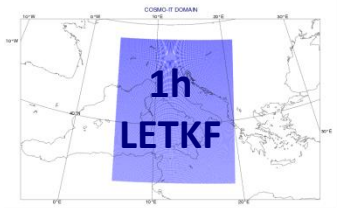
Experimental ICON-IT@COMet: case studies and verification scores

Francesca MARCUCCI, Lucio TORRISI

Operational Centre for Meteorology - COMet

ITAF-Remet /COMet NWP System

Ensemble Data Assimilation:



1h cycle
2.2 km
65 v.l.
40+1 m.

Observations

RAOB (also descent), PILOT, SYNOP, SHIP, BUOY, Wind Profilers/Radars, AMDAR-AIREP, Mode-S, Meteosat AMV, Metop scatt. winds, NOAA/Metop AMSUA/MHS and NPP ATMS radiances

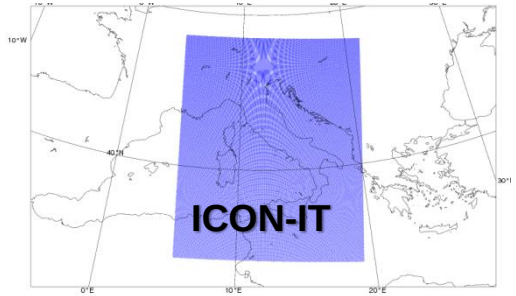
ECMWF Boundary Conditions (HRES, ENS)

Ensemble Analysis

Deterministic Analysis

2.2 km
65 v.l.
20 m.

Ensemble Prediction System:



2.2 km
65 v.l.

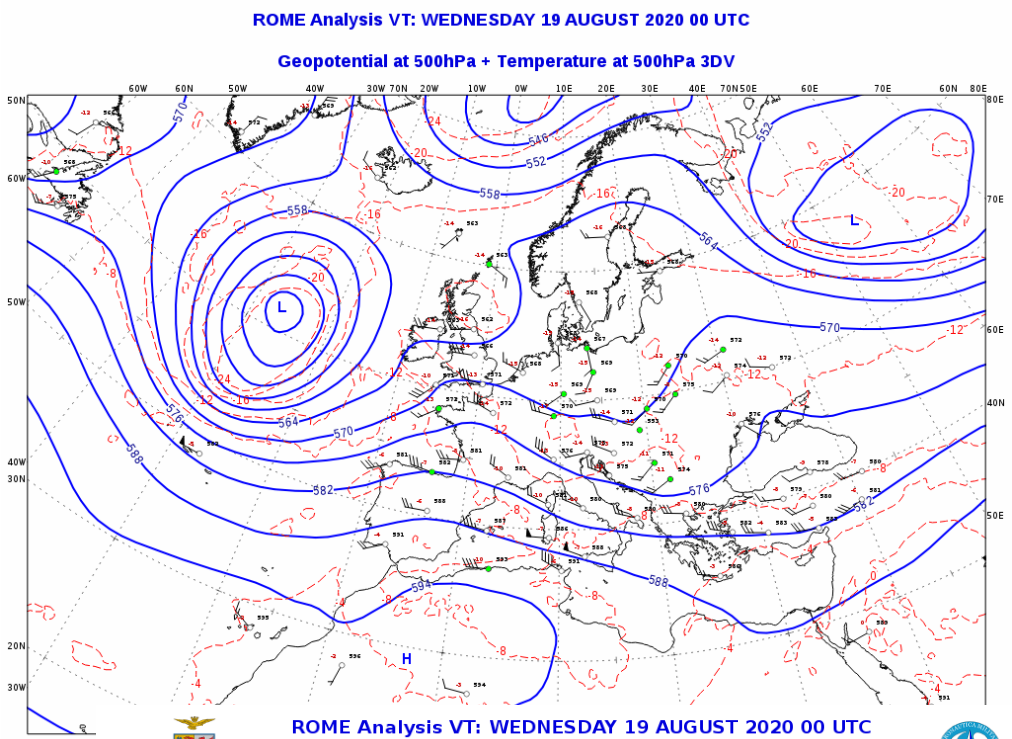
explicit convection

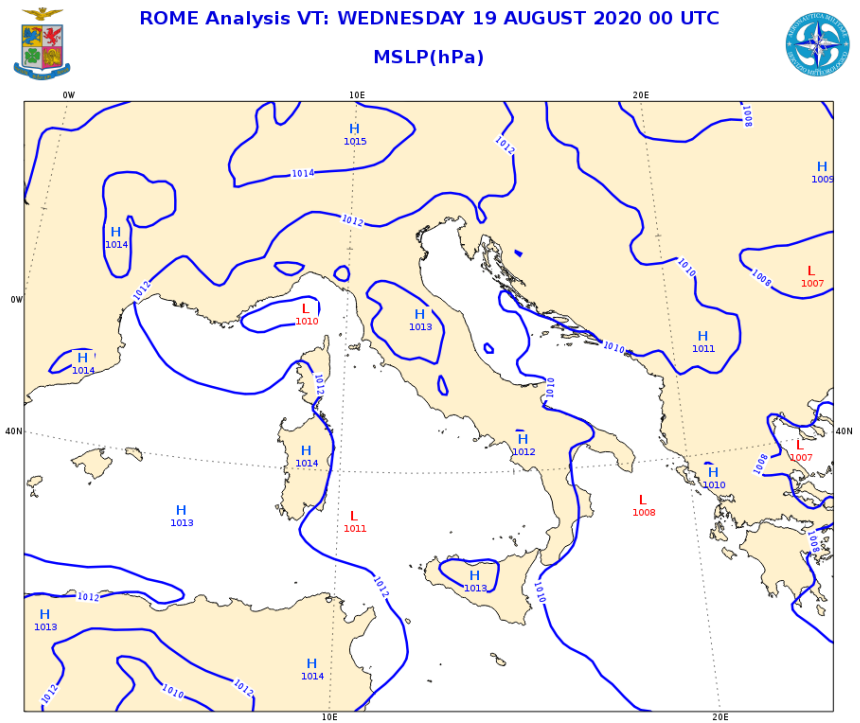
Local Area Modeling:

