ALARO-0 experience in Slovenia

Neva Pristov
ARSO

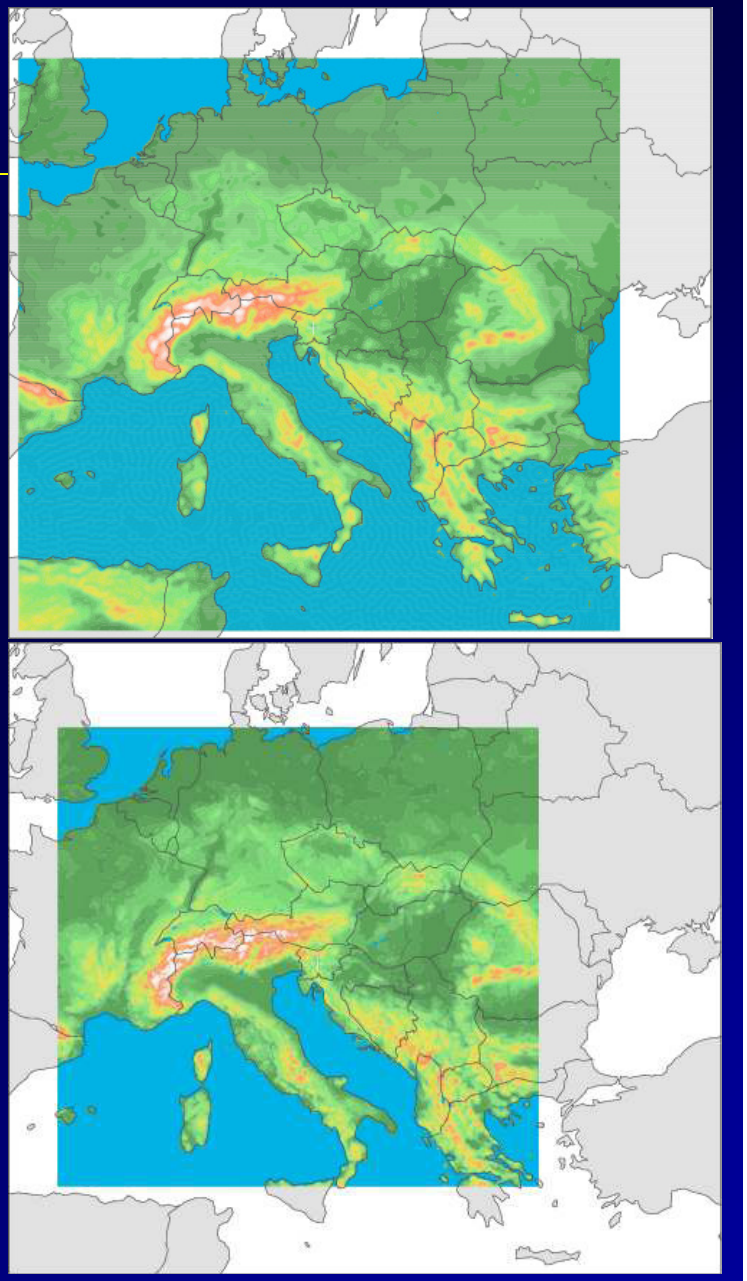
The operational ALADIN

- 4 runs per day
  - 00,06,12 UTC +72
  - 18 UTC +48
- 9.5 km, linear grid
- 43 vertical levels

