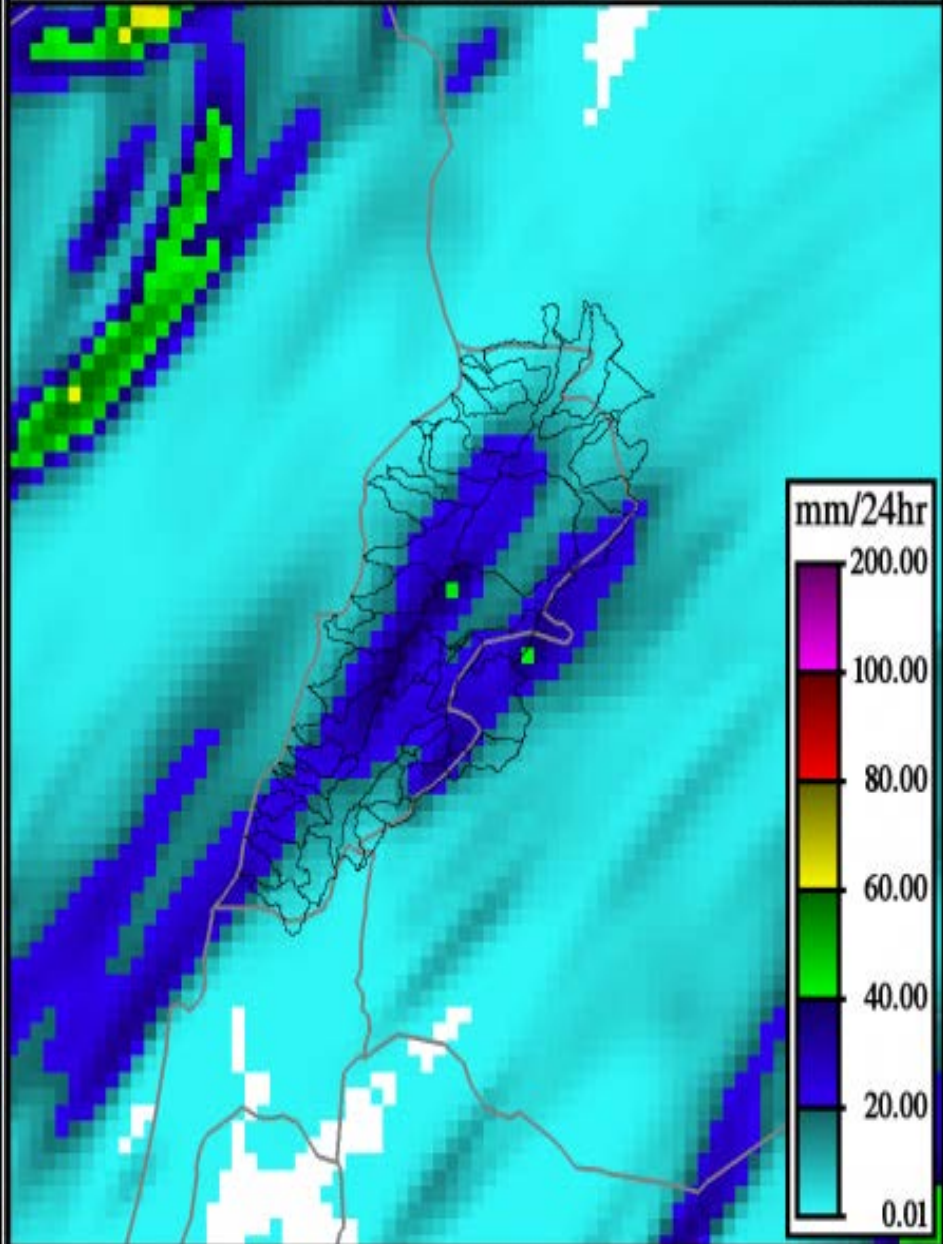
FORECAST - 24 hr 2015-10-24 18:00 UTC

LEBANON

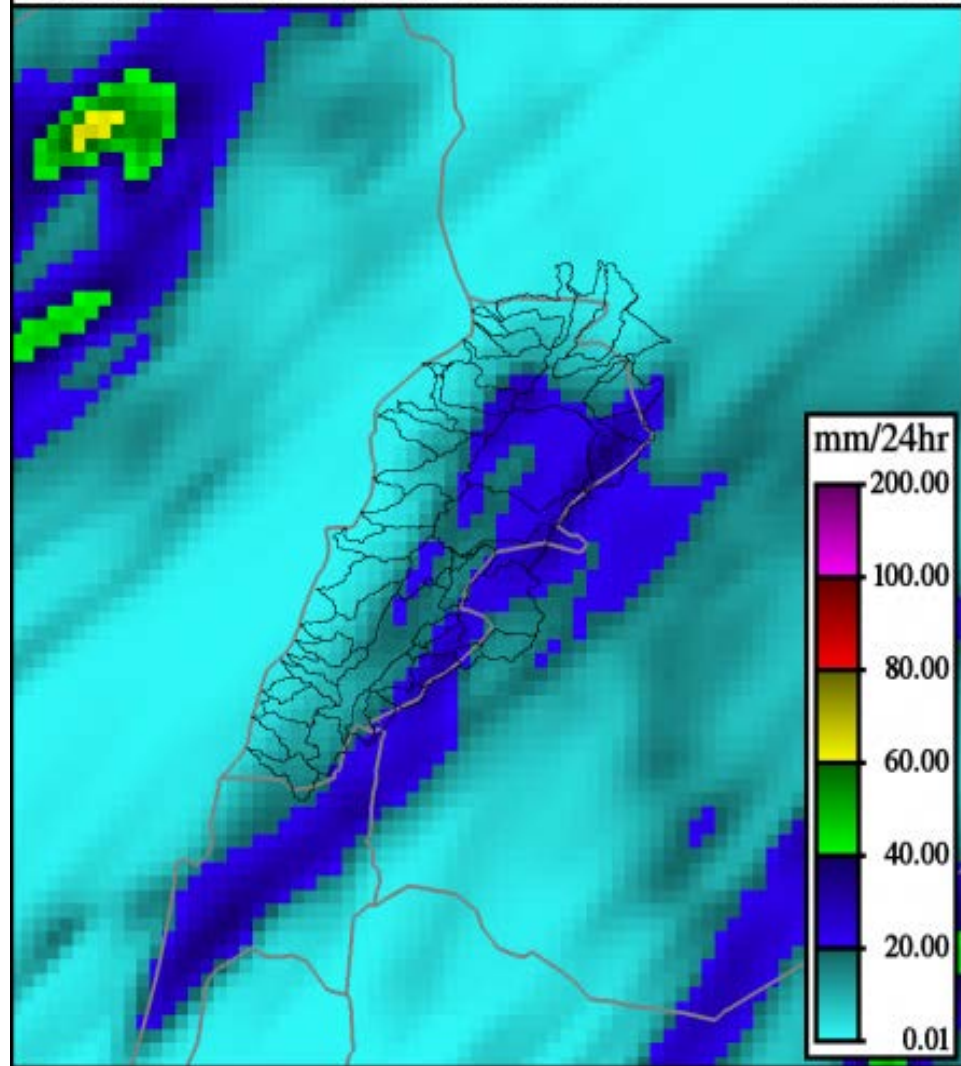


FORECAST - 24 hr 2015-10-25 00:00 UTC

LEBANON



FORECAST - 24 hr 2015-10-25 06:00 UTC LEBANON



# steps of FFGS

**1. Has there been any rainfall?**

**2. What is the soil moisture saturation level?**

**3. Are the FFG values fairly low?**

**4. How much rain is needed to cause bankfull at the outlet of the draining stream?**

**5. Is there any rainfall expected?