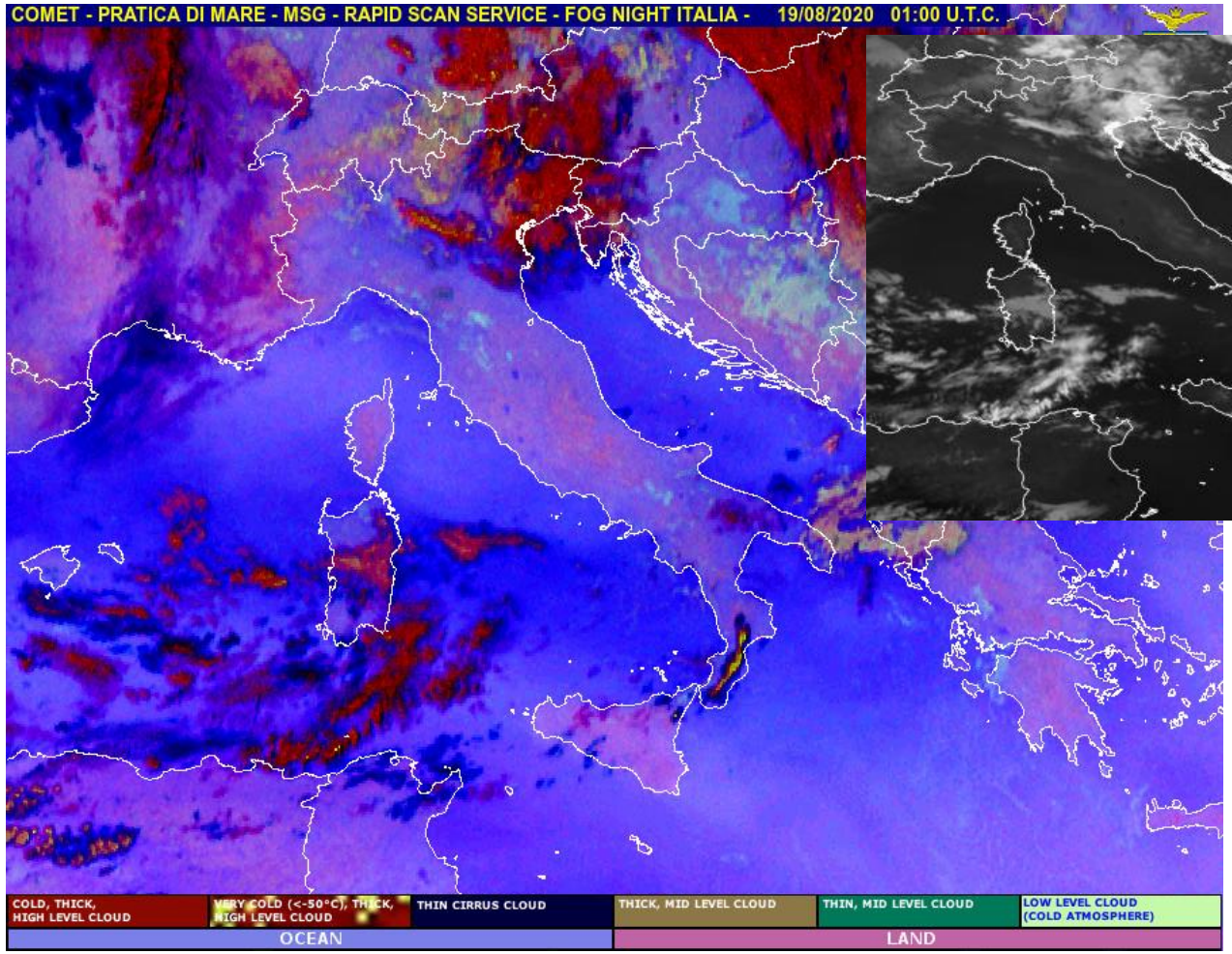
To be implemented with the GPU version

A case study of Low clouds over-estimation

Italian area: 20200819 00 UTC

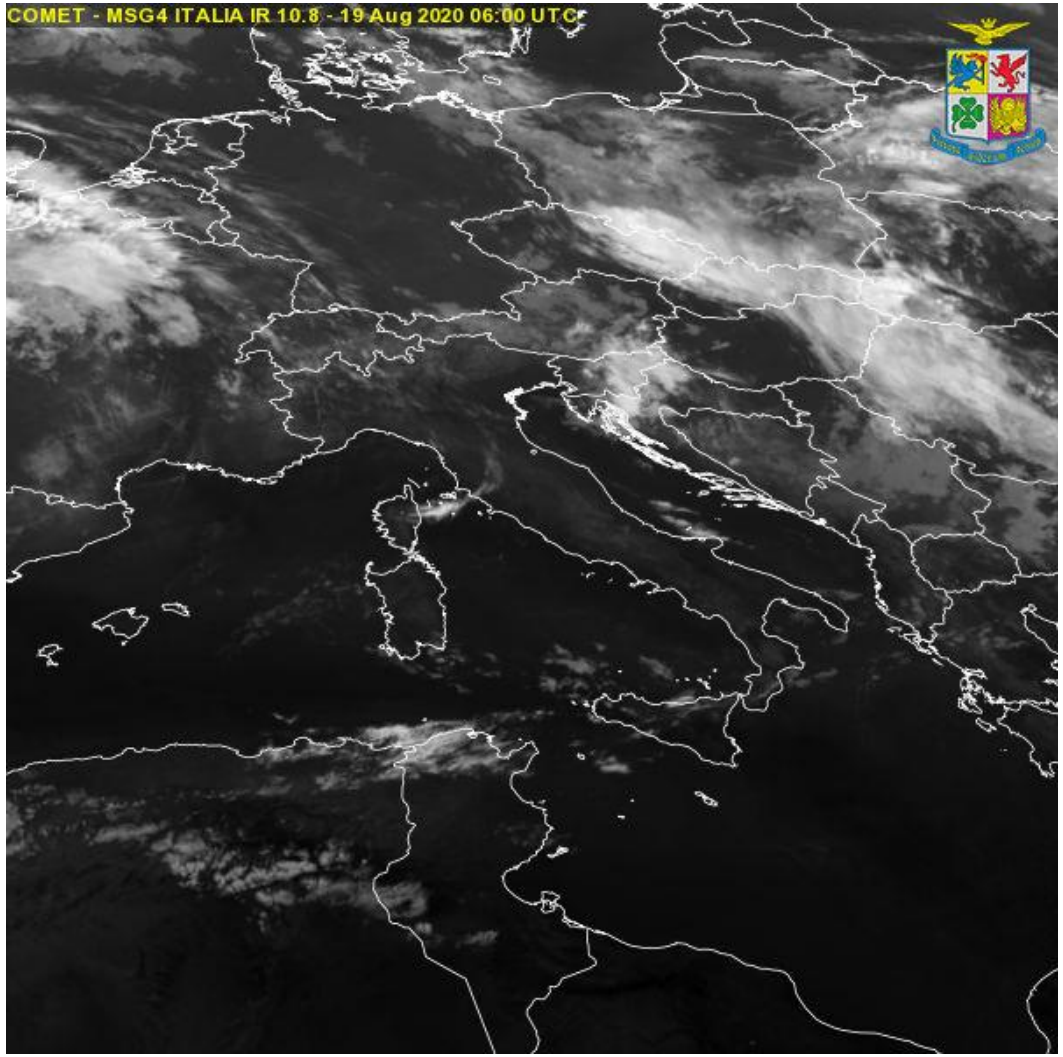


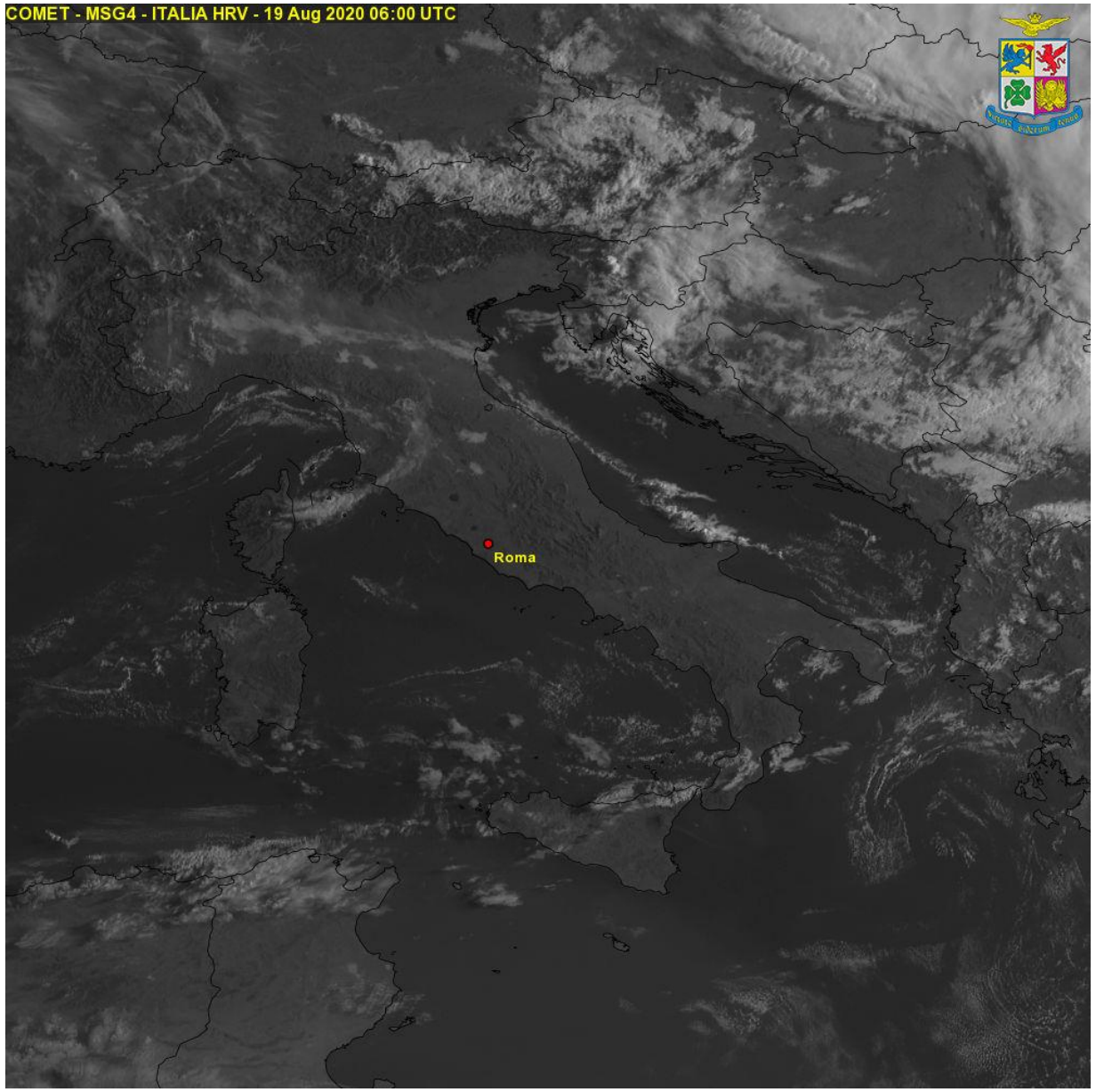




Low clouds over-estimation

Italian area: 20200819 06 UTC

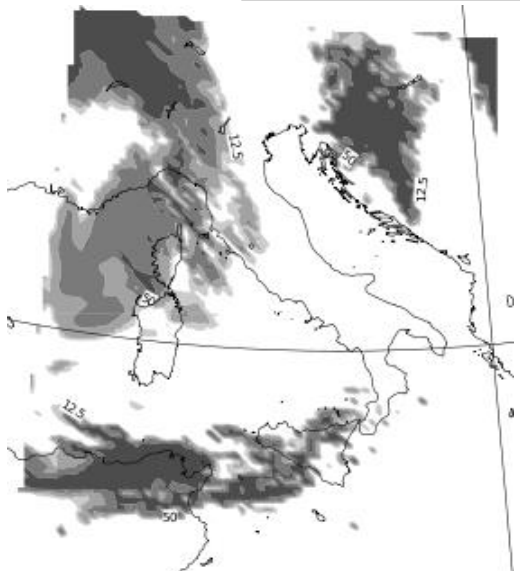




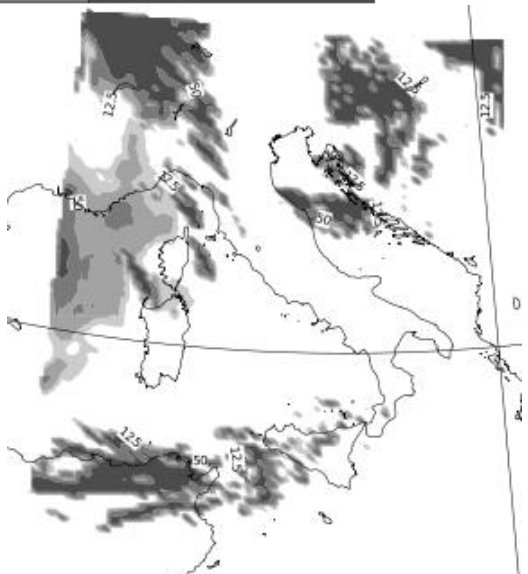
Low clouds over-estimation

20200819 00 UTC + 06h

High clouds

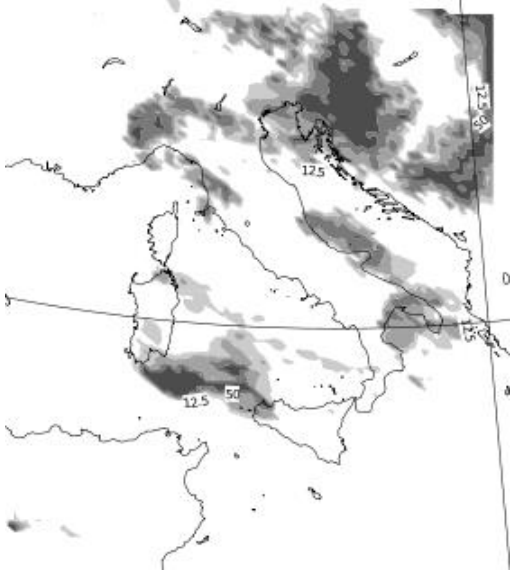


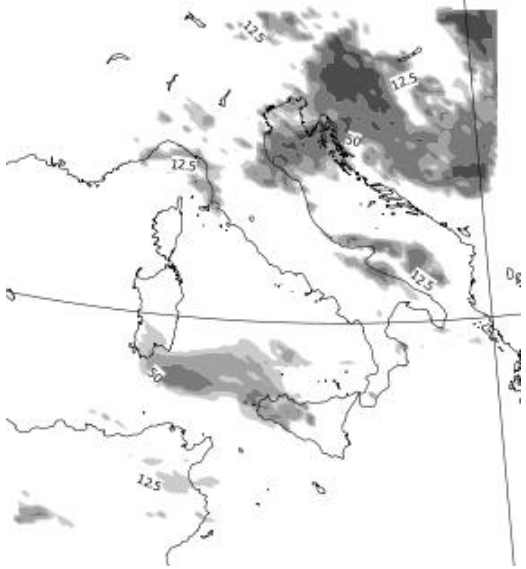
COSMO-IT from KENDA (2.2km)



ICON-IT from KENDA (2.2km)

Middle clouds

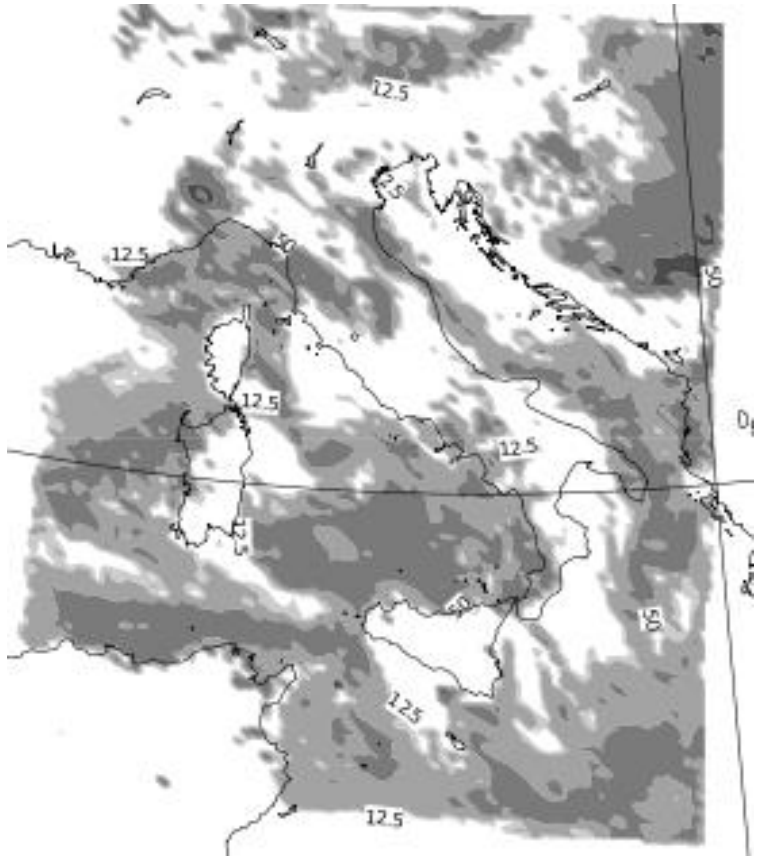




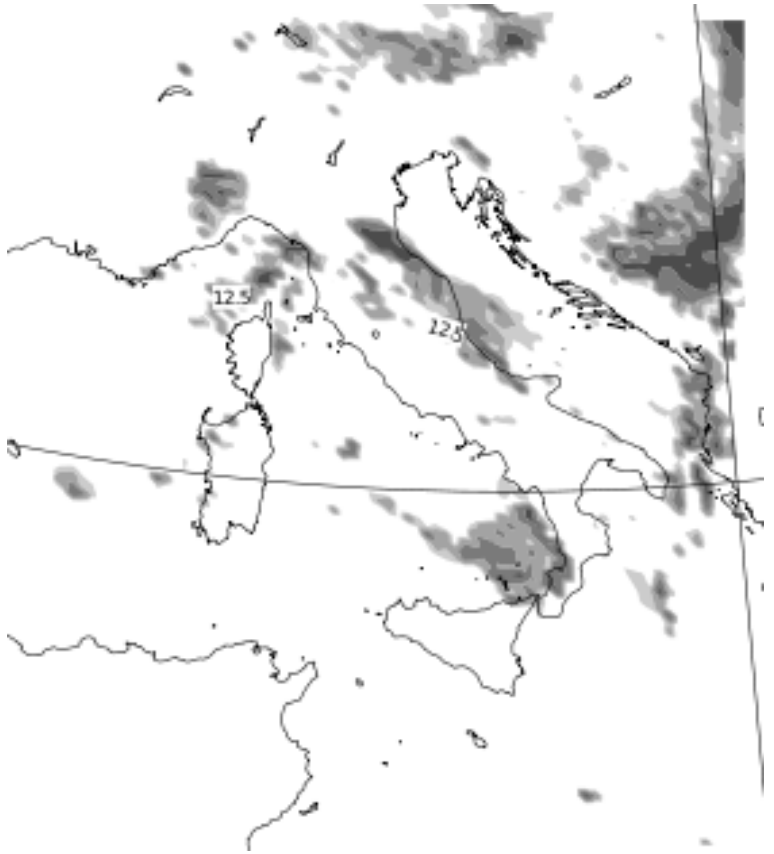
Low clouds over-estimation

20200819 00 UTC + 06h Low clouds

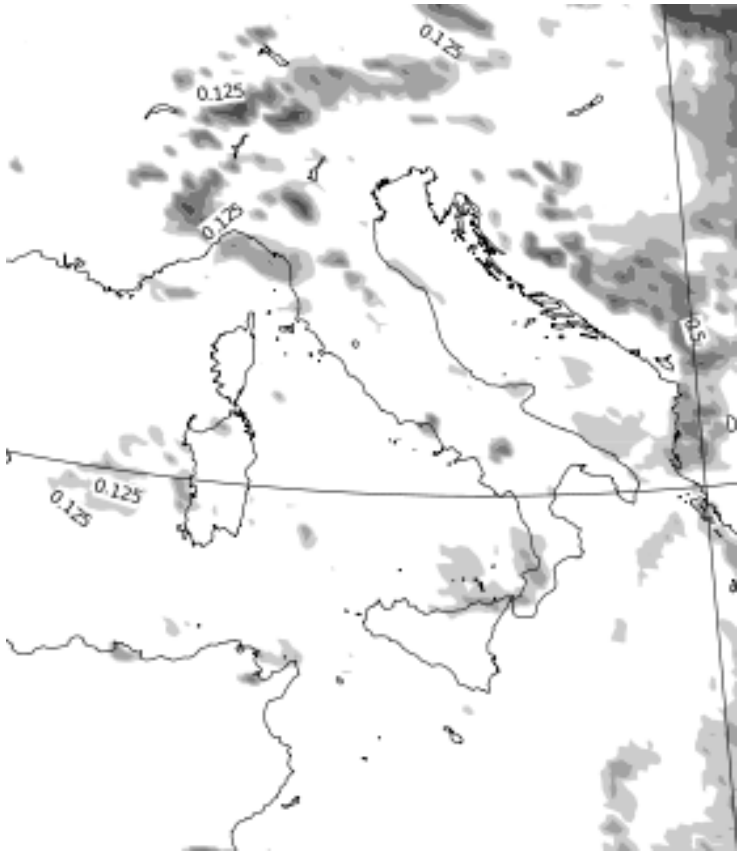
ICON-IT from KENDA (2.2km)

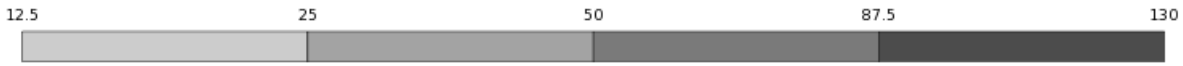


COSMO-IT from KENDA (2.2km)



IFS (9km)

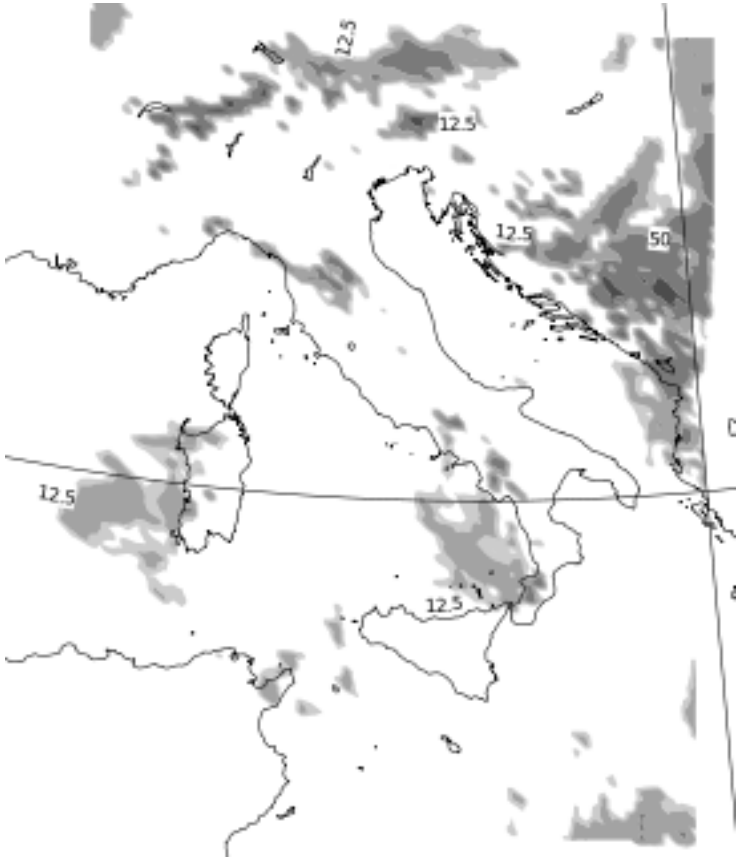




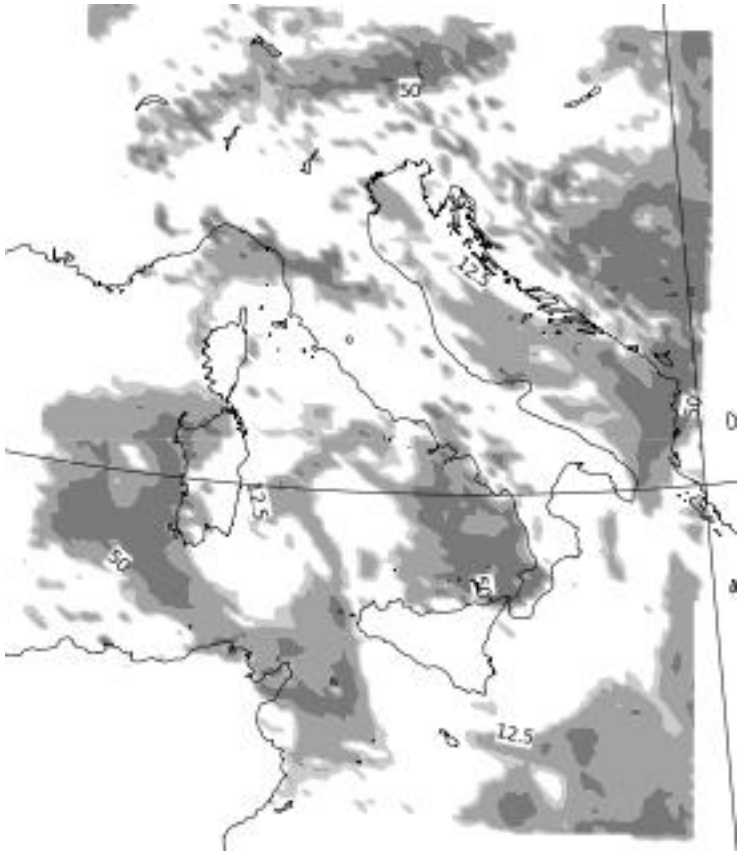
Low clouds over-estimation

ICON-IT from IFS IC (2.2km) Low clouds (inwp_cldcover=1)