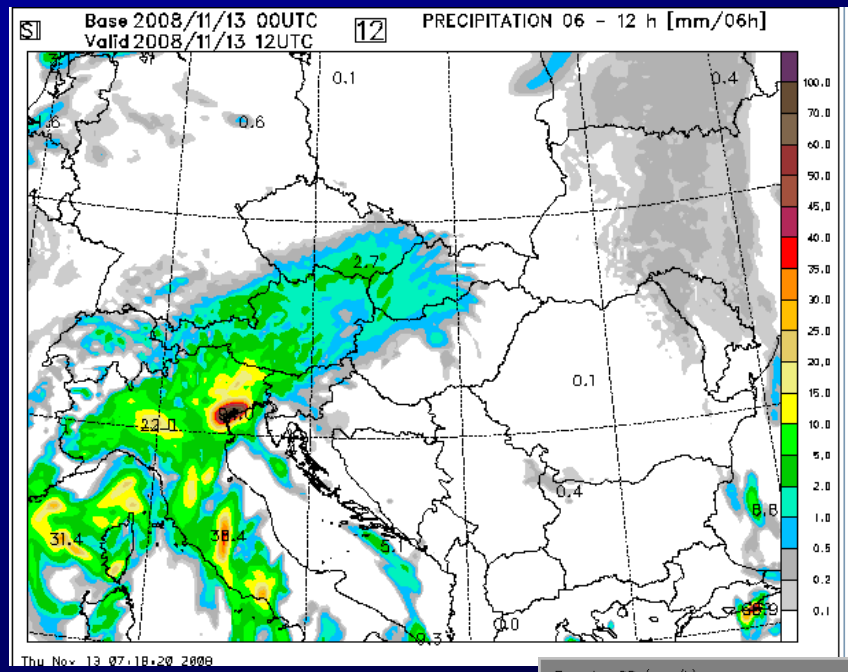
June 2008: ALARO 3MT

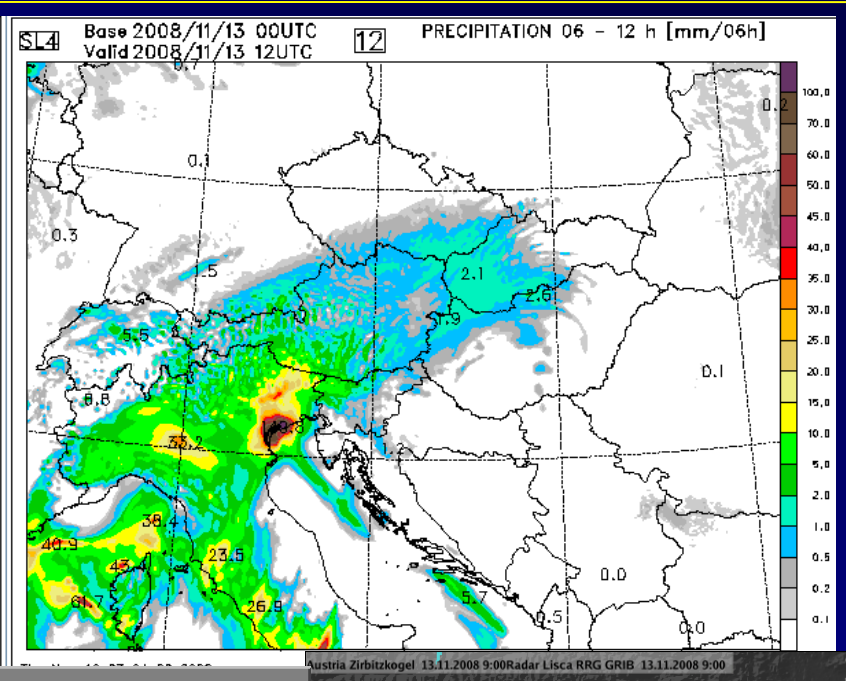
- 2 runs per day
  - 00,12 UTC +54
- 4.4 km, linear grid
- 43 vertical levels