**

**6. Are there areas where you would be concerned for flash flooding?**

**7. Specific location of concern**

**8. Evaluation & forecast uncertainty**

To forecast FF u have to ask ur self:

How much rain will cause FF in this area?

To answer this qwestion u have to know:

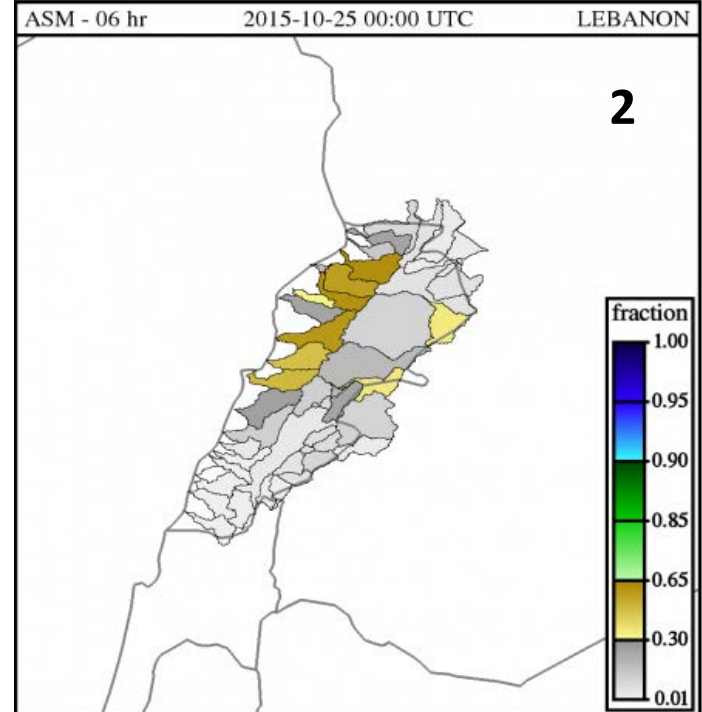
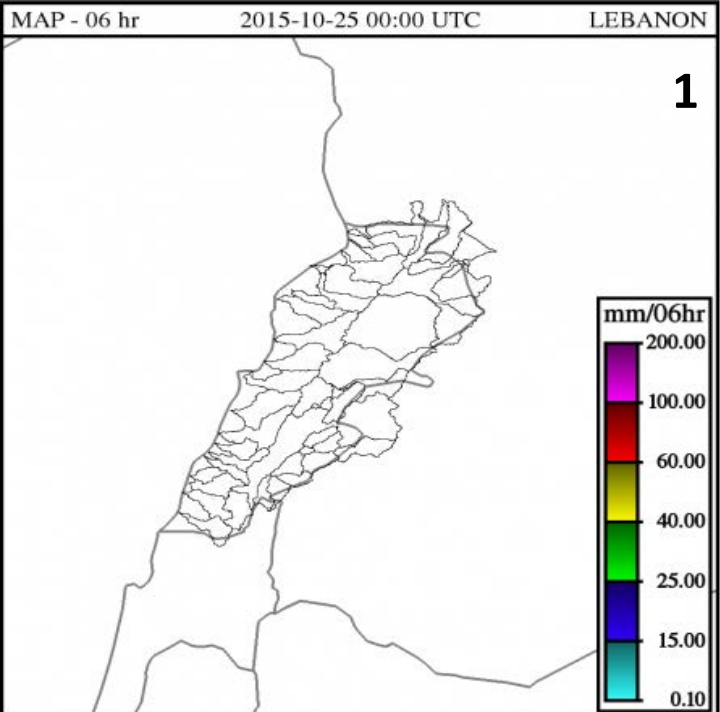
How much water will runoff?

What about the recent rain?

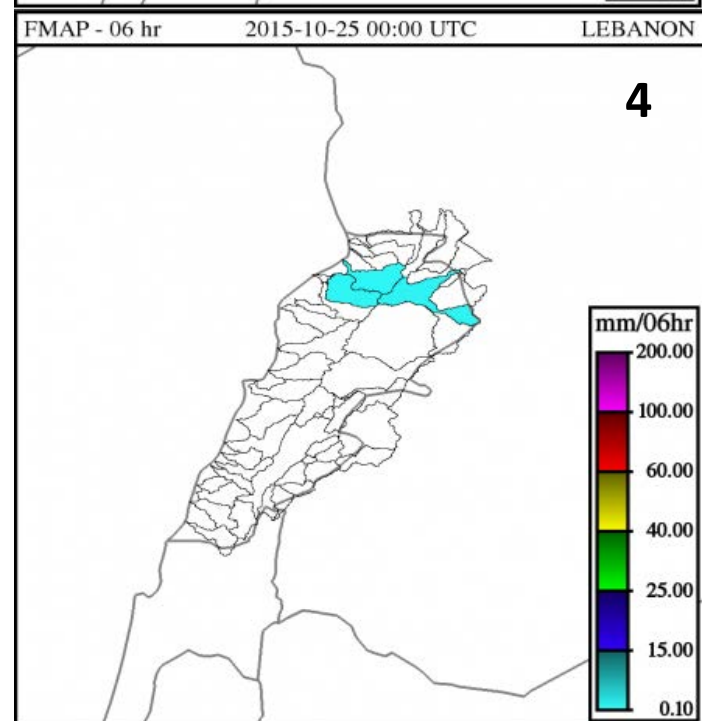
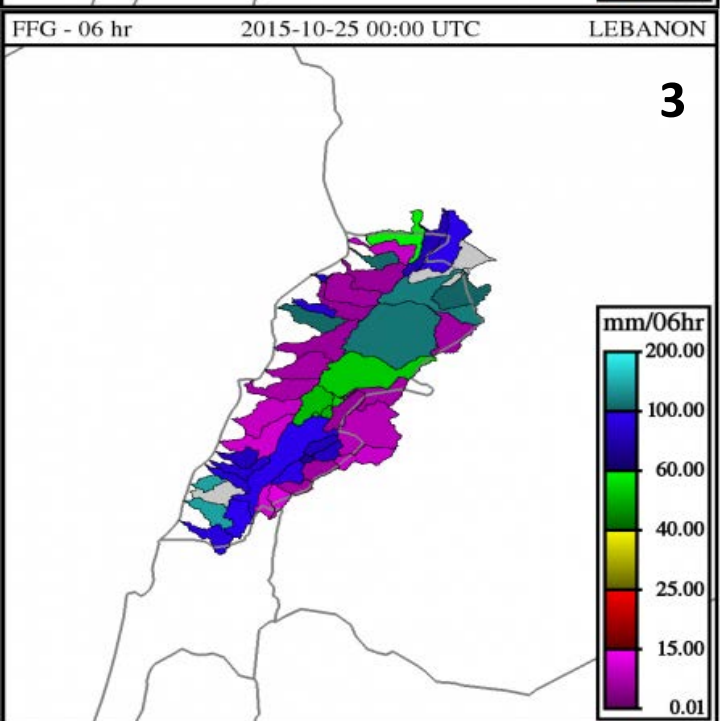
How the stream level is?