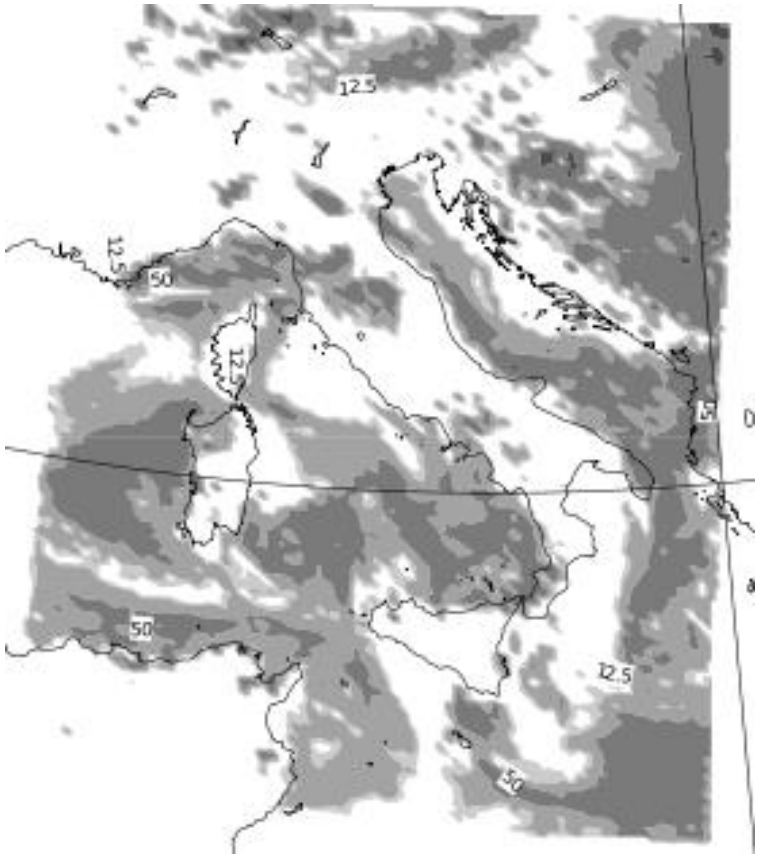
20200819 00 UTC + 0 h

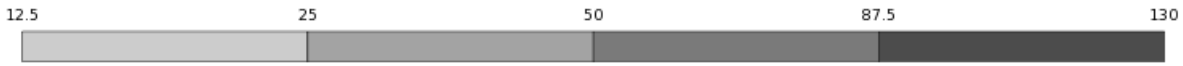


20200819 00 UTC + 1 h



20200819 00 UTC + 6 h

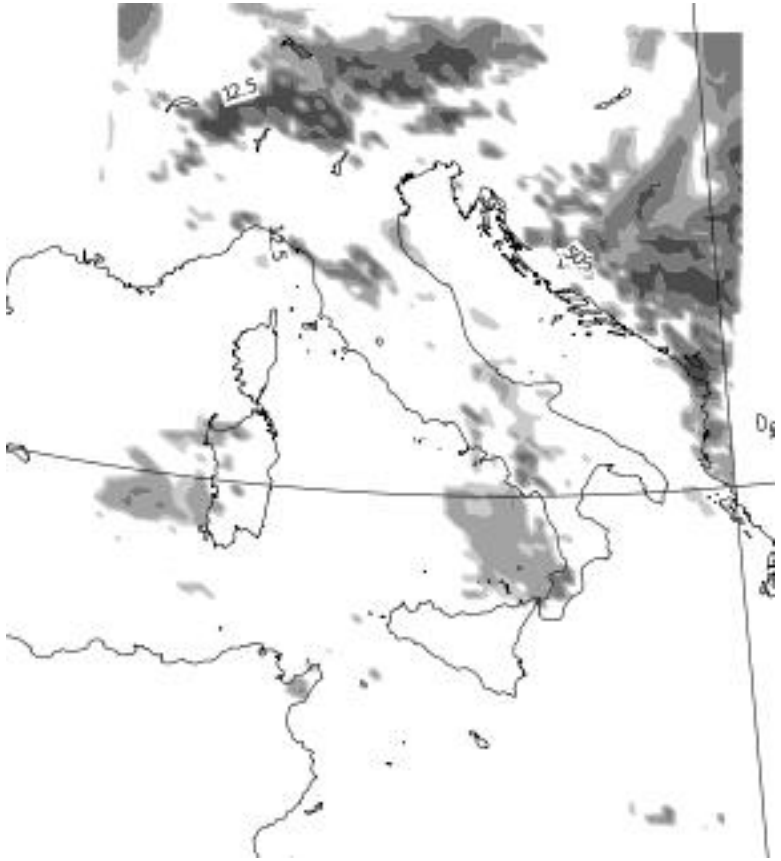




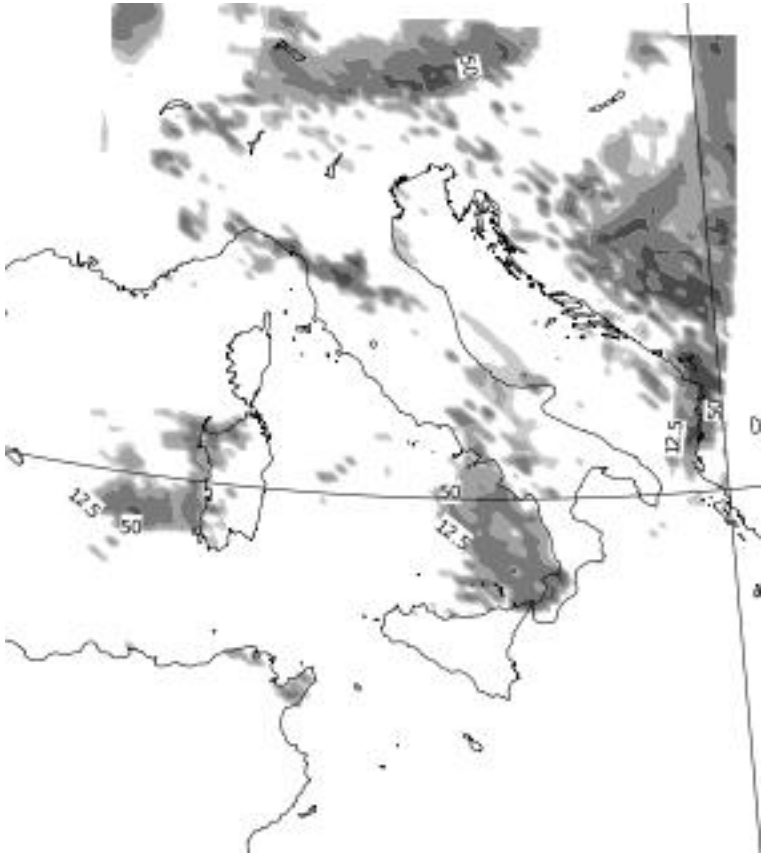
Low clouds over-estimation

ICON-IT from IFS IC (2.2km) Low clouds inwp_cldcover=3 (COSMO version)

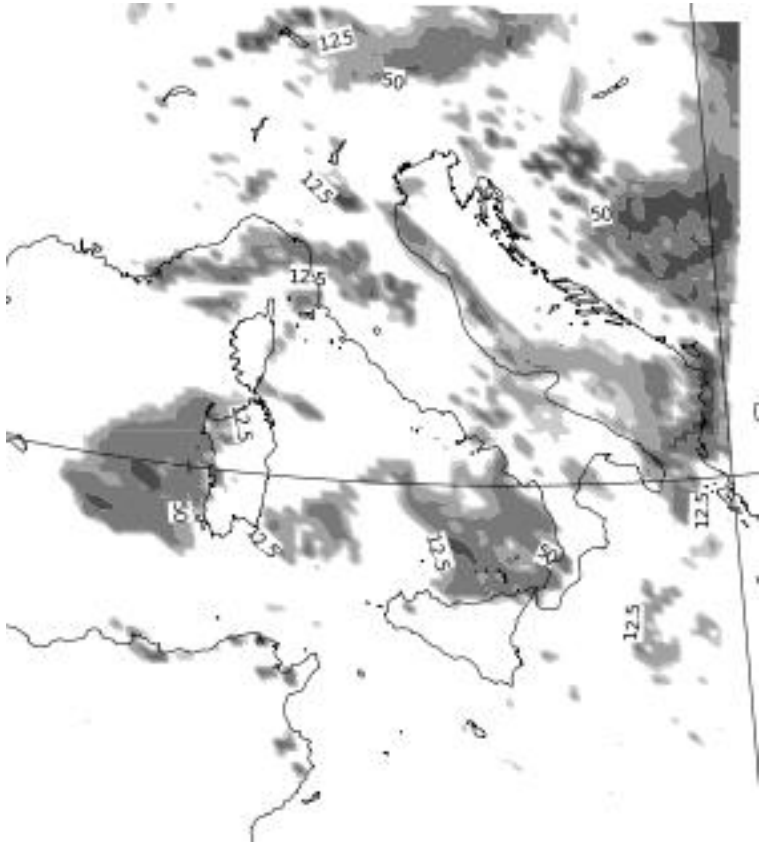
20200819 00 UTC + 0 h



20200819 00 UTC + 1 h



20200819 00 UTC + 6 h



Low clouds over-estimation

20200819 00 UTC ICON-IT run

In a grid point, where COSMO-IT has no cloudiness, the low cloud cover (CLCL) increases with the time step where no cloud water (QC) is present on model layers, but relative humidity is larger than 90%.

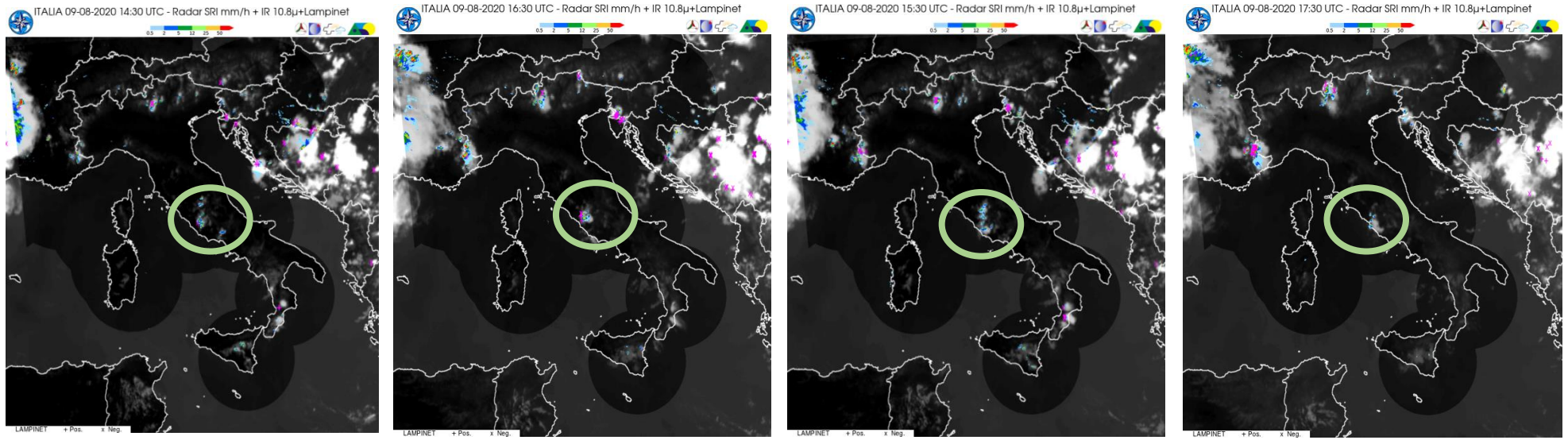
Gridpoint 207537

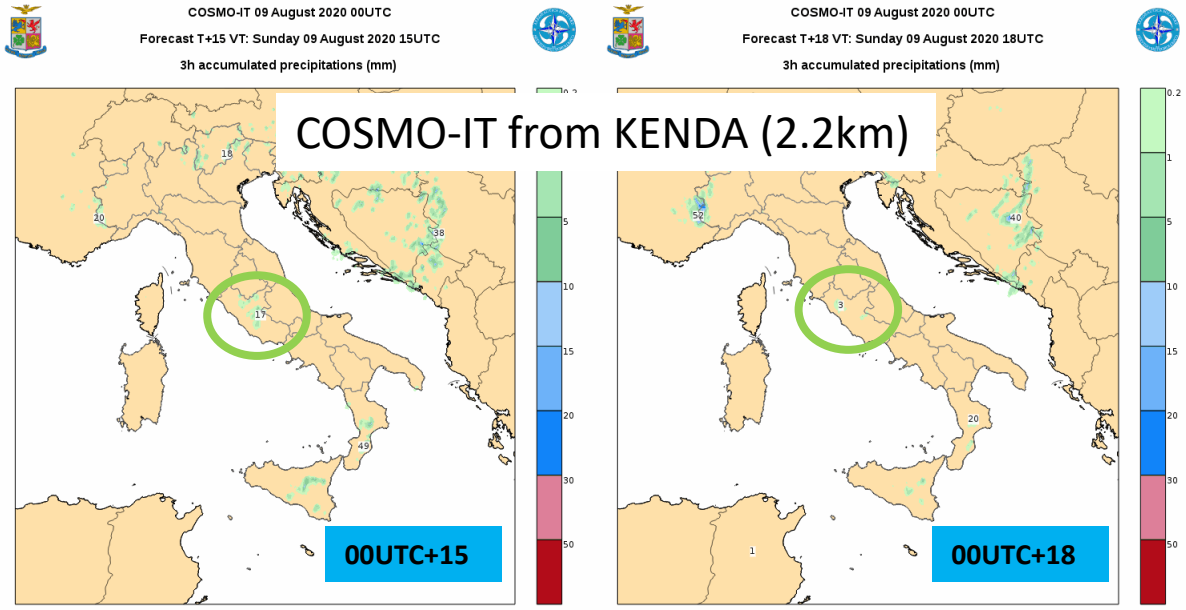
Lat 40. Lon 8.

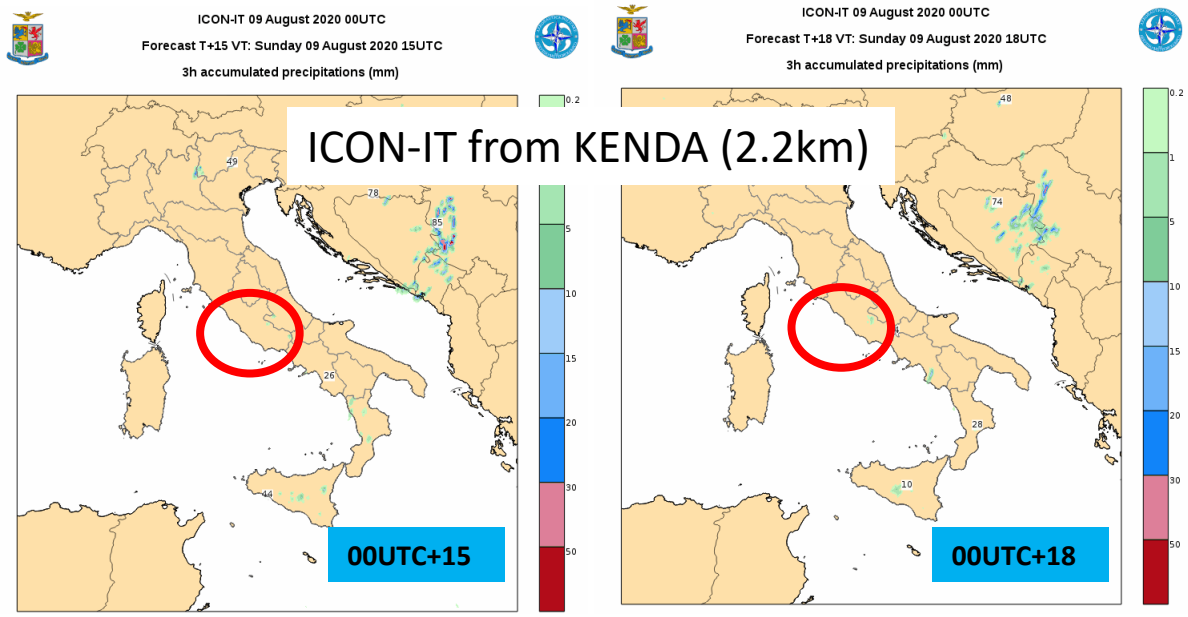
FC	clcl	tqc
0h	5.58594	0.
1h	51.8809	0.
2h	61.8496	0.
3h	64.9727	0.
4h	66.1309	0.
5h	68.2793	0.
6h	69.2148	0.