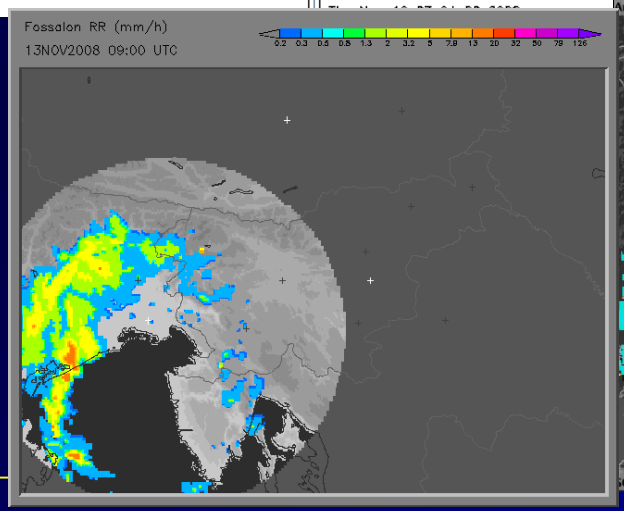
August 2008: ALARO 3MT

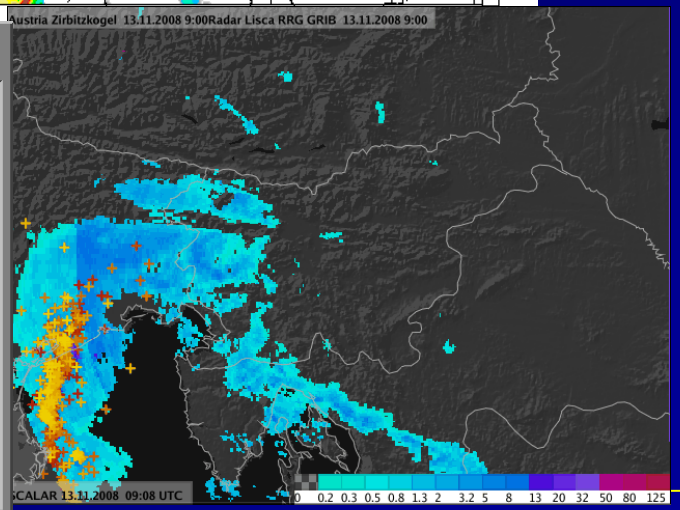