River basin response?

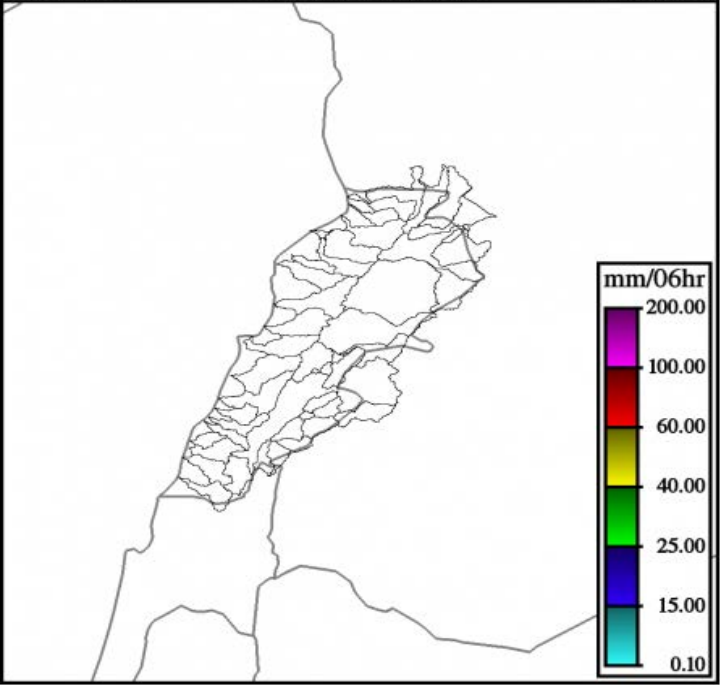
And how much precipitation u r expecting to generate FF?



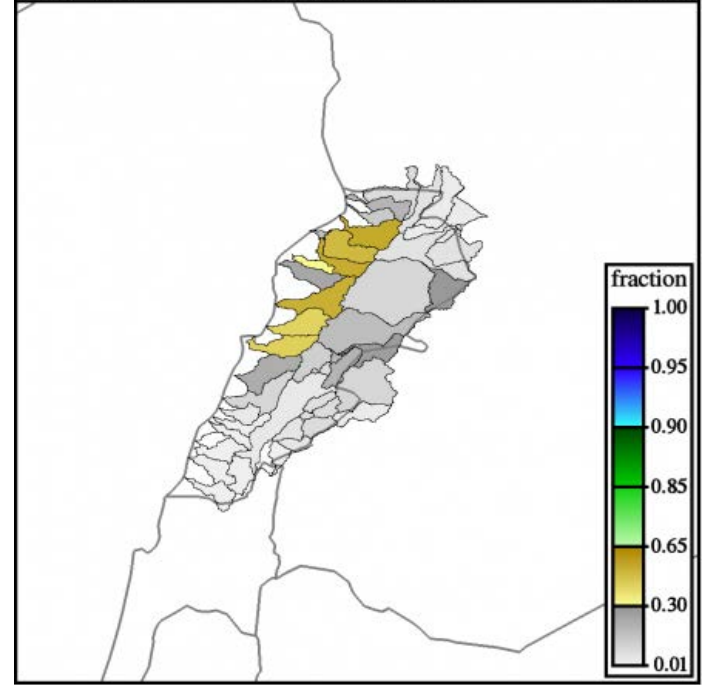
# FFGS Products 25-10-15.00Z



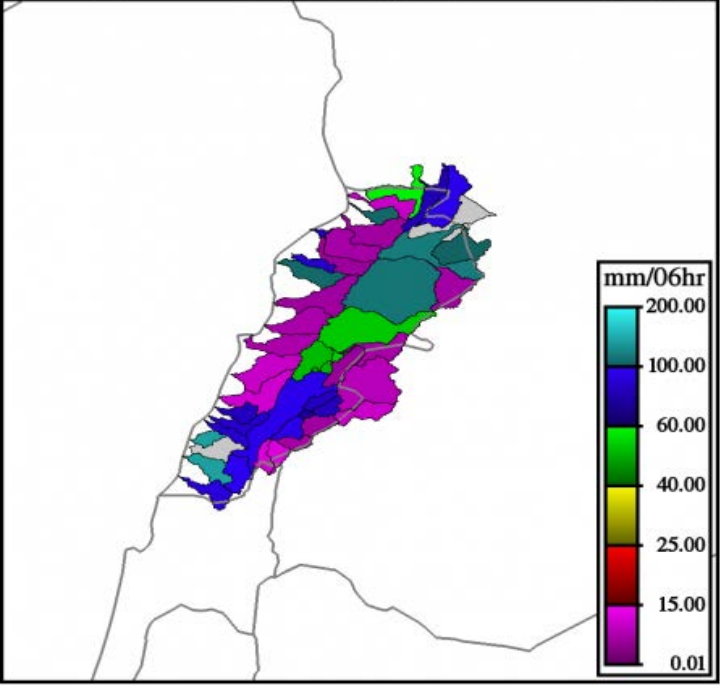
MAP - 06 hr 2015-10-25 06:00 UTC LEBANON