Recent case studies:
Intense convection over Italy

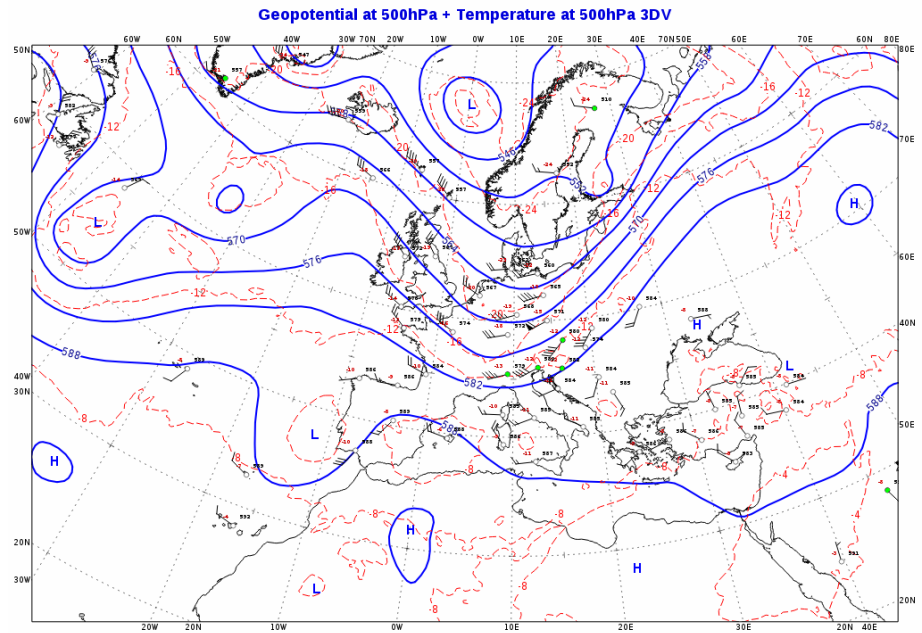
Deep convection over «Lazio» 9 Aug 2020

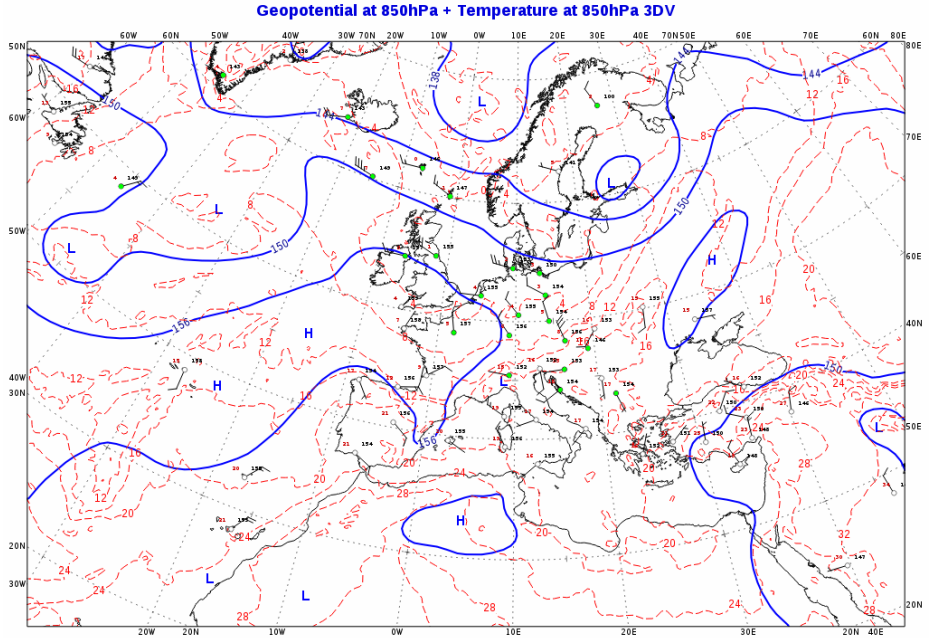


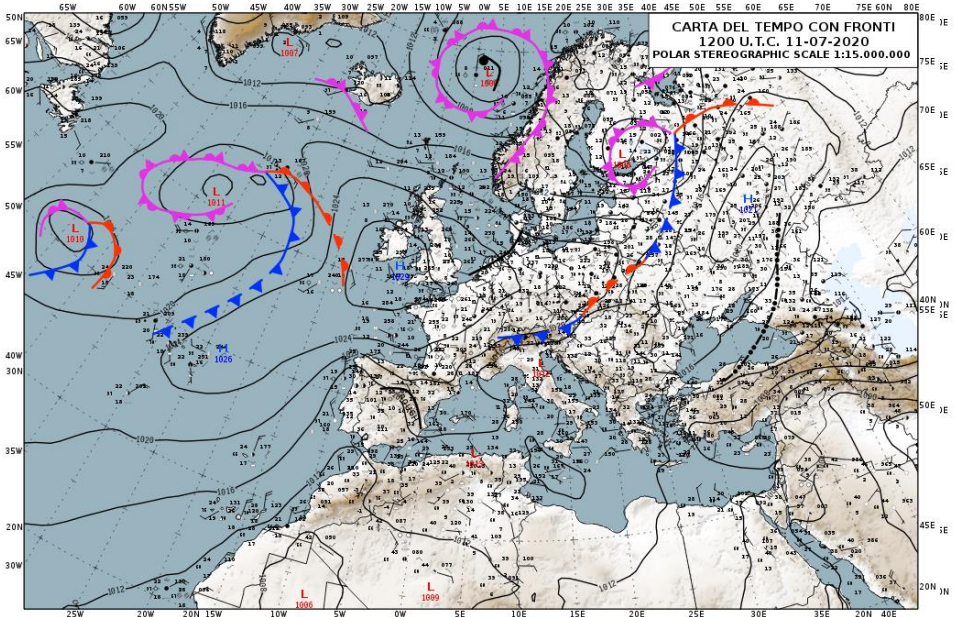


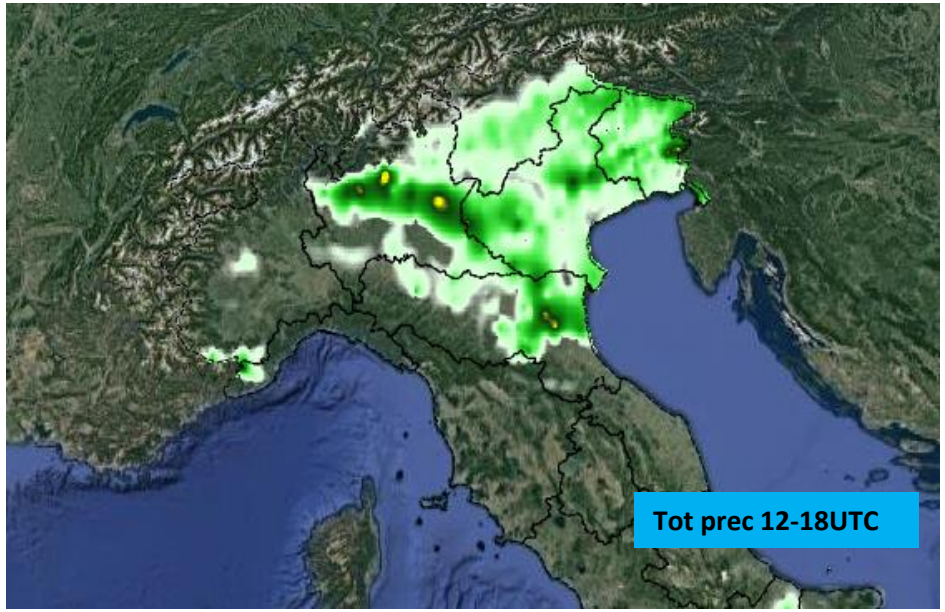


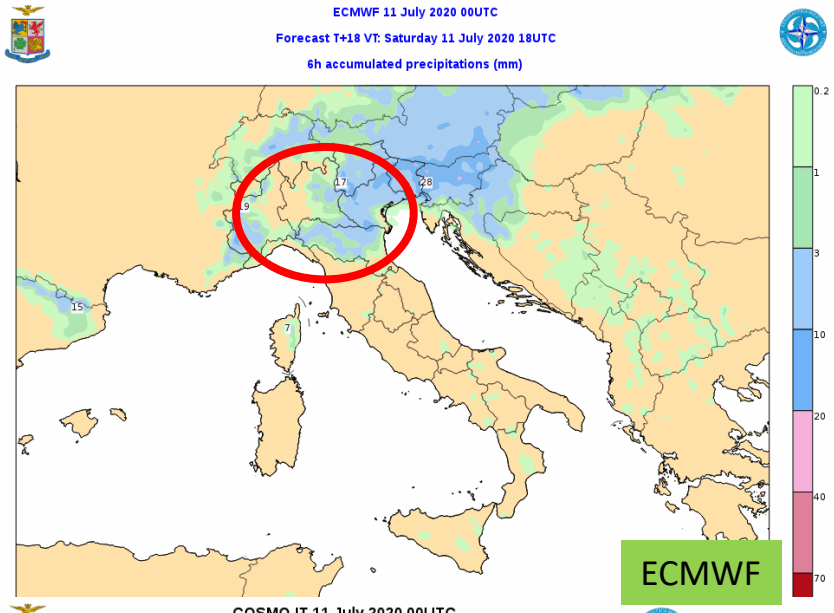
Squall line over «Brianza» 11 jul 2020

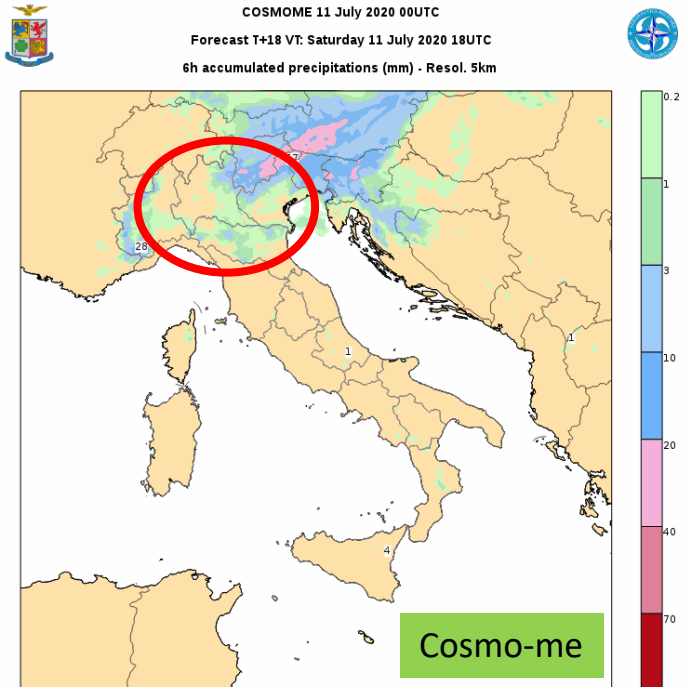


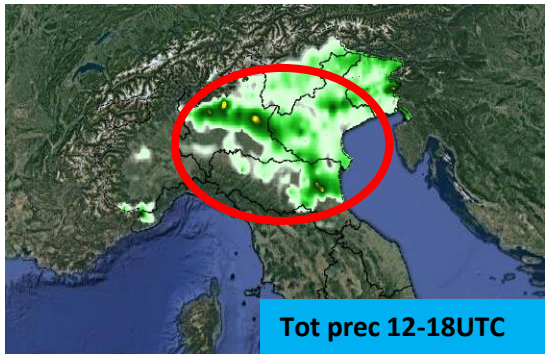


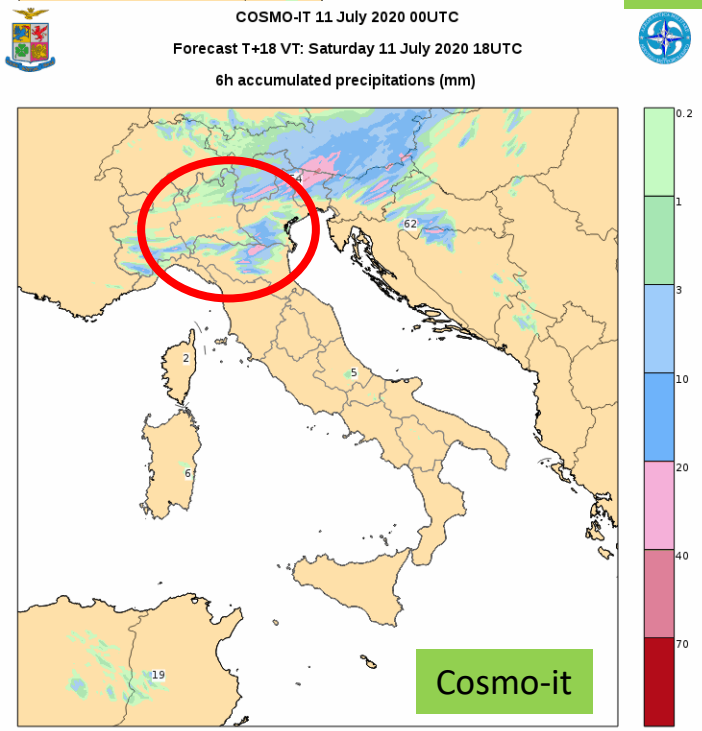


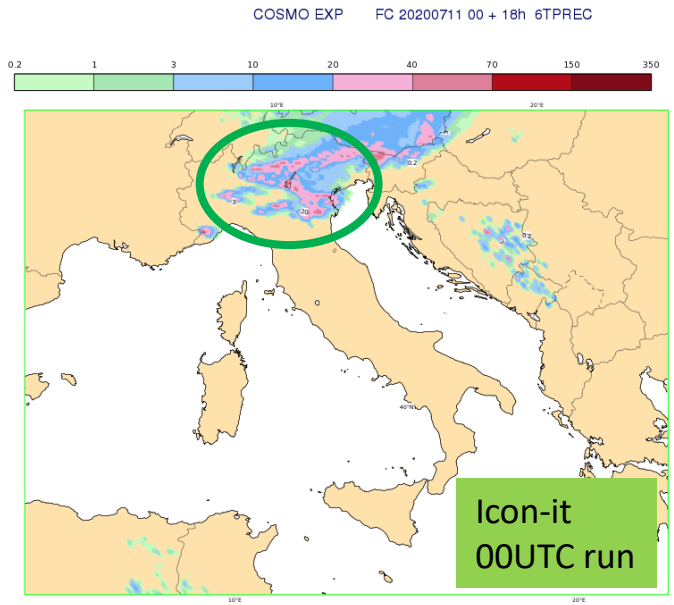


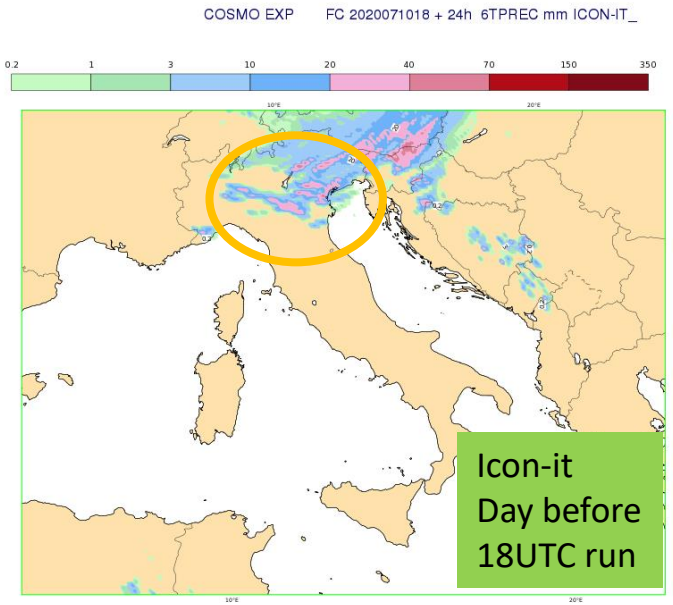

ECMWF 11 July 2020 00UTC
Forecast T+18 VT: Saturday 11 July 2020 18UTC
6h accumulated precipitations (mm)
0.2
1
3
10
20
40
70
ECMWF