ALARO 10km / 5 km

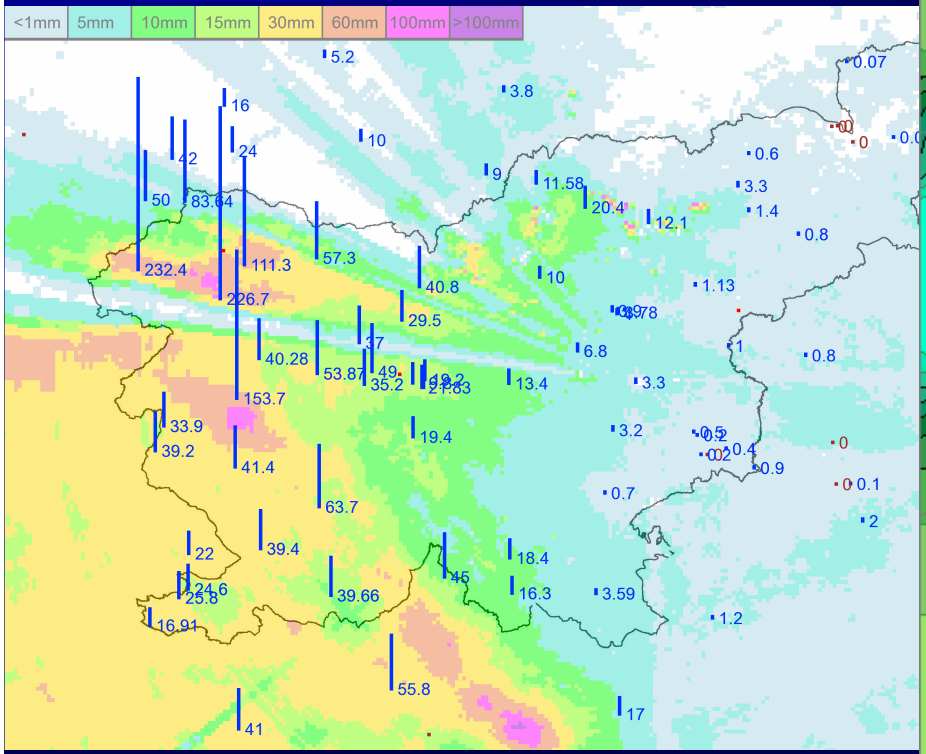


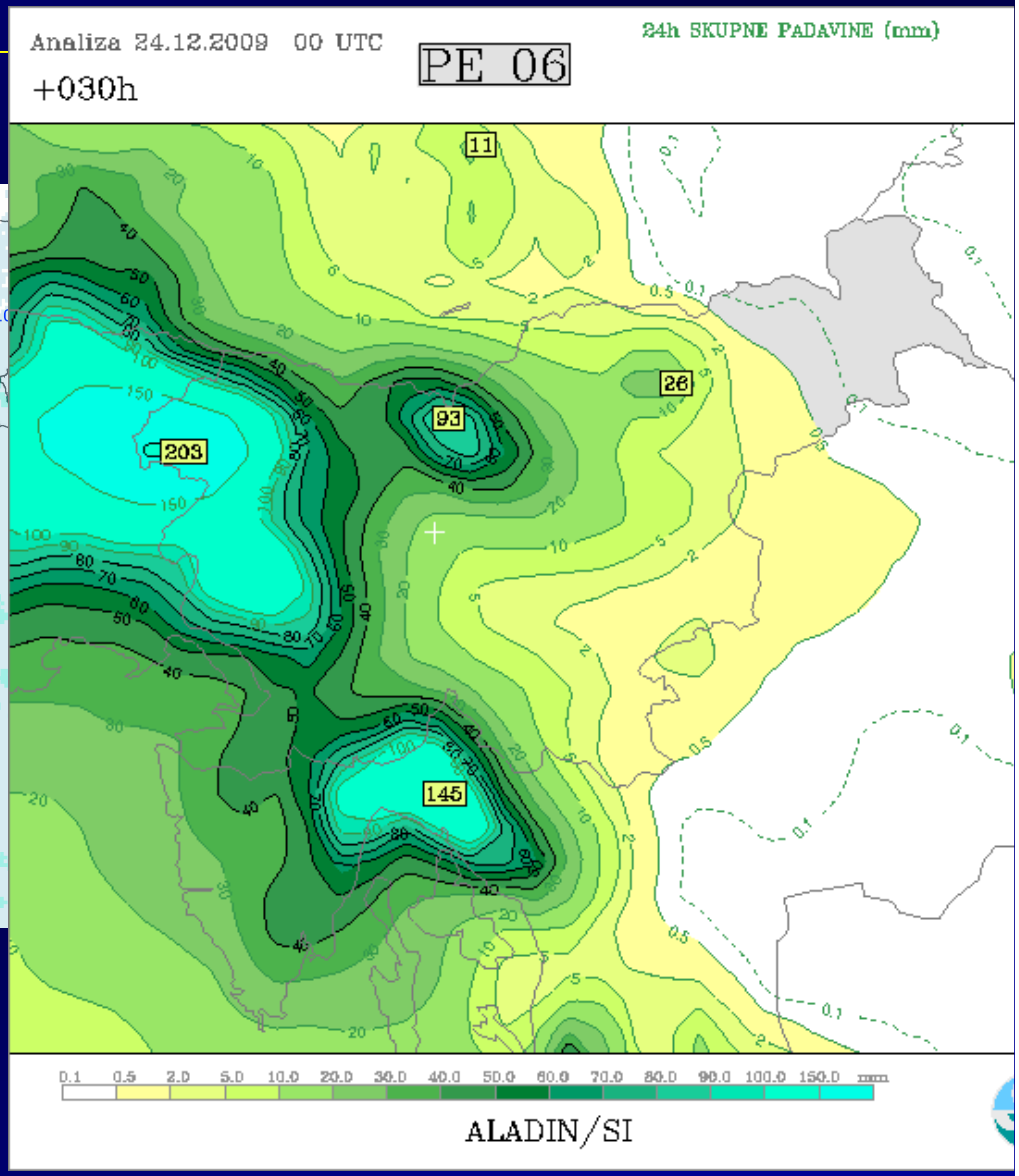