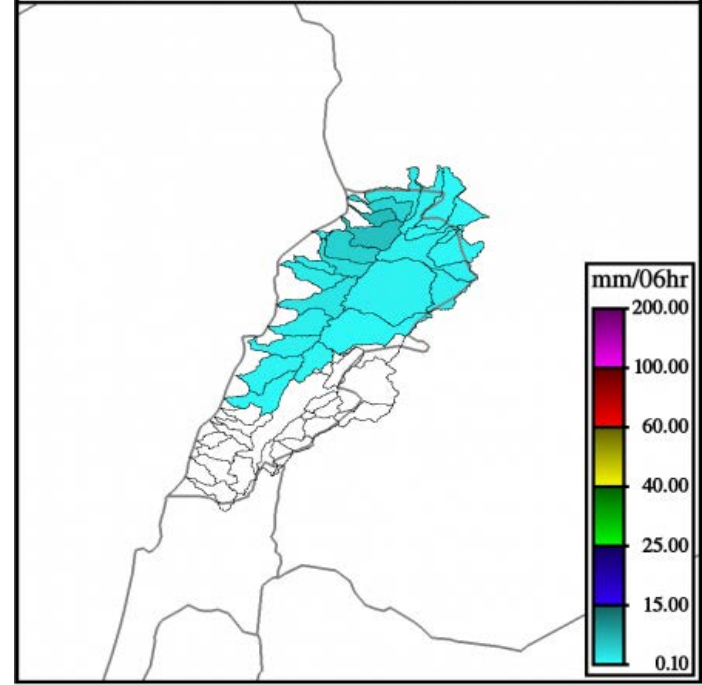
ASM - 06 hr 2015-10-25 06:00 UTC LEBANON



FFG - 06 hr 2015-10-25 06:00 UTC LEBANON



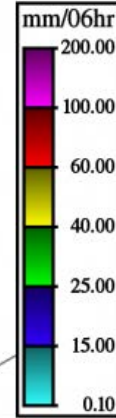
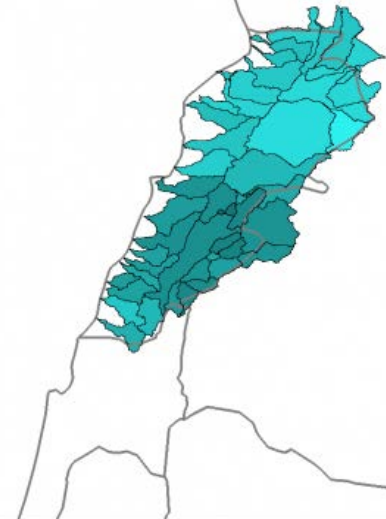
FMAP - 06 hr 2015-10-25 06:00 UTC LEBANON





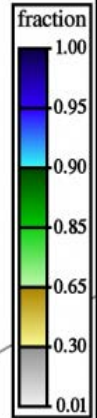
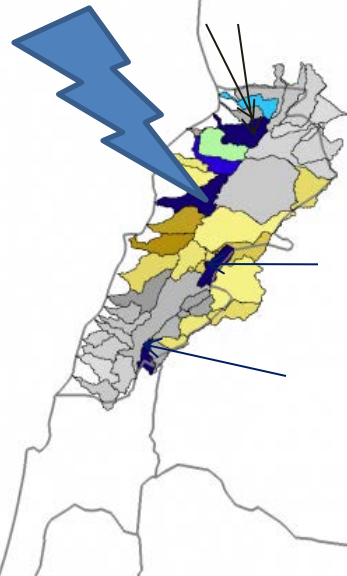
MAP - 06 hr 2015-10-25 12:00 UTC LEBANON

1

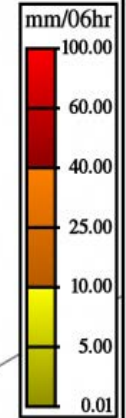
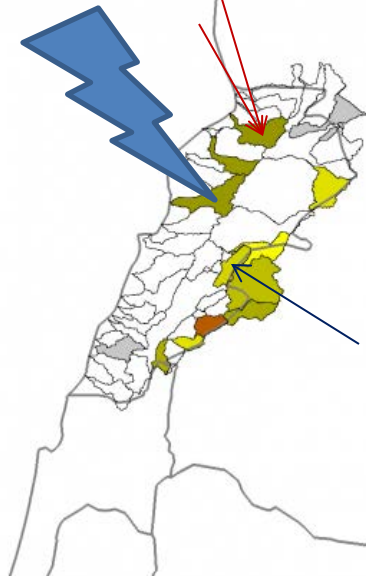


ASM - 06 hr 2015-10-25 12:00 UTC LEBANON

2

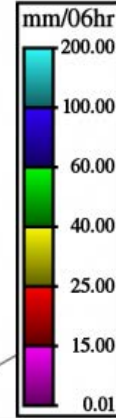
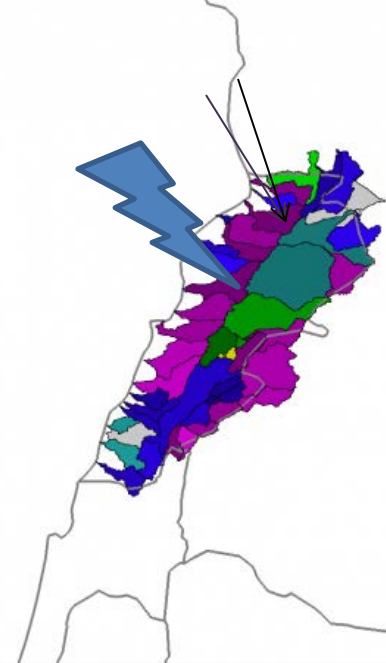


FFFT - 06 hr 2015-10-25 12:00 UTC LEBANON



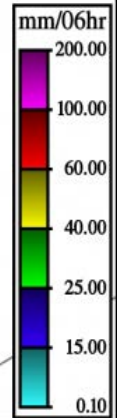
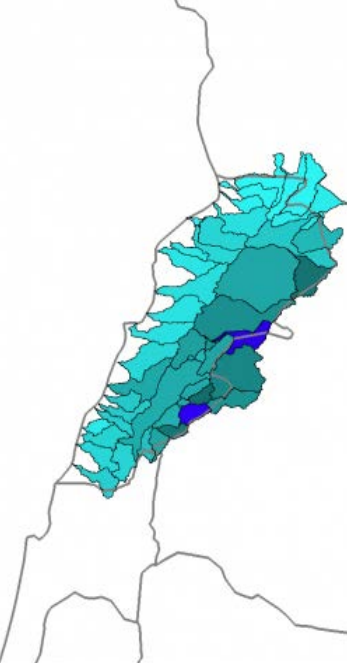
FFG - 06 hr 2015-10-25 12:00 UTC LEBANON