COSMOME 11 July 2020 00UTC
Forecast T+18 VT: Saturday 11 July 2020 18UTC
6h accumulated precipitations (mm) - Resol. 5km
0.2
1
3
10
20
40
70
Cosmo-me

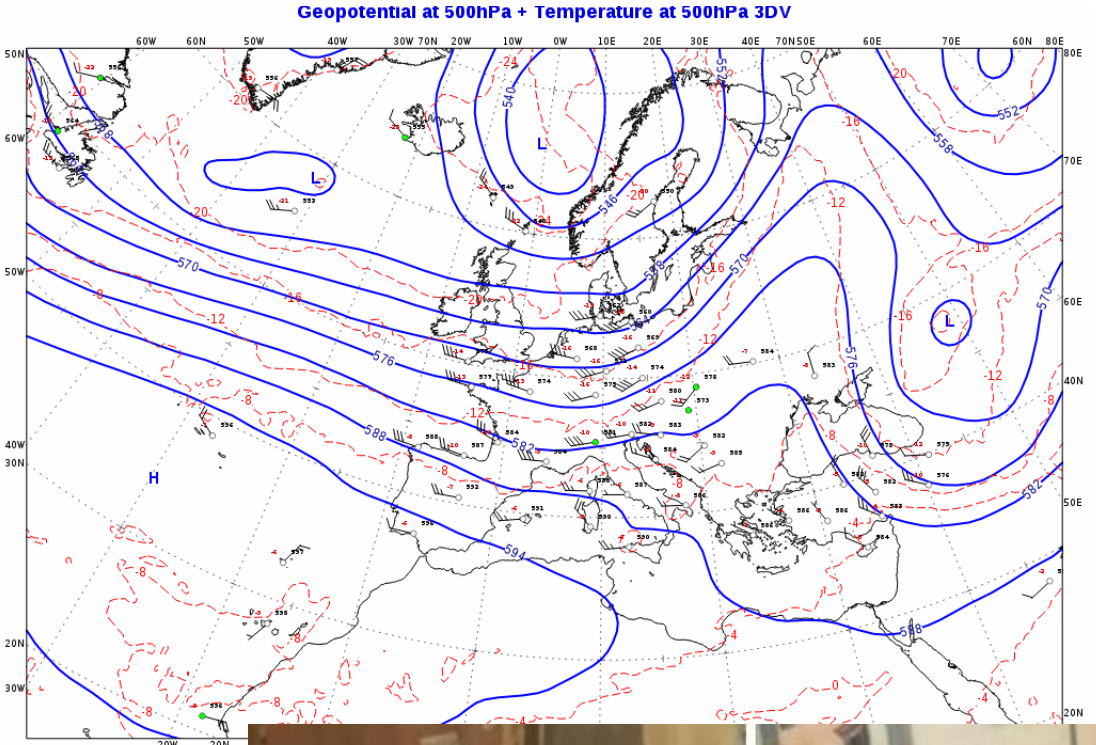

Tot prec 12-18UTC

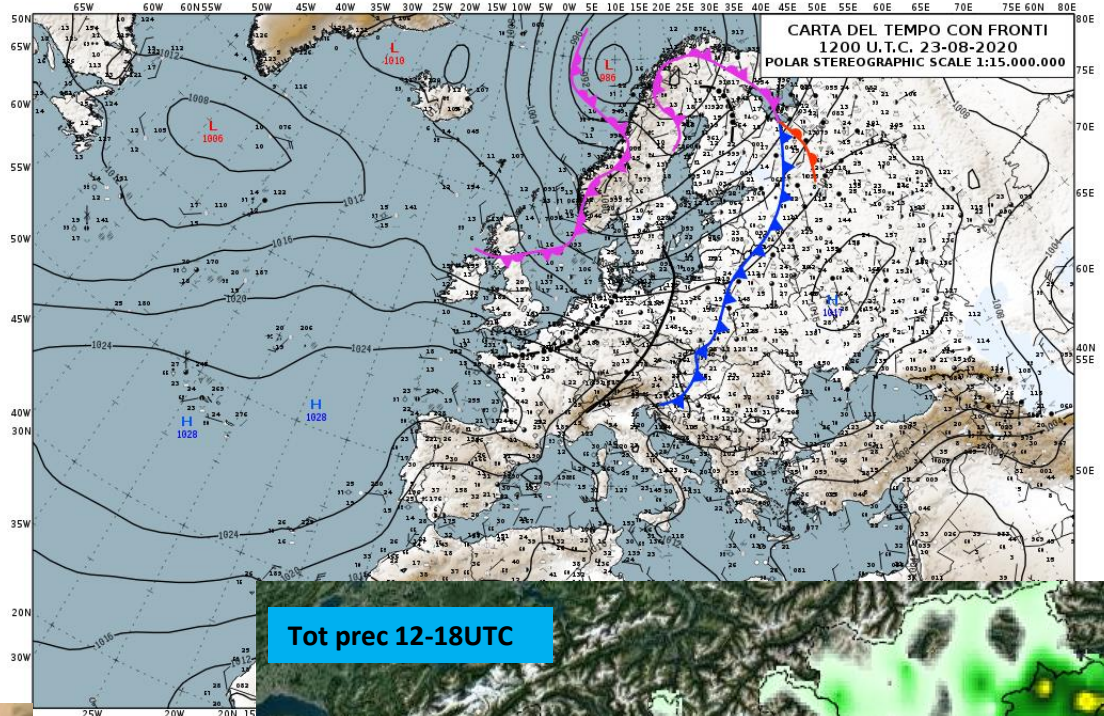

COSMO-IT 11 July 2020 00UTC
Forecast T+18 VT: Saturday 11 July 2020 18UTC
6h accumulated precipitations (mm)
0.2
1
3
10
20
40
70
Cosmo-it

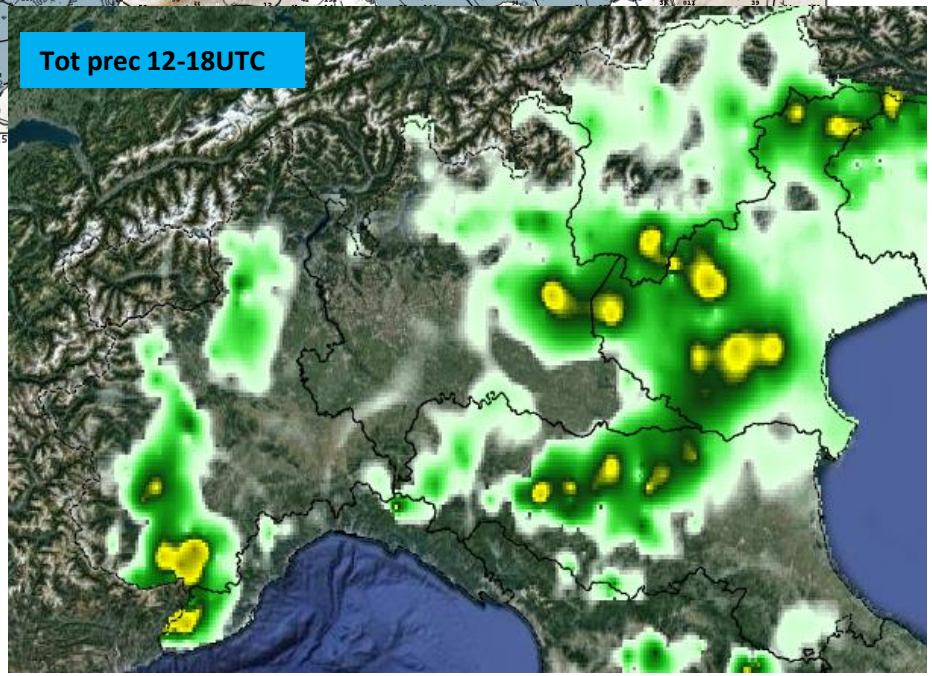

COSMO EXP FC 20200711 00 + 18h 6TPREC
0.2
1
3
10
20
40
70
150
350
Icon-it
00UTC run

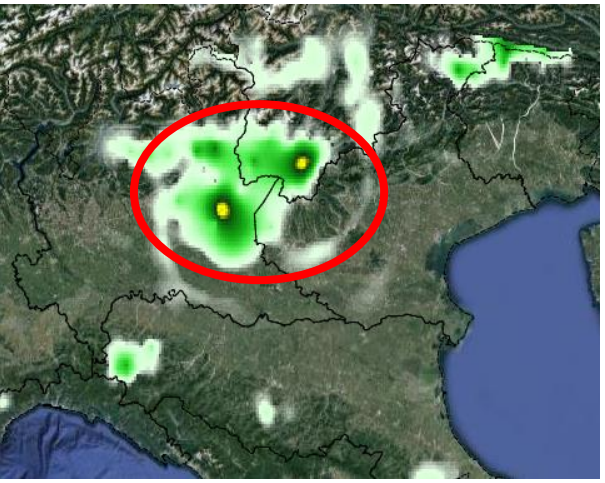

COSMO EXP FC 2020071018 + 24h 6TPREC mm ICON-IT_
0.2
1
3
10
20
40
70
150
350
Icon-it
Day before
18UTC run

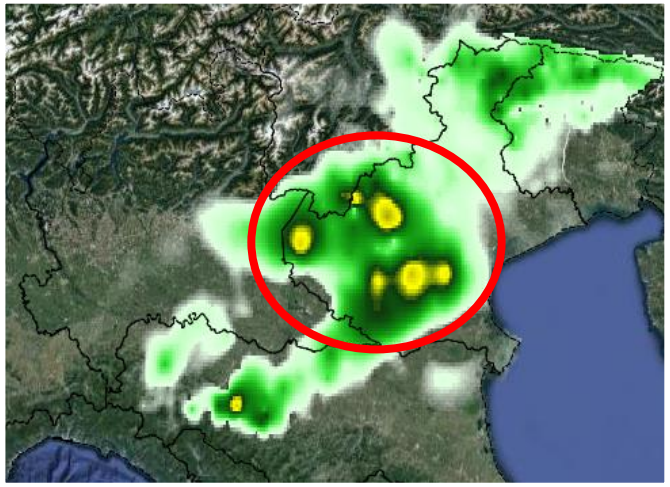
Heavy precipitation over NE Italy 23 aug 2020

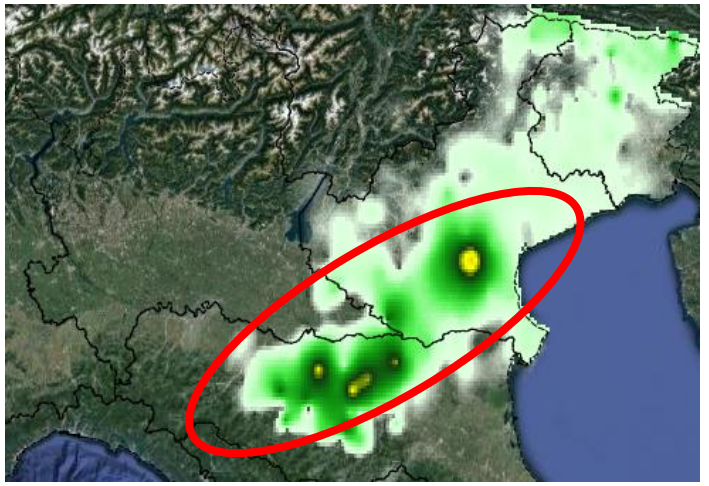


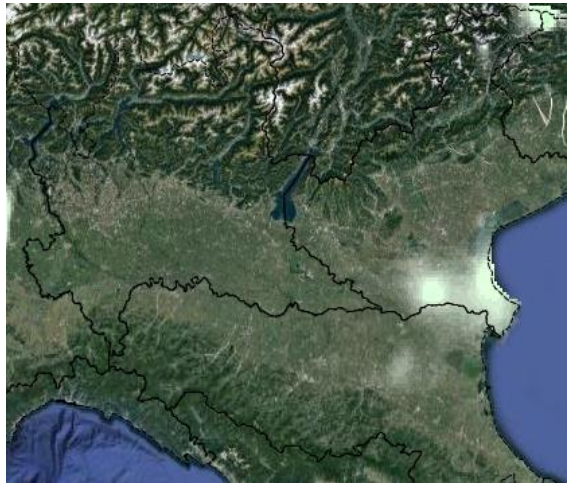


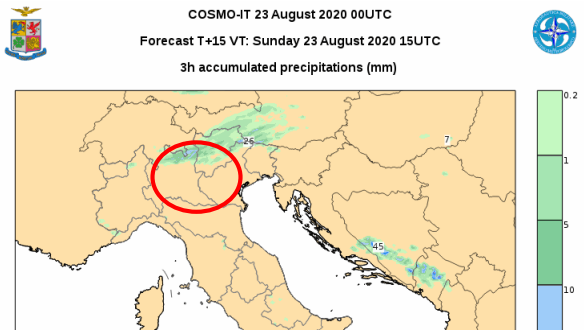


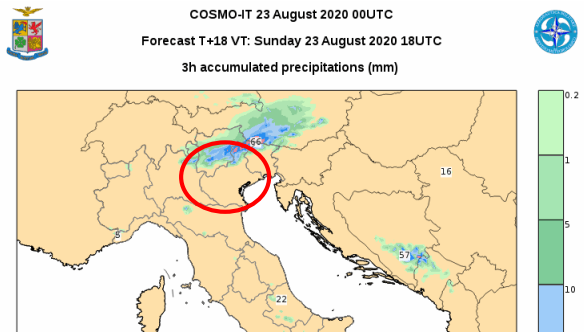


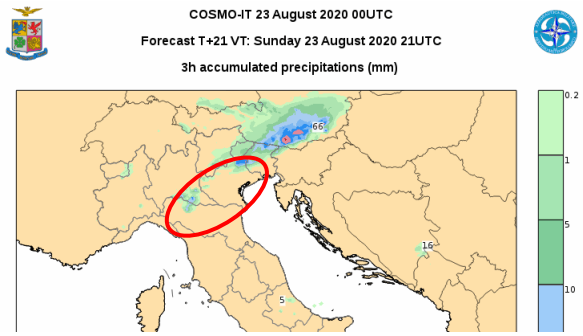


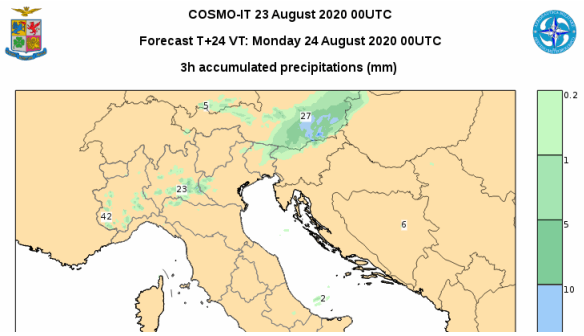


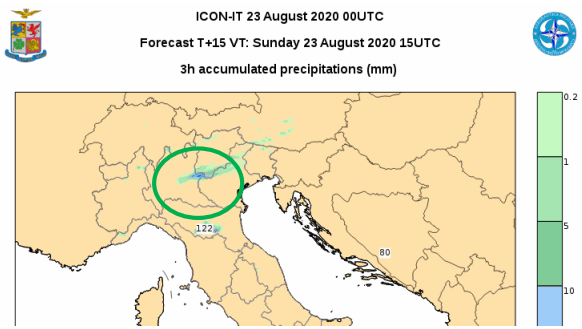


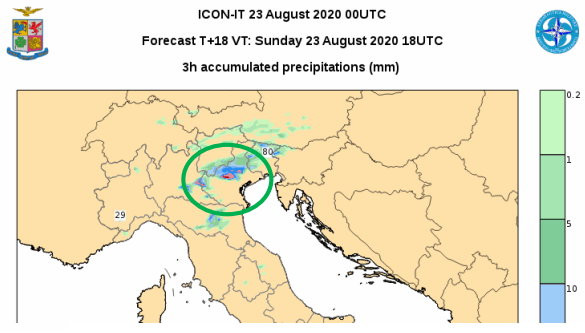

COSMO-IT 23 August 2020 00UTC
Forecast T+15 VT: Sunday 23 August 2020 15UTC
3h accumulated precipitations (mm)
26
7
45
0.2
1
5
10