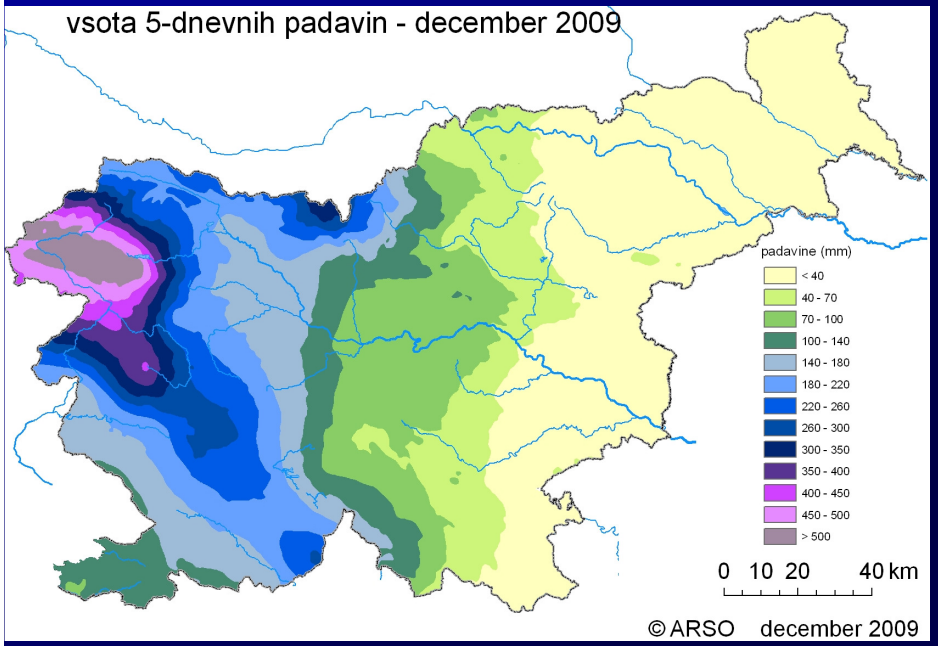


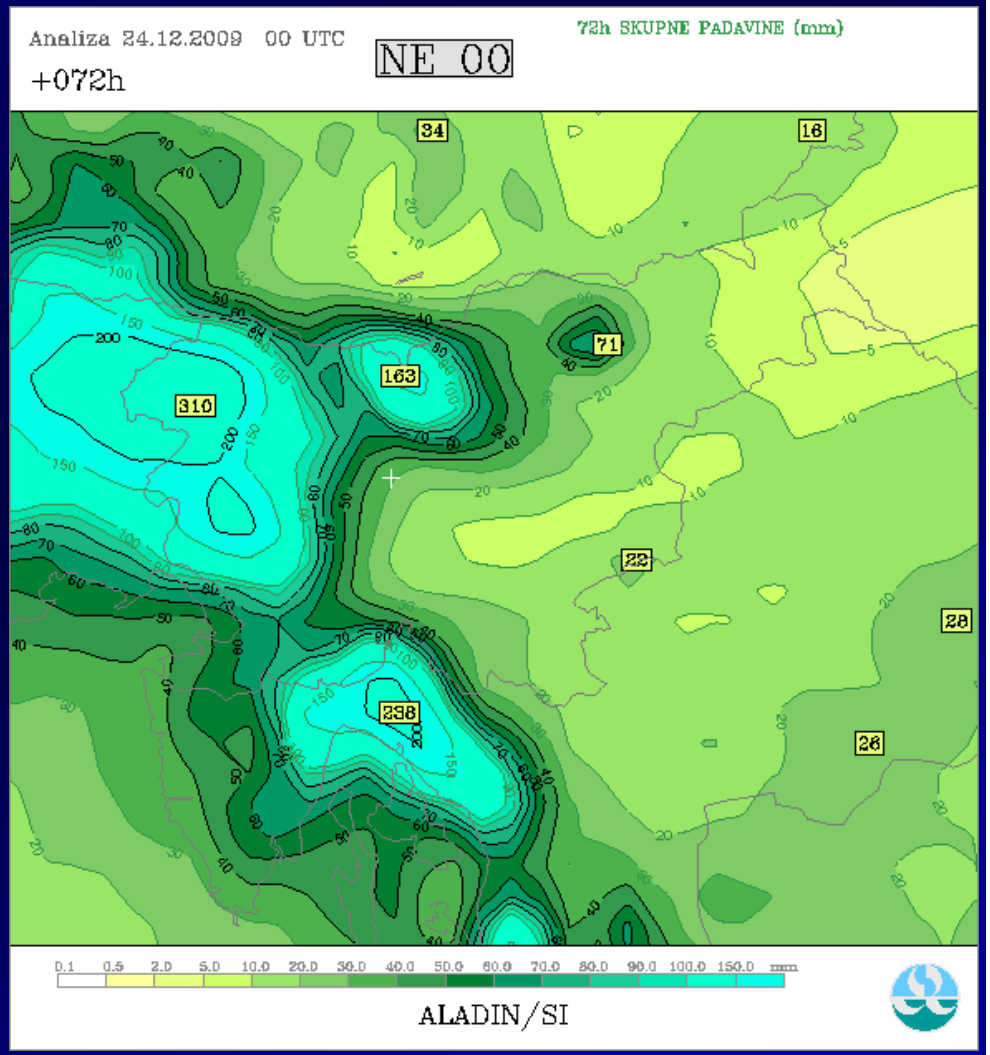
Extreme precipitation
23-27 December 2009