3

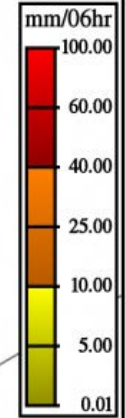


FMAP - 06 hr 2015-10-25 12:00 UTC LEBANON

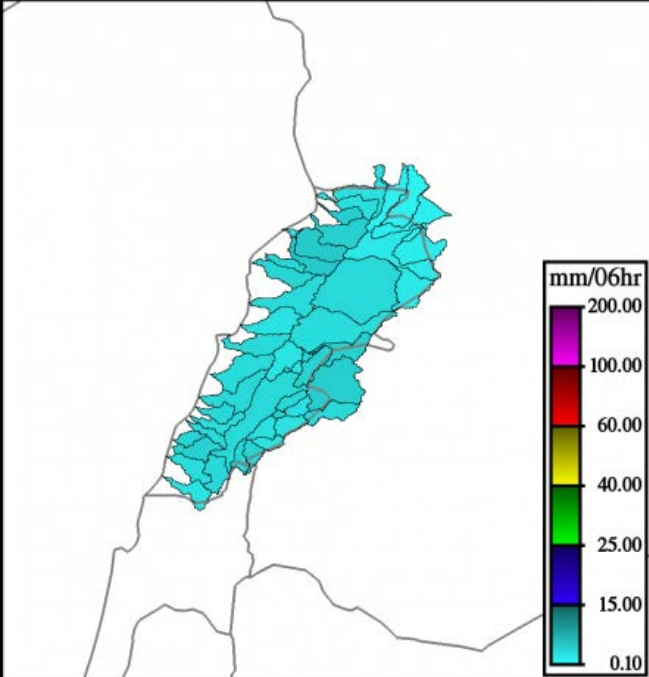
4



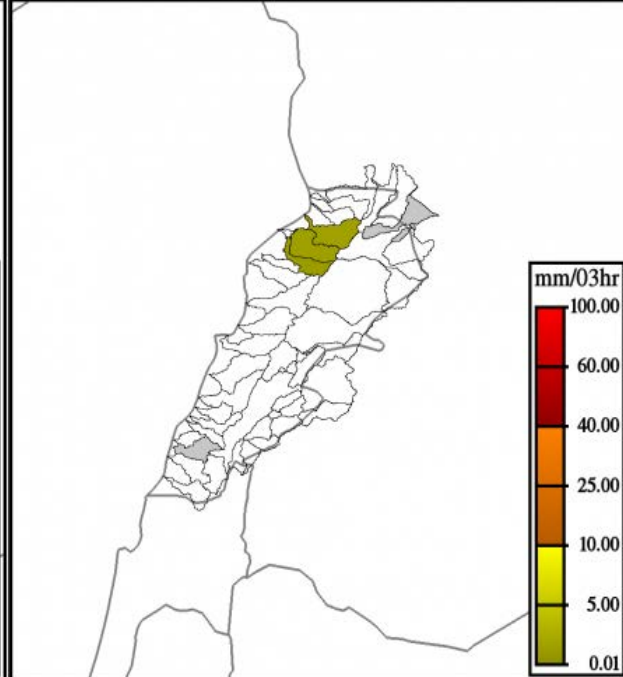
PFFT - 06 hr 2015-10-25 12:00 UTC LEBANON



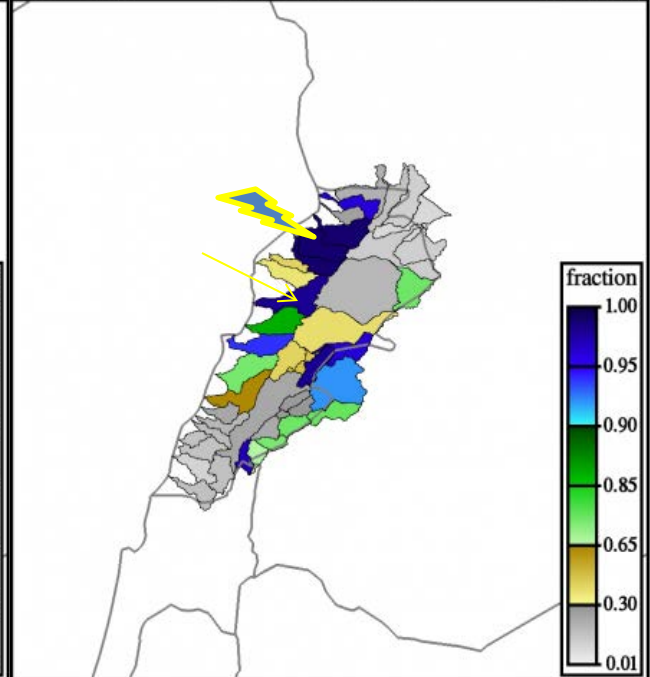
MAP - 06 hr 2015-10-25 18:00 UTC LEBANON



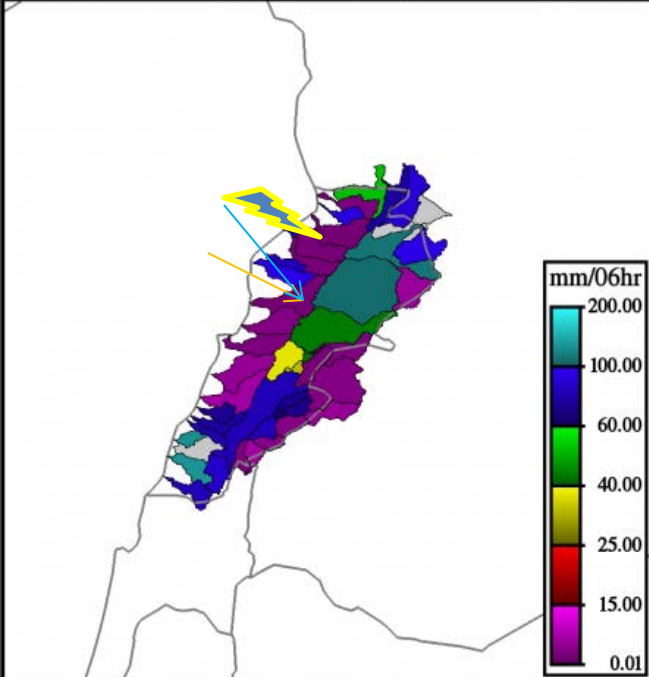
PFFT - 03 hr 2015-10-25 18:00 UTC LEBANON