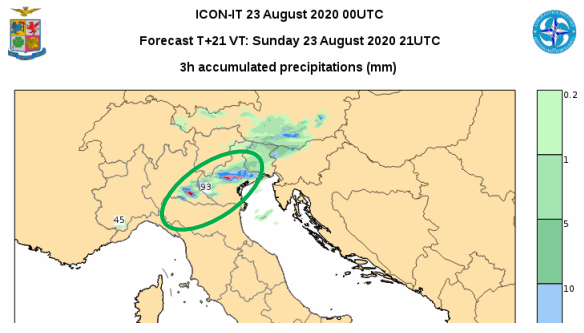

COSMO-IT 23 August 2020 00UTC
Forecast T+18 VT: Sunday 23 August 2020 18UTC
3h accumulated precipitations (mm)
66
16
57
22
0.2
1
5
10

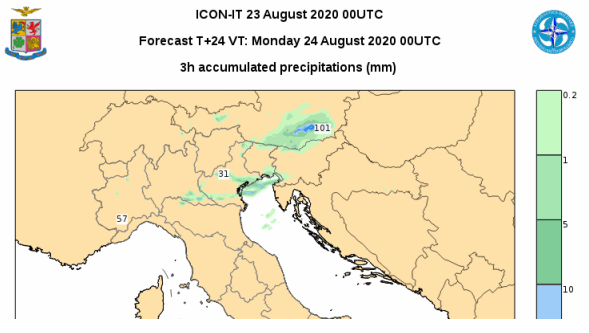

COSMO-IT 23 August 2020 00UTC
Forecast T+21 VT: Sunday 23 August 2020 21UTC
3h accumulated precipitations (mm)
66
16
5
0.2
1
5
10


COSMO-IT 23 August 2020 00UTC
Forecast T+24 VT: Monday 24 August 2020 00UTC
3h accumulated precipitations (mm)
5
27
23
42
6
2
0.2
1
5
10


ICON-IT 23 August 2020 00UTC
Forecast T+15 VT: Sunday 23 August 2020 15UTC
3h accumulated precipitations (mm)
122
80
0.2
1
5
10


ICON-IT 23 August 2020 00UTC
Forecast T+18 VT: Sunday 23 August 2020 18UTC
3h accumulated precipitations (mm)
80
29
0.2
1
5
10


ICON-IT 23 August 2020 00UTC
Forecast T+21 VT: Sunday 23 August 2020 21UTC
3h accumulated precipitations (mm)
93
45
0.2
1
5
10


ICON-IT 23 August 2020 00UTC
Forecast T+24 VT: Monday 24 August 2020 00UTC
3h accumulated precipitations (mm)
101
31
57
0.2
1
5
10

Conclusions

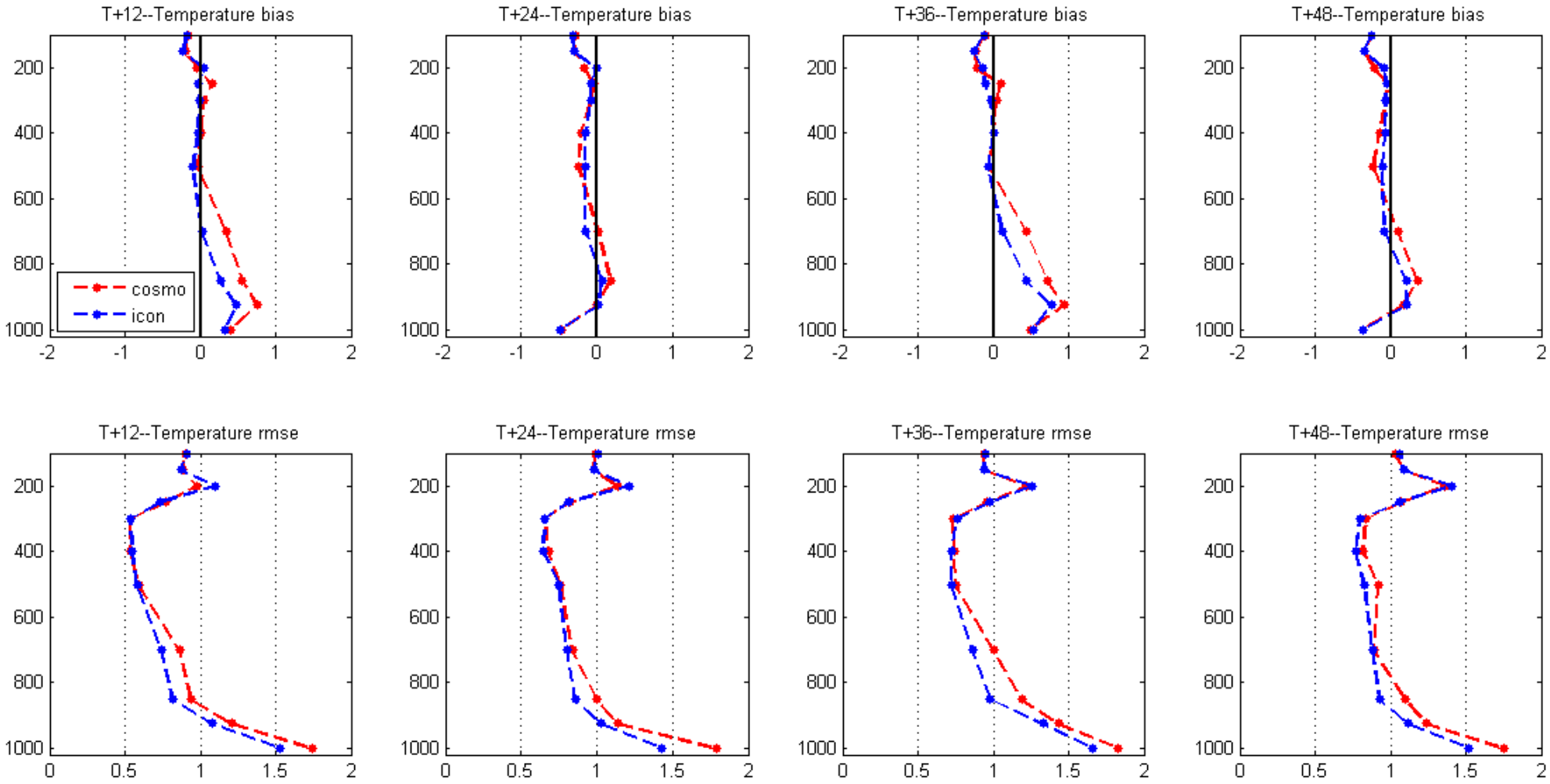
- In this summer case study ICON-IT over-estimates the low cloudiness over Italian area. Such over-estimation is not found in medium and high clouds.
- To avoid the effects of DA we use IFS analysis. In this case ICON-IT tends to form the low cloudiness (with cloud water QC=0) in excess during the first hour of integration where relative humidity is > 90% .
- Could this bias in the low clouds could be related to the failures of ICON-IT in developing some intense deep convection events over land?