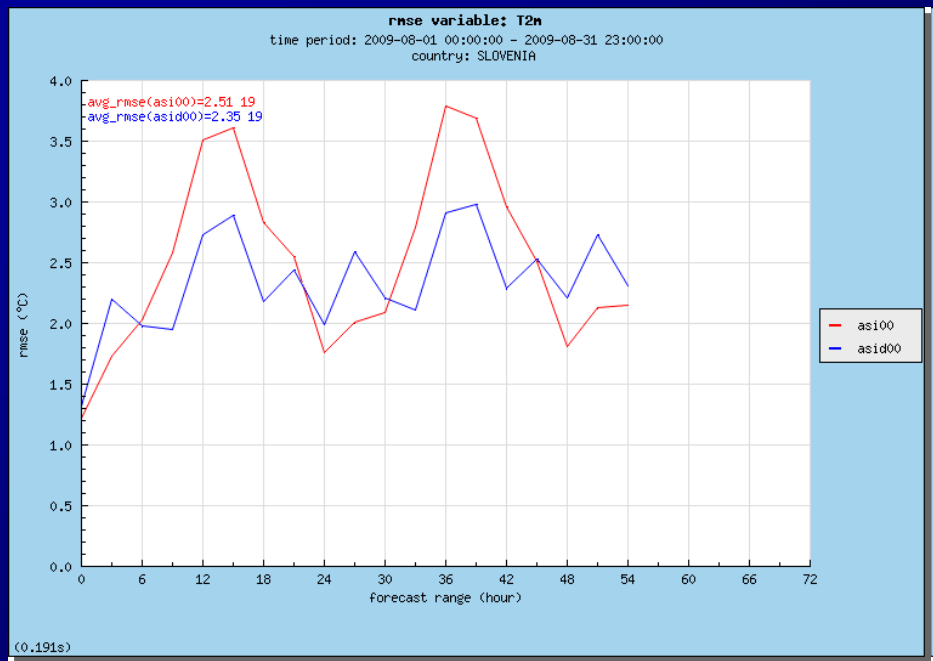


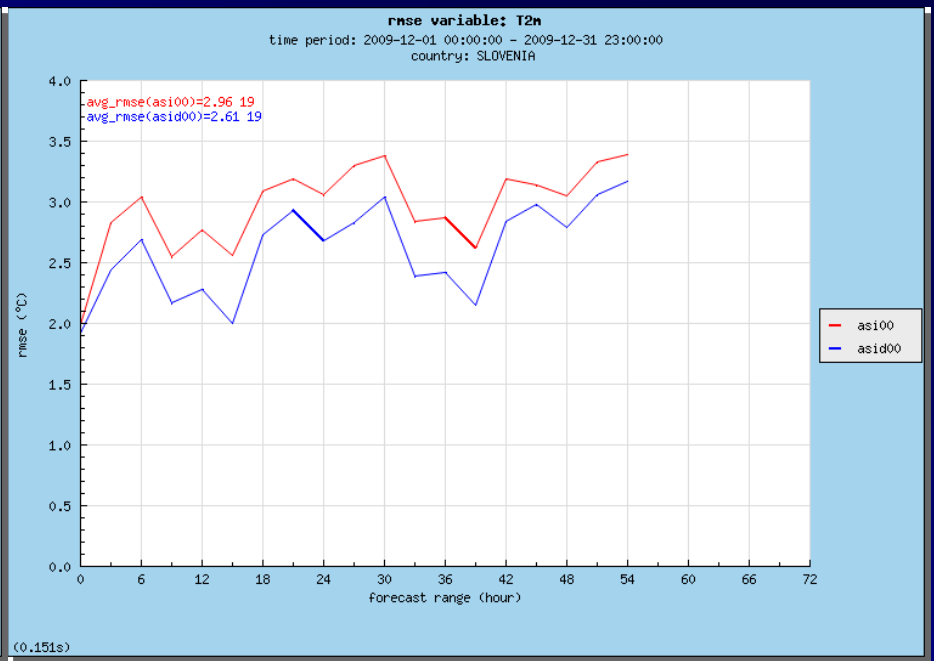


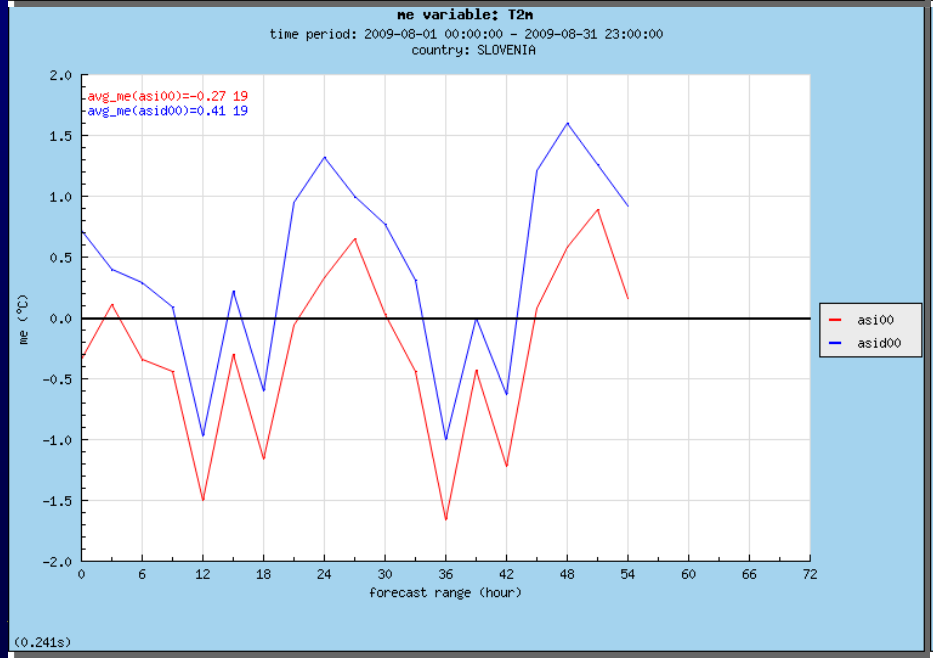
Extreme precipitation
23-27 December 2009