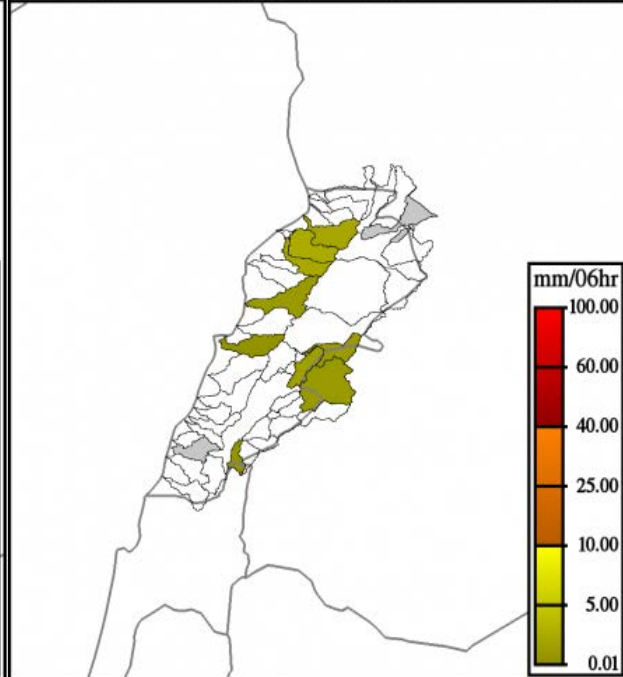
ASM - 06 hr 2015-10-25 18:00 UTC LEBANON



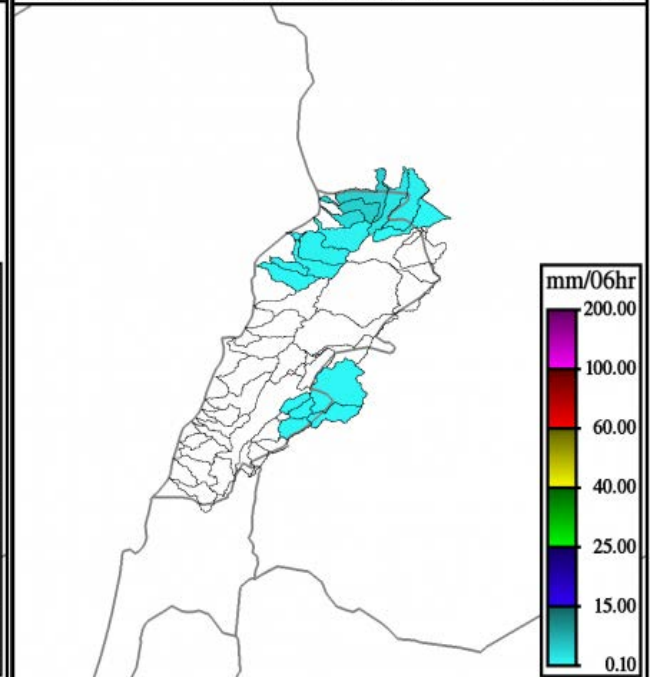
FFG - 06 hr 2015-10-25 18:00 UTC LEBANON