VERIFICATION RESULTS

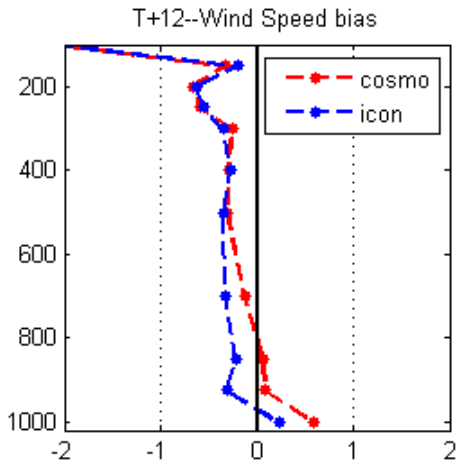
1st may – 25th aug 2020

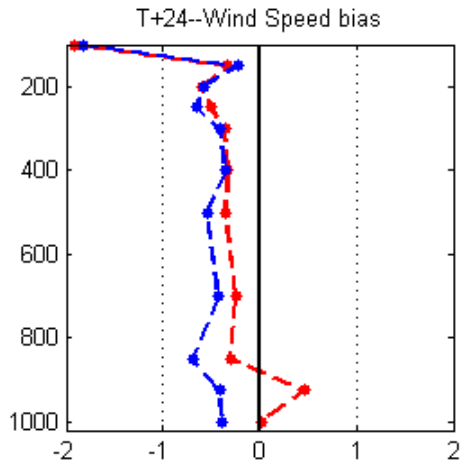
ICON-IT vs COSMO-IT

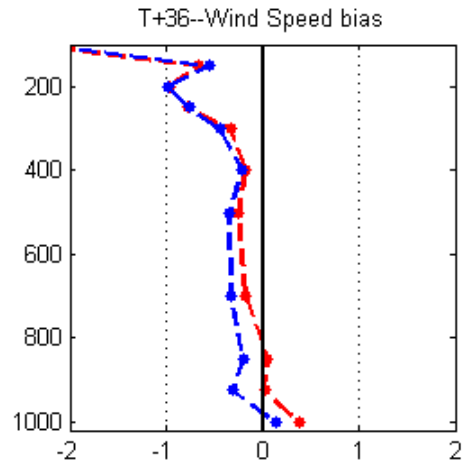
Upper-air Temperature

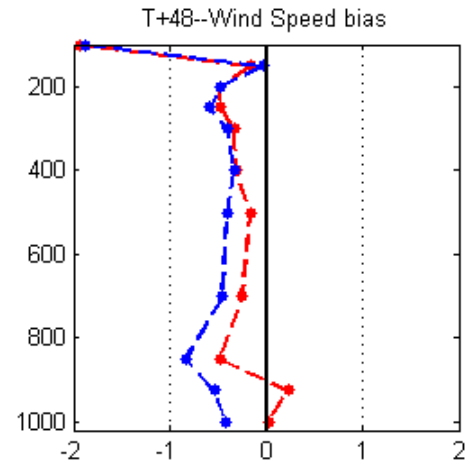


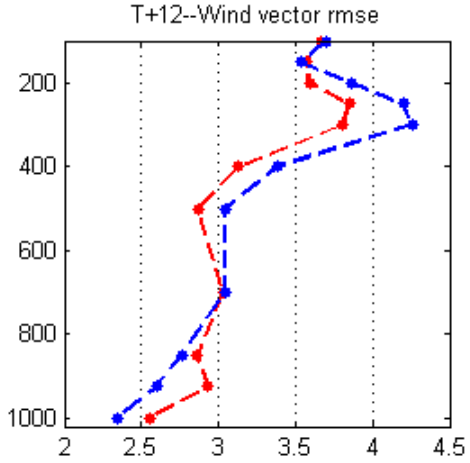
Upper-air wind

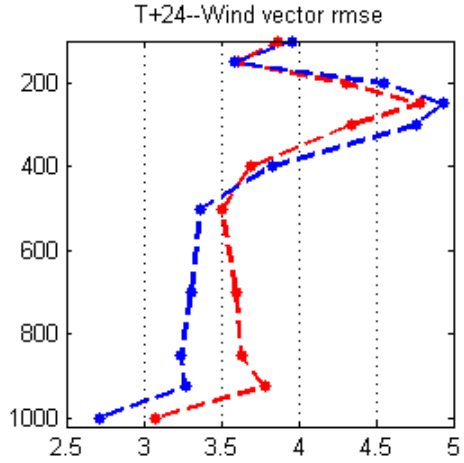


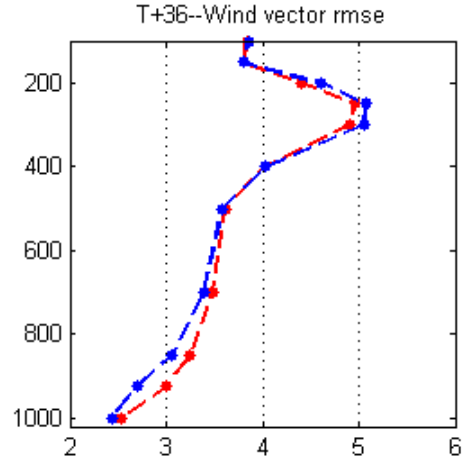


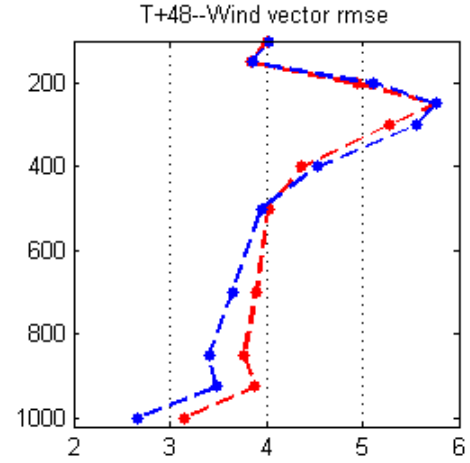




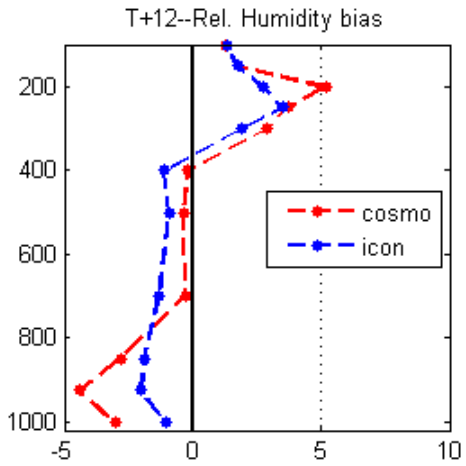


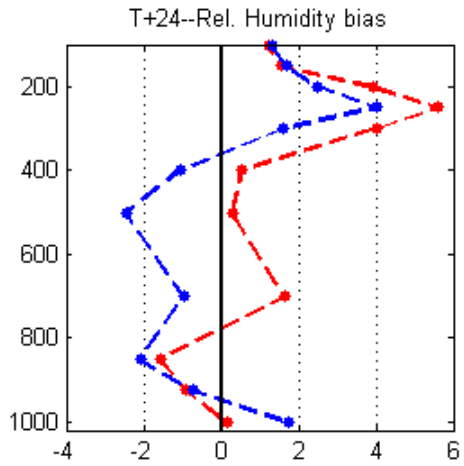


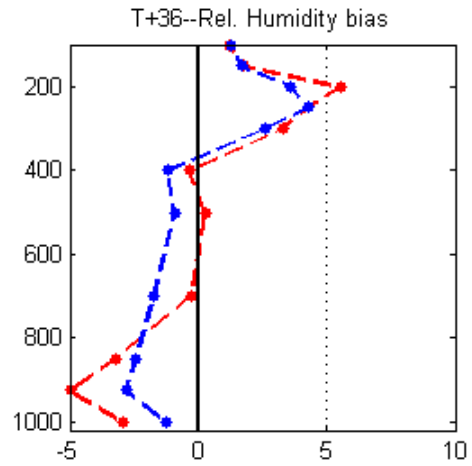


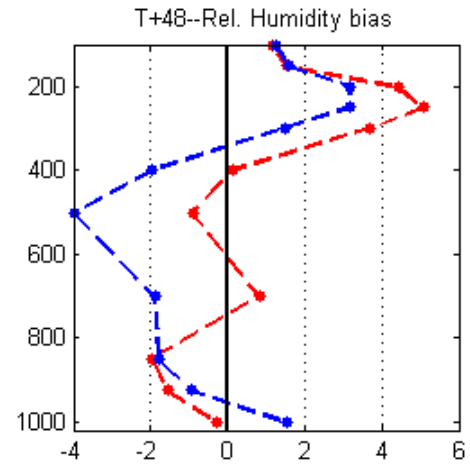


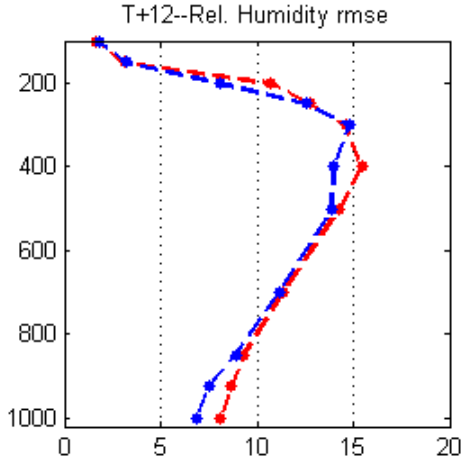
Upper-air Relative Humidity

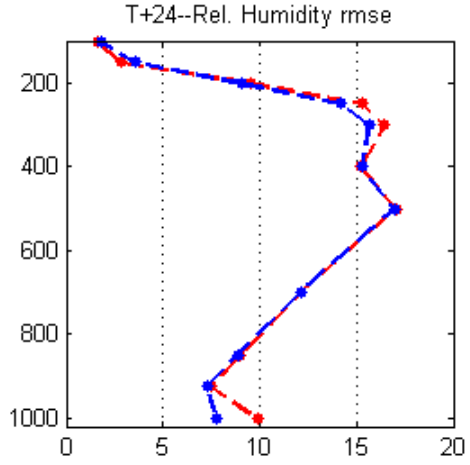


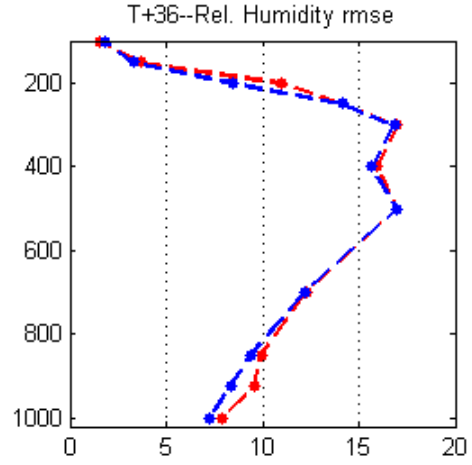


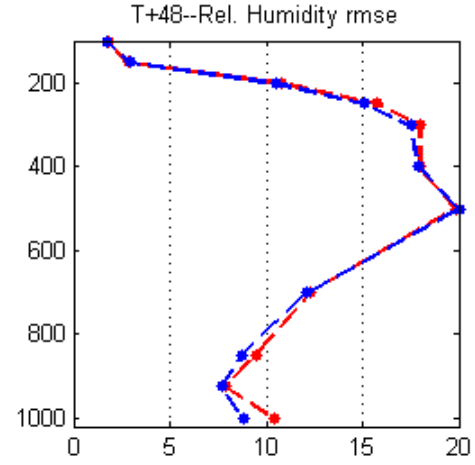




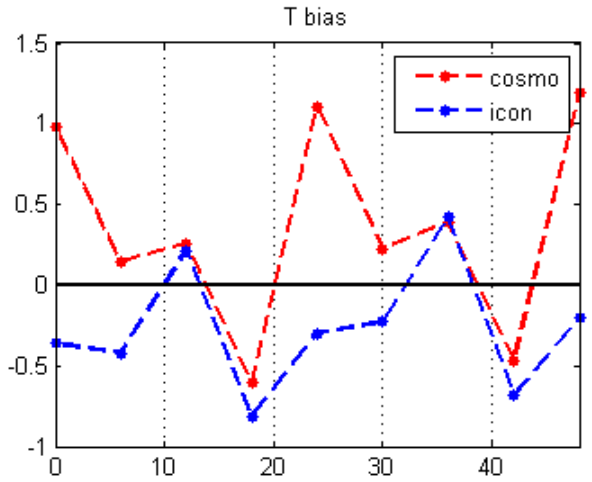


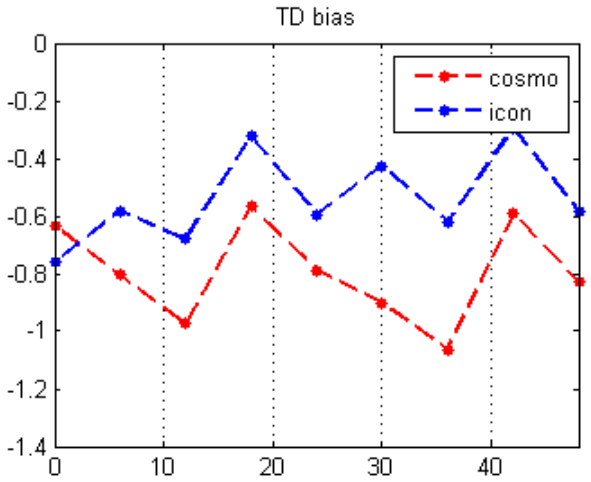


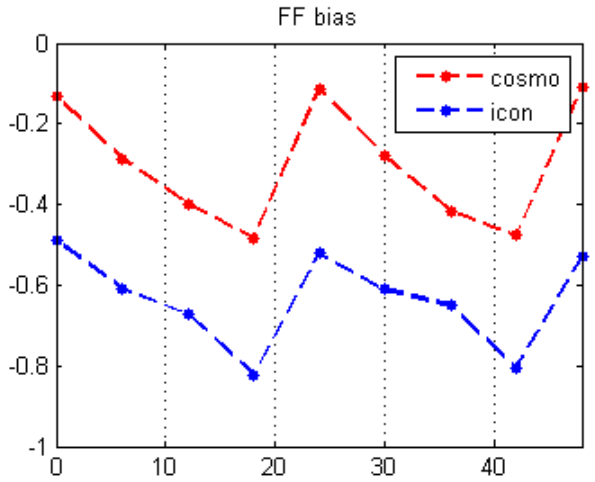