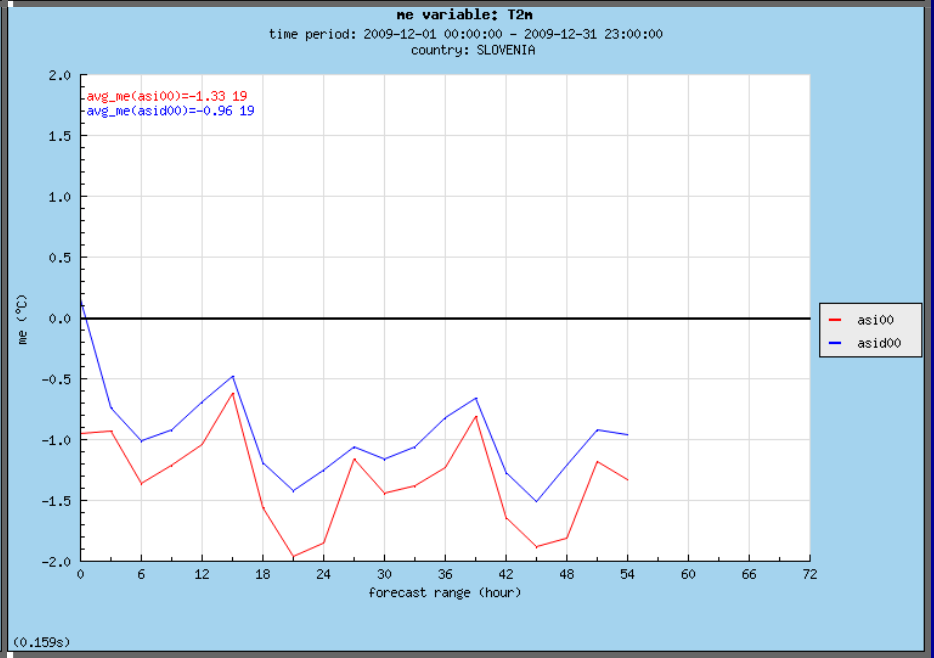


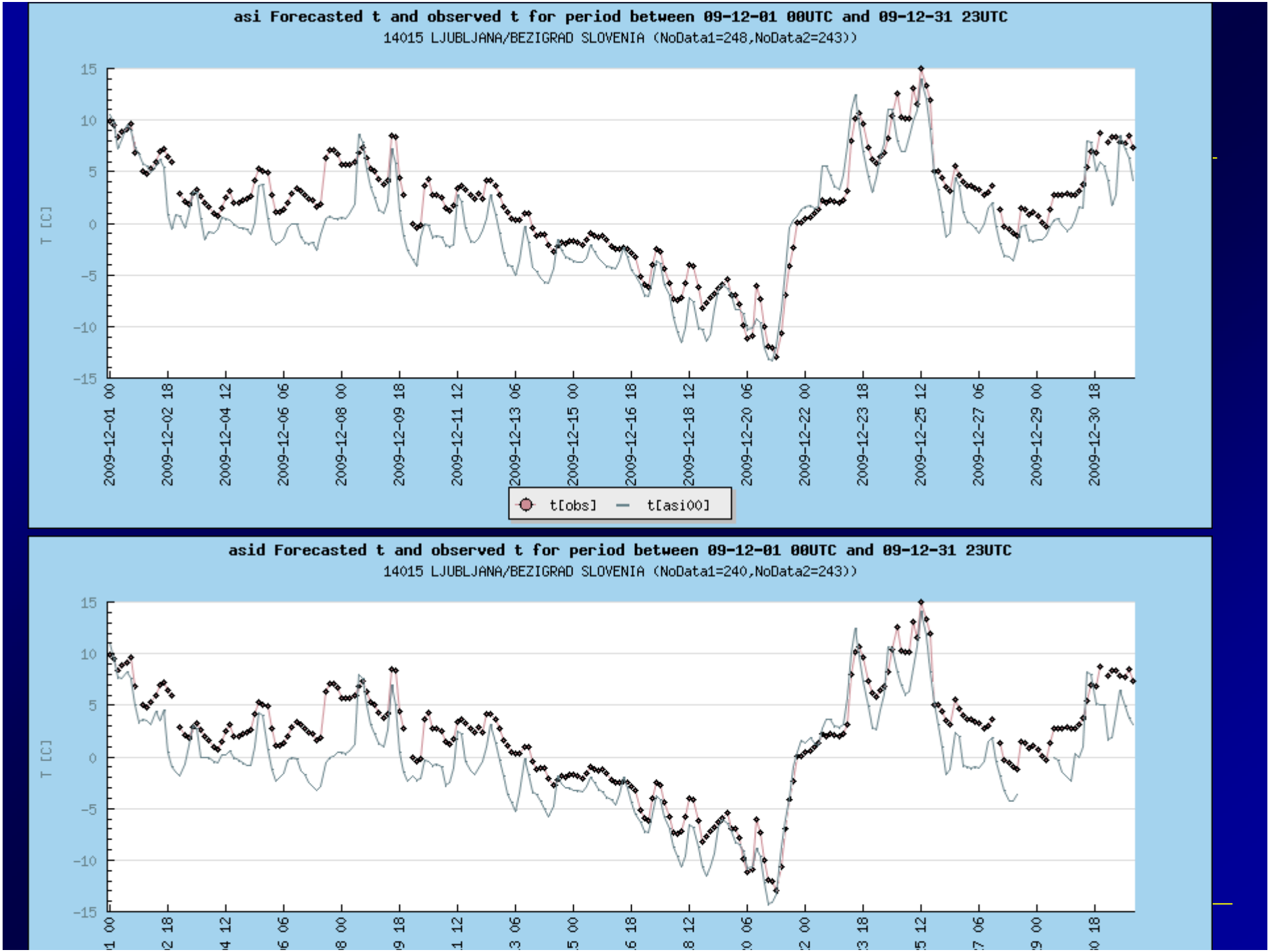


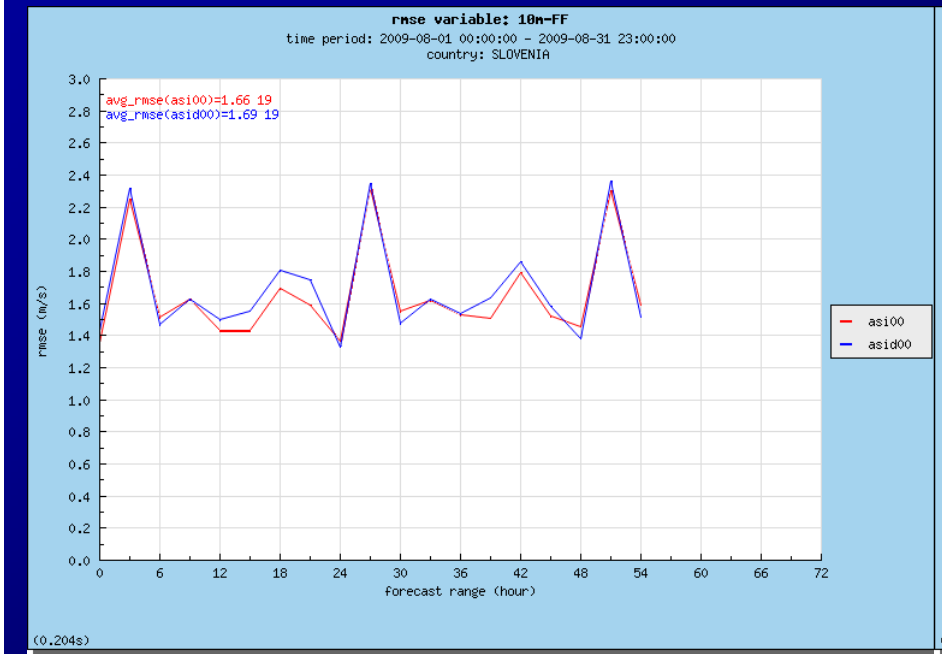

rmse variable: T2m
time period: 2009-08-01 00:00:00 - 2009-08-31 23:00:00
country: SLOVENIA
avg_rmse(asi00)=2.51 19
avg_rmse(asid00)=2.35 19
rmse (°C)
forecast range (hour)
asi00
asid00
(0.191s)