PFFT - 06 hr 2015-10-25 18:00 UTC LEBANON



FMAP - 06 hr 2015-10-25 18:00 UTC LEBANON

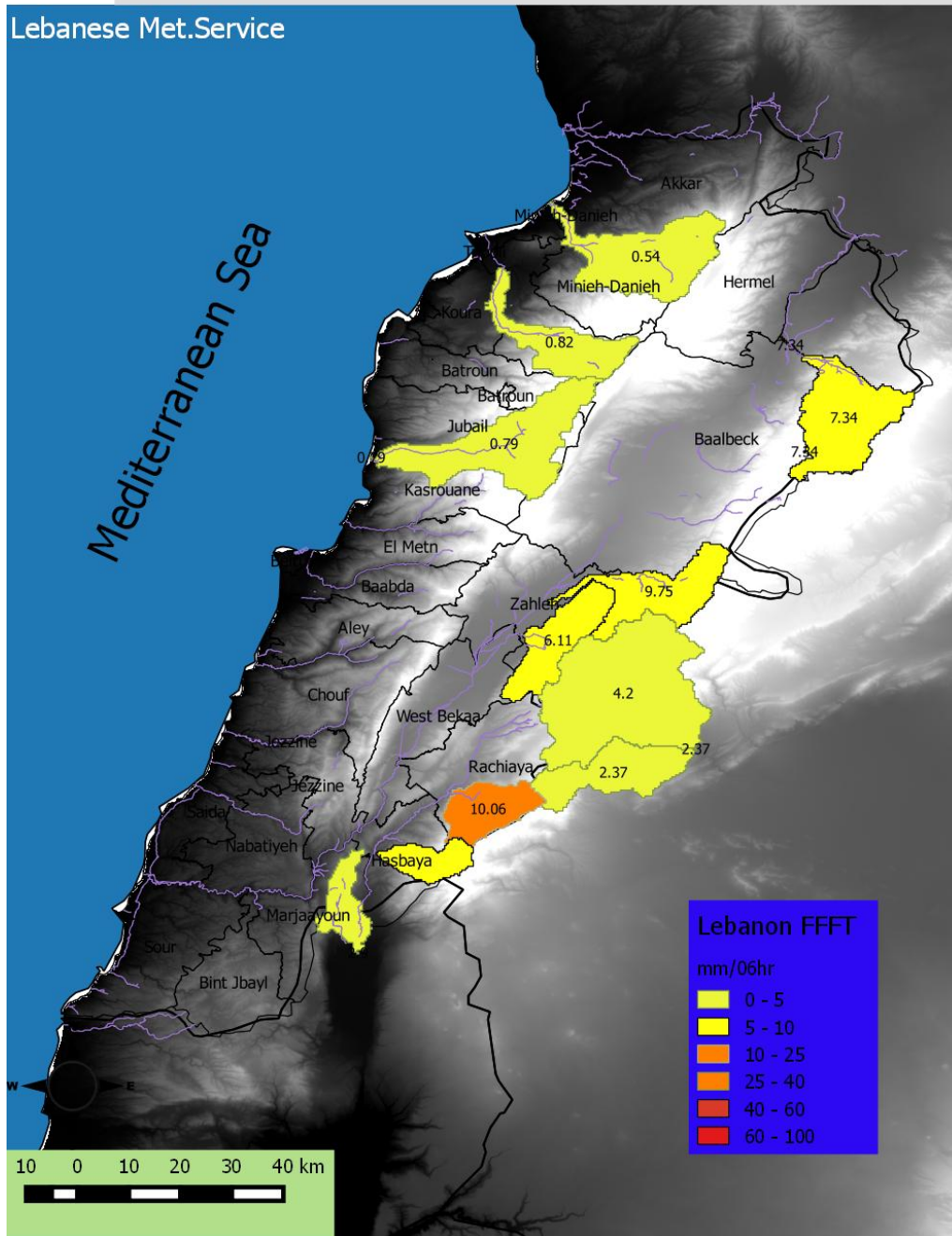




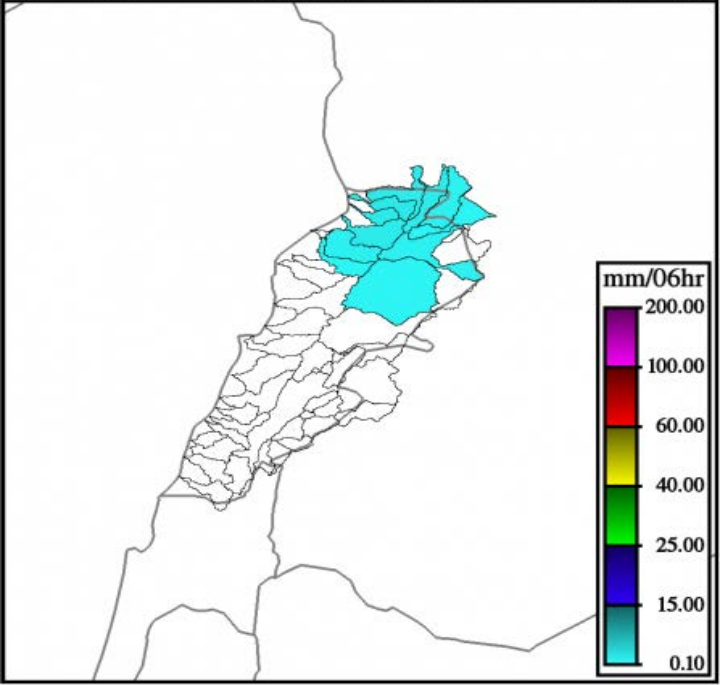
# Forecast Flash Flood Threat

## FFFT 25-10-16 12:00 UTC

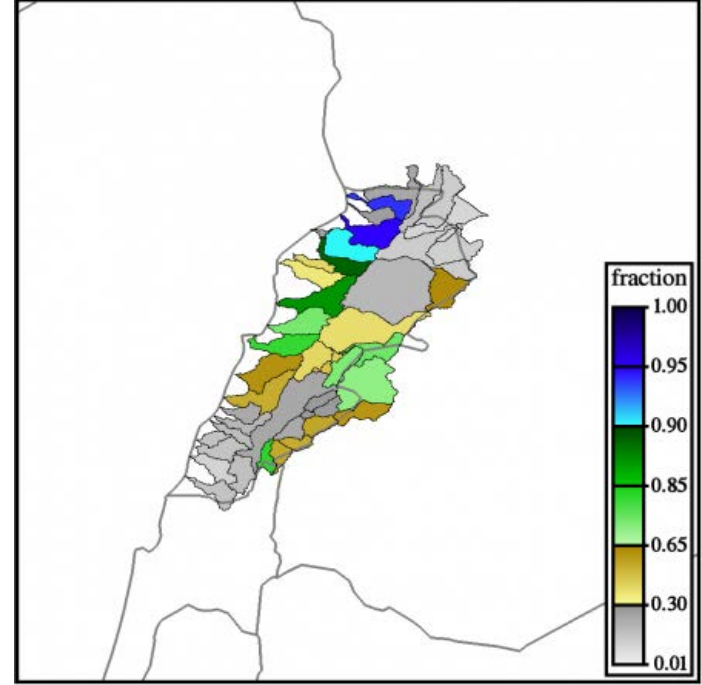
Lebanese Met.Service



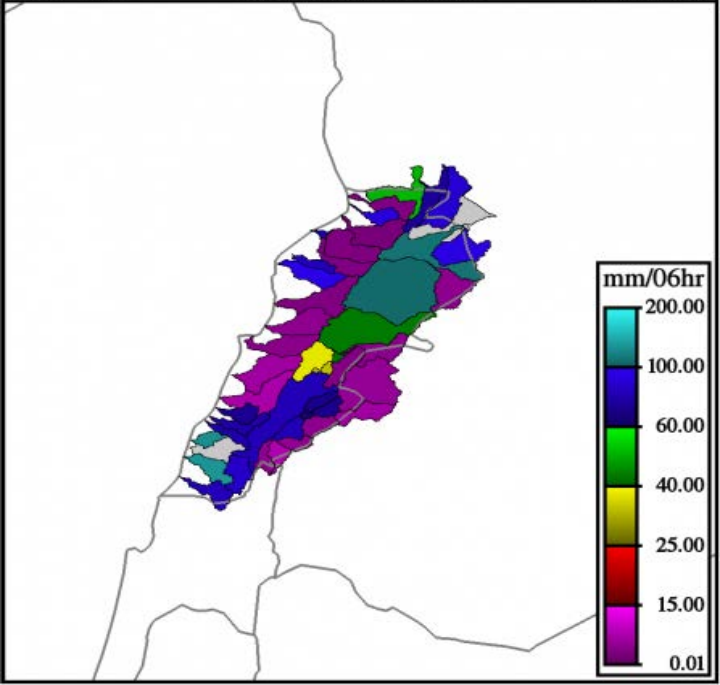
MAP - 06 hr 2015-10-26 00:00 UTC LEBANON



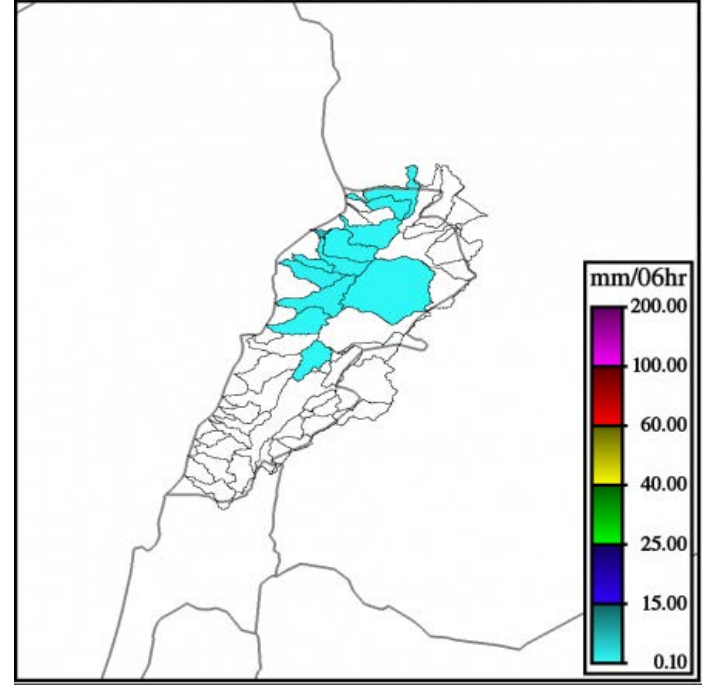
ASM - 06 hr 2015-10-26 00:00 UTC LEBANON