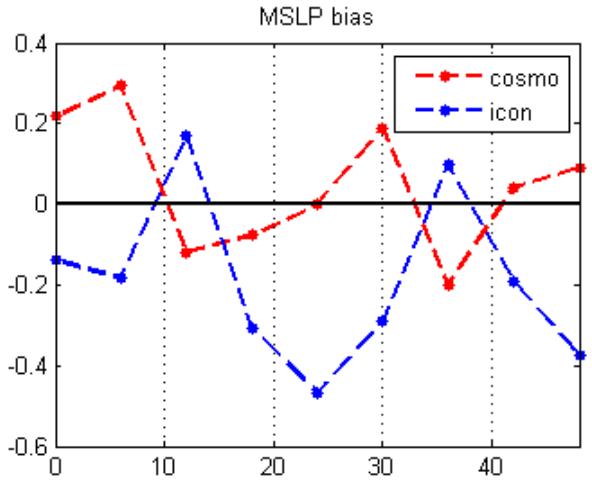


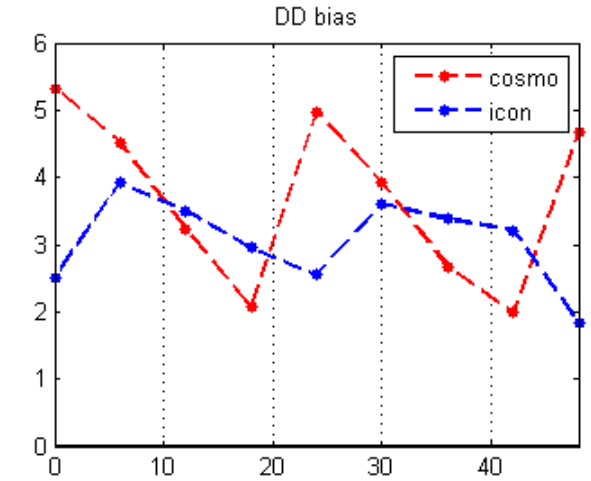
Surface parameters: bias

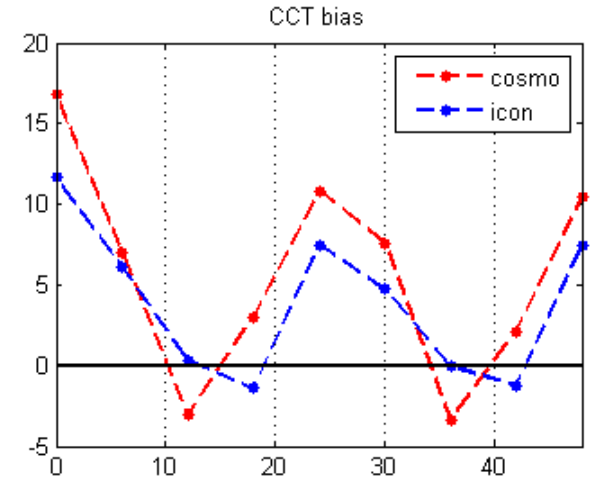




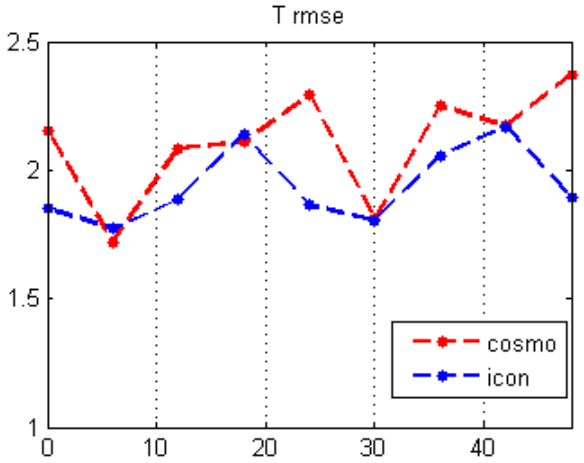


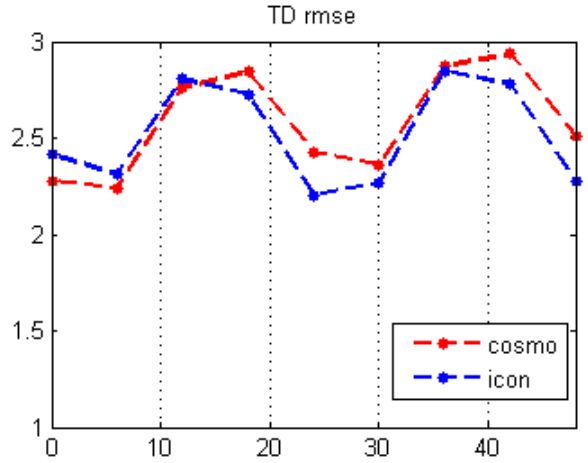


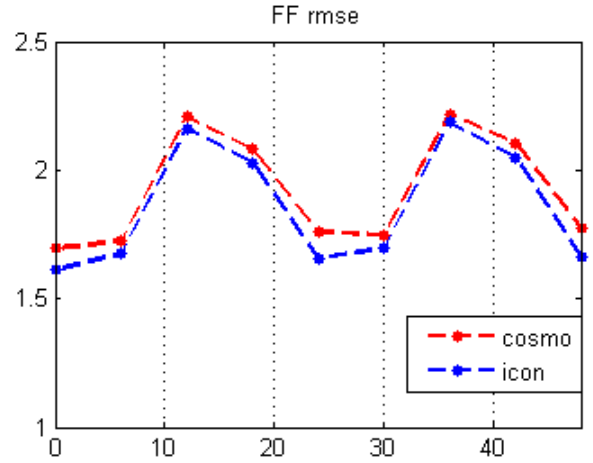


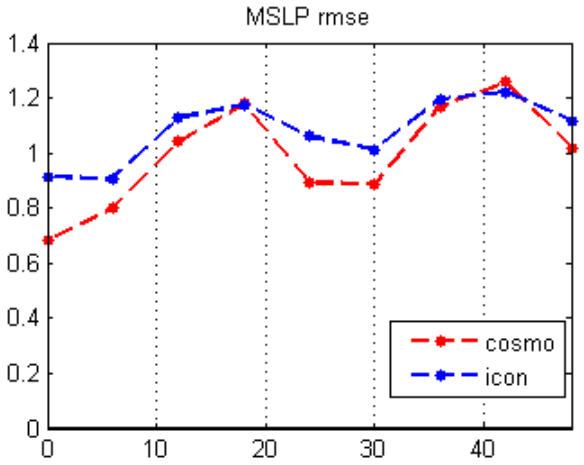


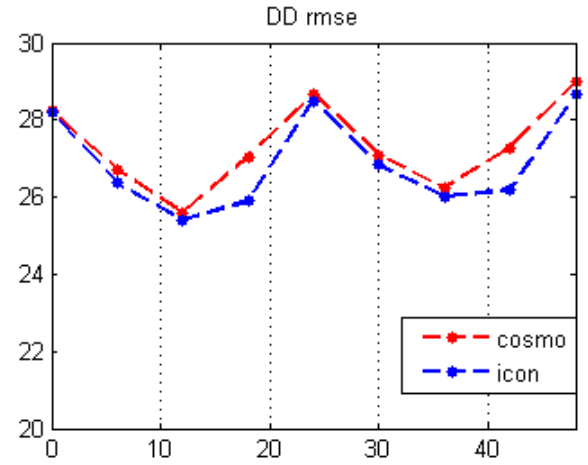
Surface parameters: rmse

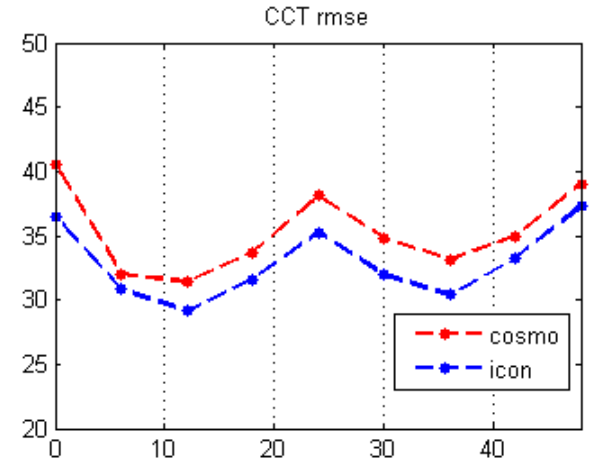






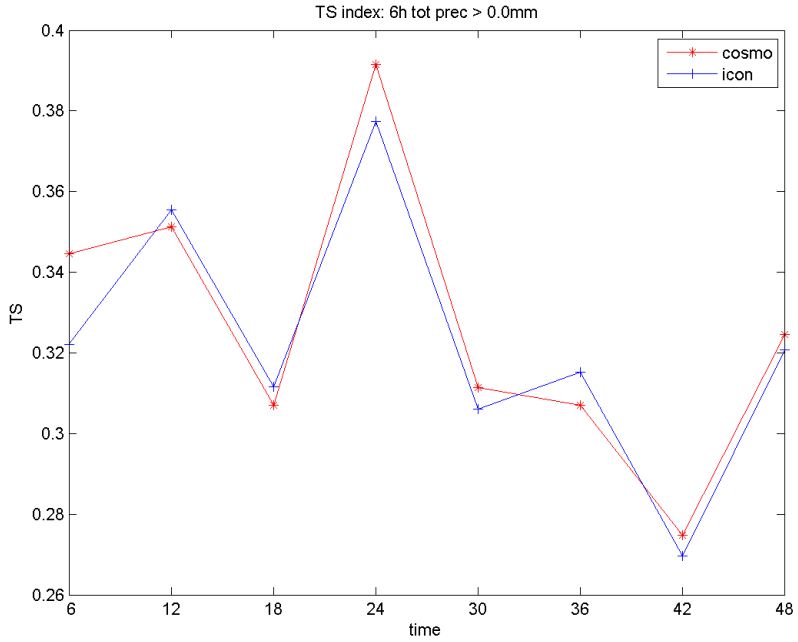


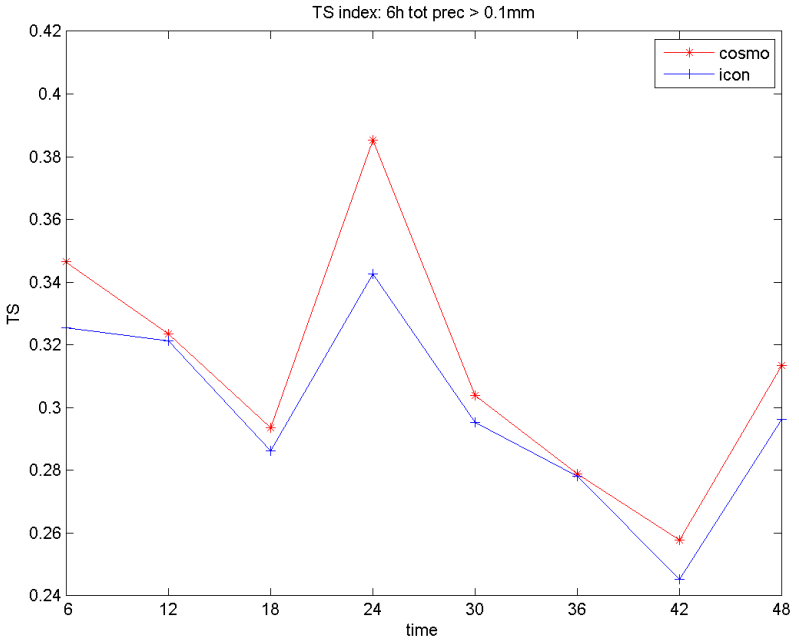


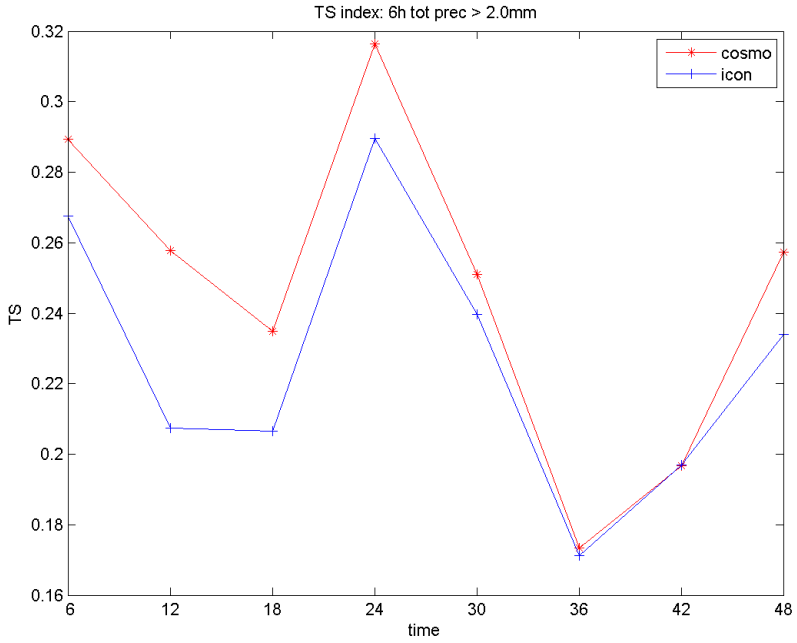


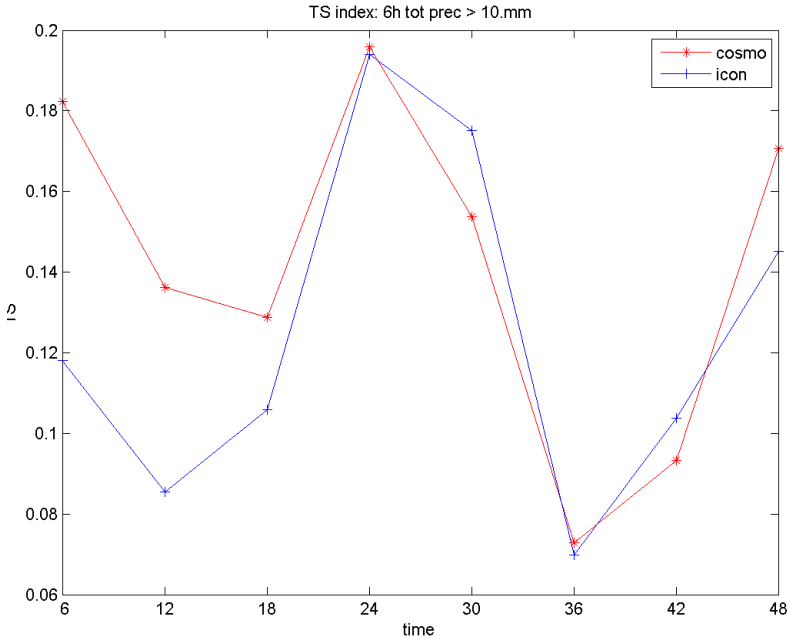
6h cum.precipitation

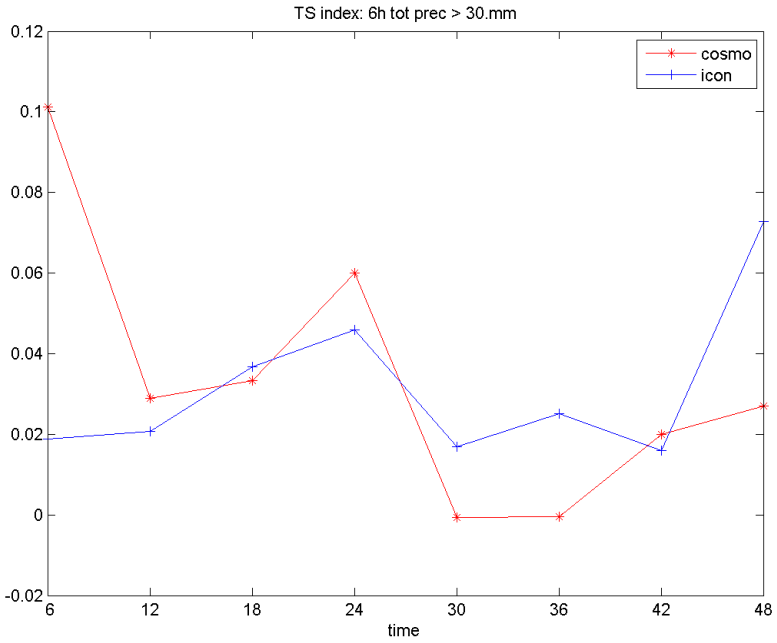
TS for different thresholds

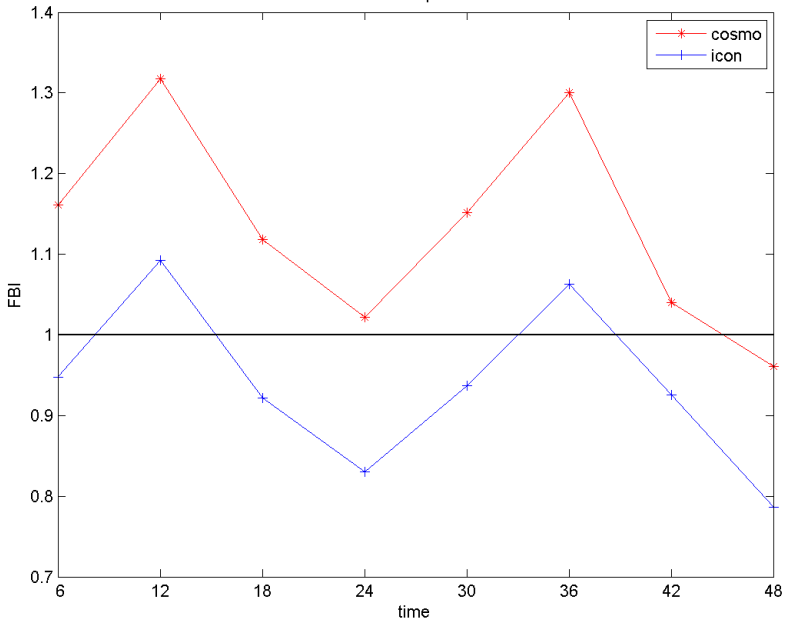
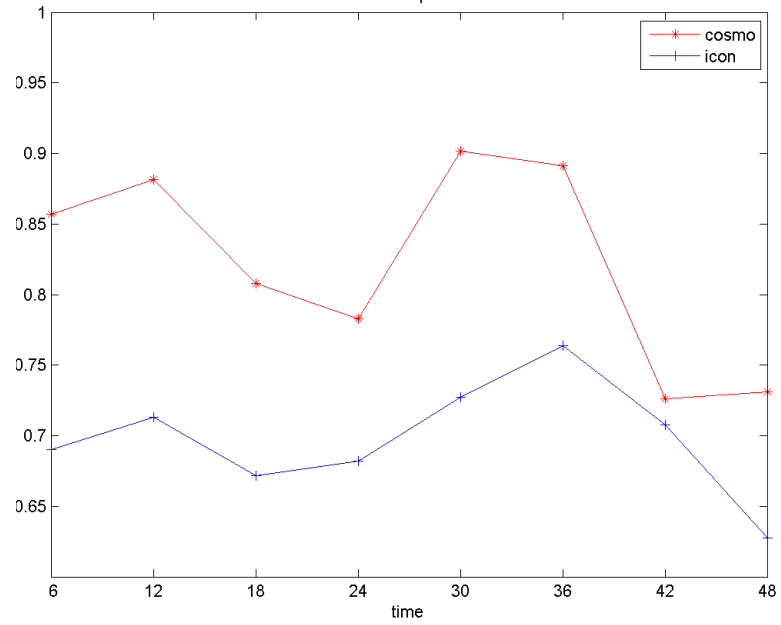
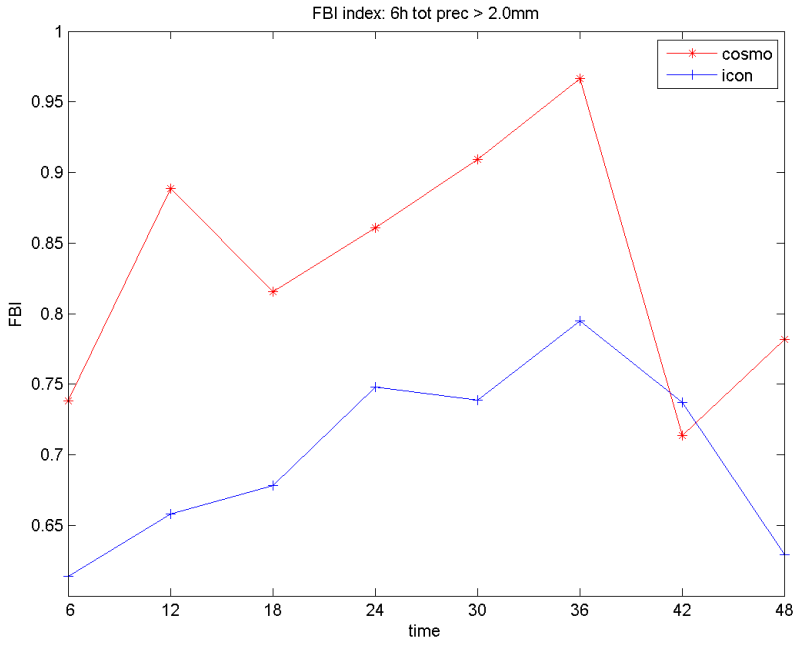
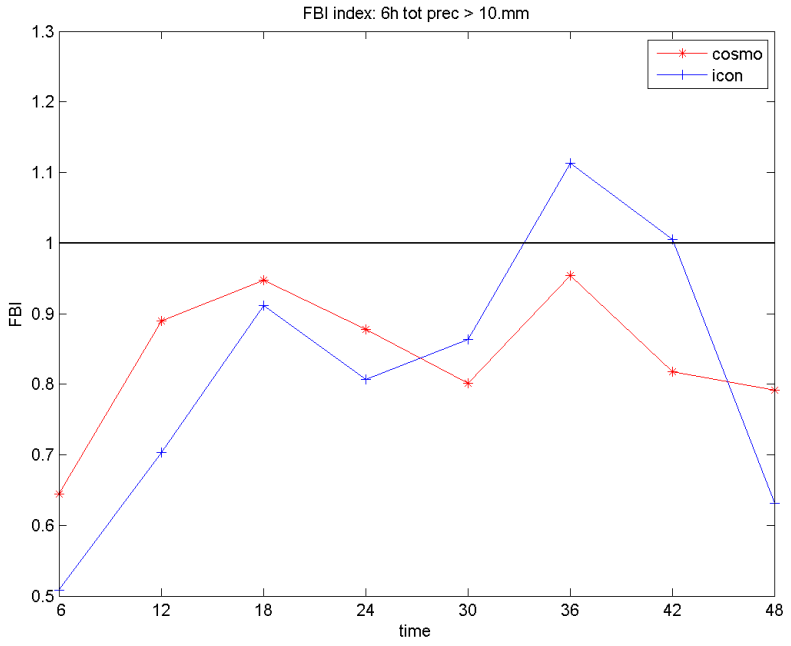
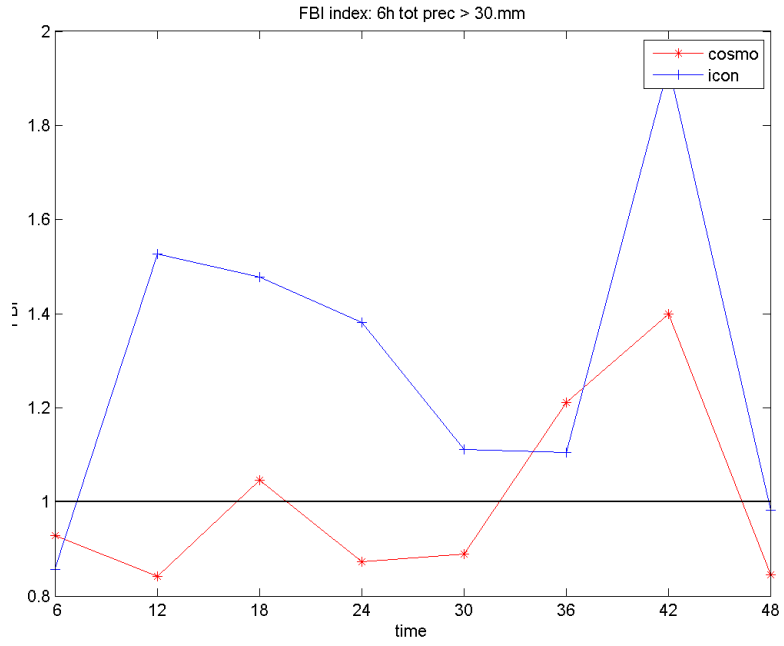










6h cum.precipitation

FBI for different thresholds