FPG - 06 hr 2015-10-26 00:00 UTC LEBANON



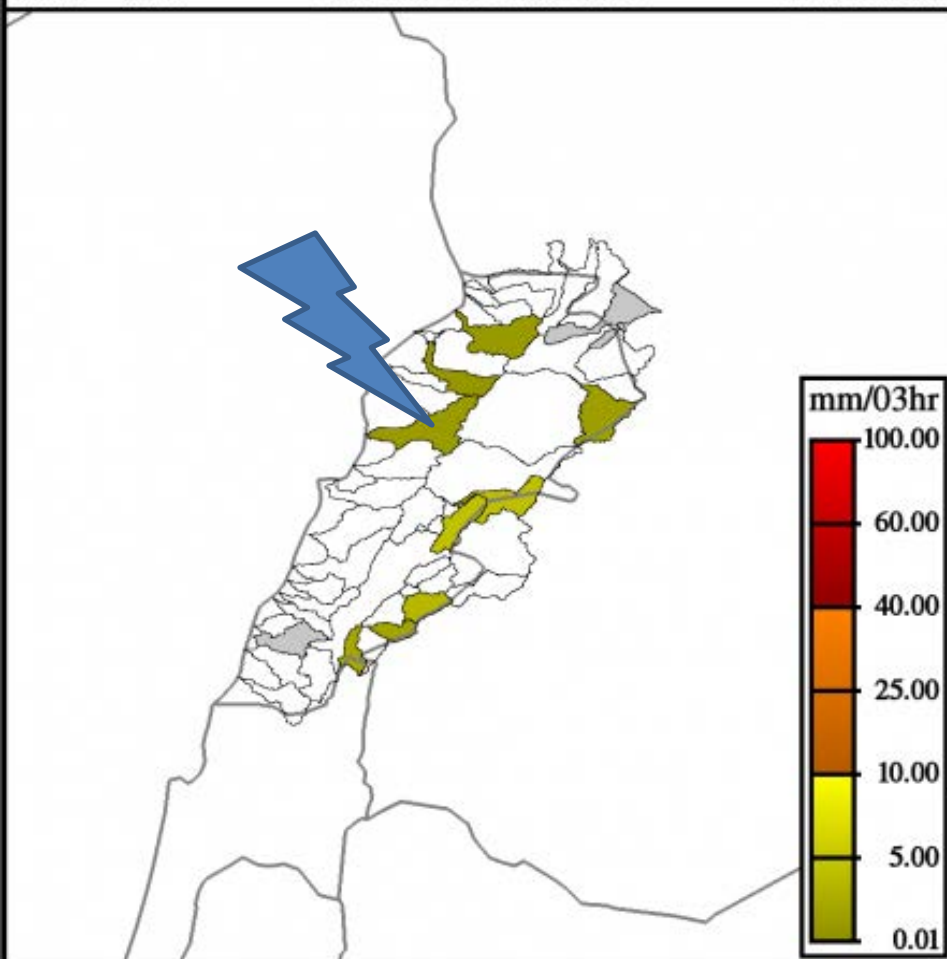
FMAP - 06 hr 2015-10-26 00:00 UTC LEBANON



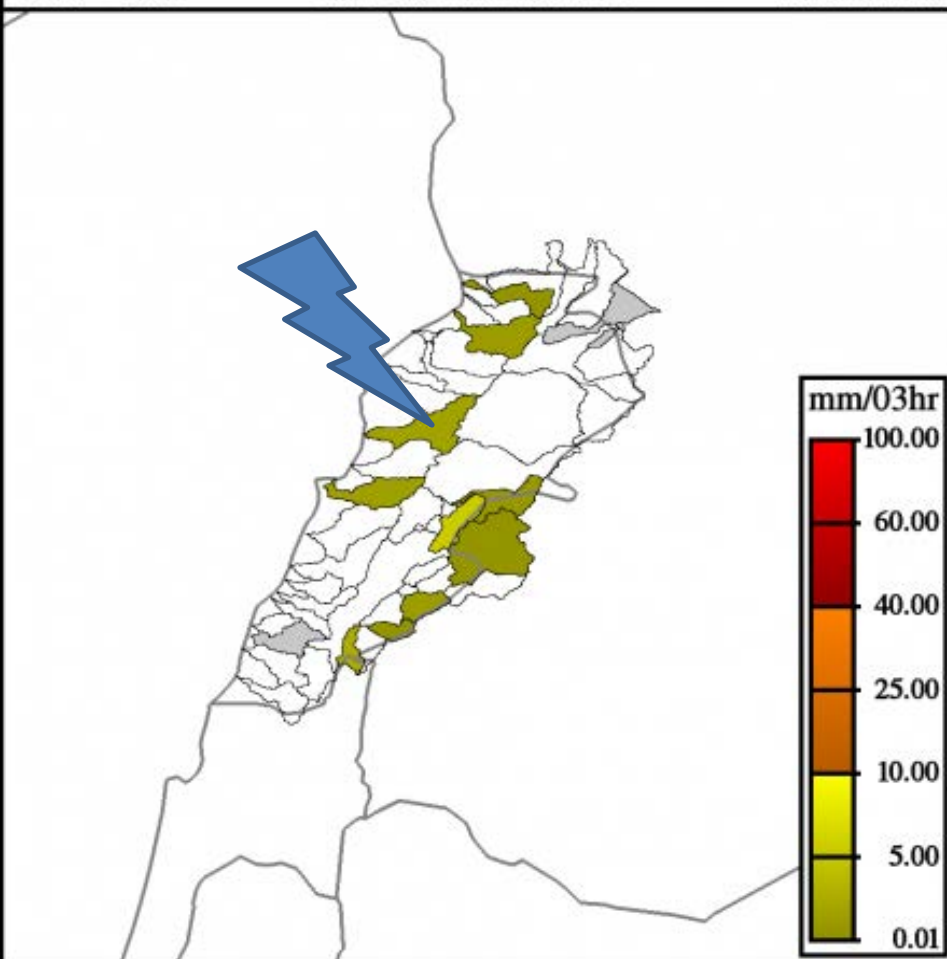


# (FFFT & PFFT) 3hr . 25-10-15.12Z

FFFT - 03 hr      2015-10-25 12:00 UTC      LEBANON



PFFT - 03 hr      2015-10-25 12:00 UTC      LEBANON



# Flash Flood Warning

Issued : 25-10-2015 at 12 UTC

Valid to : 25-10-2015 at 18 UTC

Warning : Flash floods are expected with very high confidence in northern mountain areas (Qartaba, Qoubayat), and mid-area (Baysour) during the next 6 hours.

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# Real Time

What happened in real-time that rainfall event had began 25-10-2015 at 06UTC, became intensive in less than half-hour and lasts few hours later.

Our best mission was issuing flash flood watch at 03UTC and warning at 06UTC on October 2015 for the FF prone areas.



QARTABA





**QARTABA**



QARTABA



QARTABA



BEIRUT 25-10-15



**BAYSOUR**



**BAYSOUR**





BAYSOUR





**BAYSOUR**

QOUBAYAT



QOUBAYAT





QOUBAYAT



**QOUBAYAT**







«تنين البحر» قبالة الرملة البيضاء



THANK  
YOU