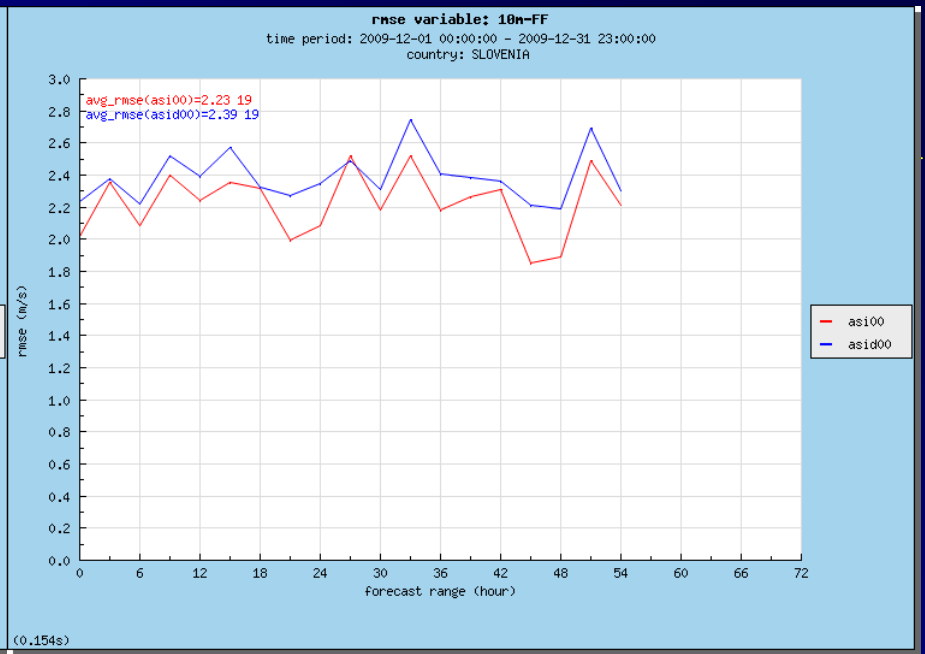

rmse variable: T2m
time period: 2009-12-01 00:00:00 - 2009-12-31 23:00:00
country: SLOVENIA
avg_rmse(asi00)=2.96 19
avg_rmse(asid00)=2.61 19
rmse (°C)
forecast range (hour)
asi00
asid00
(0.151s)

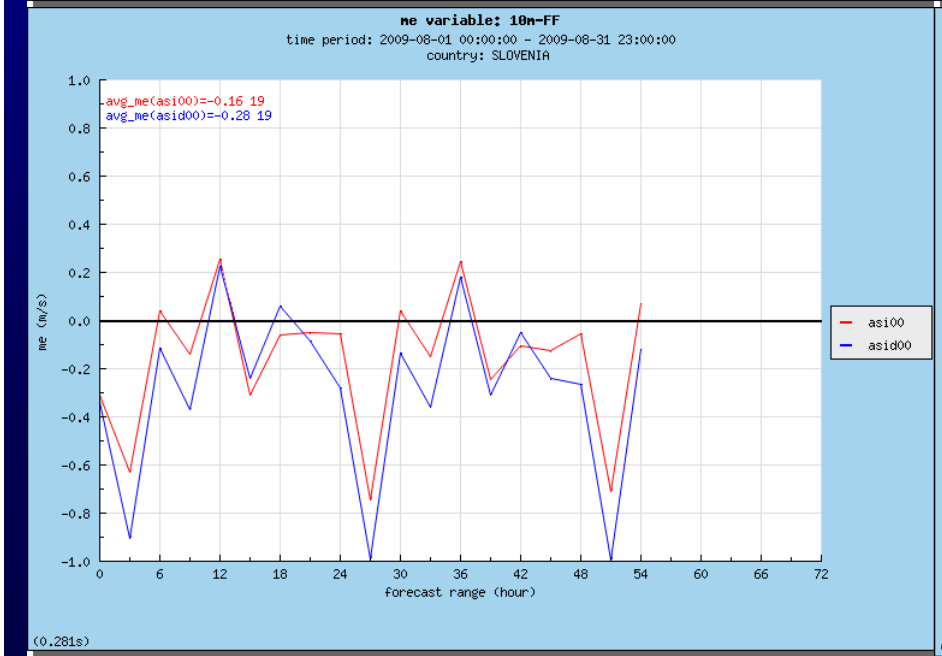

me variable: T2m
time period: 2009-08-01 00:00:00 - 2009-08-31 23:00:00
country: SLOVENIA
avg_me(asi00)=-0.27 19
avg_me(asid00)=0.41 19
me (°C)
forecast range (hour)
asi00
asid00
(0.241s)

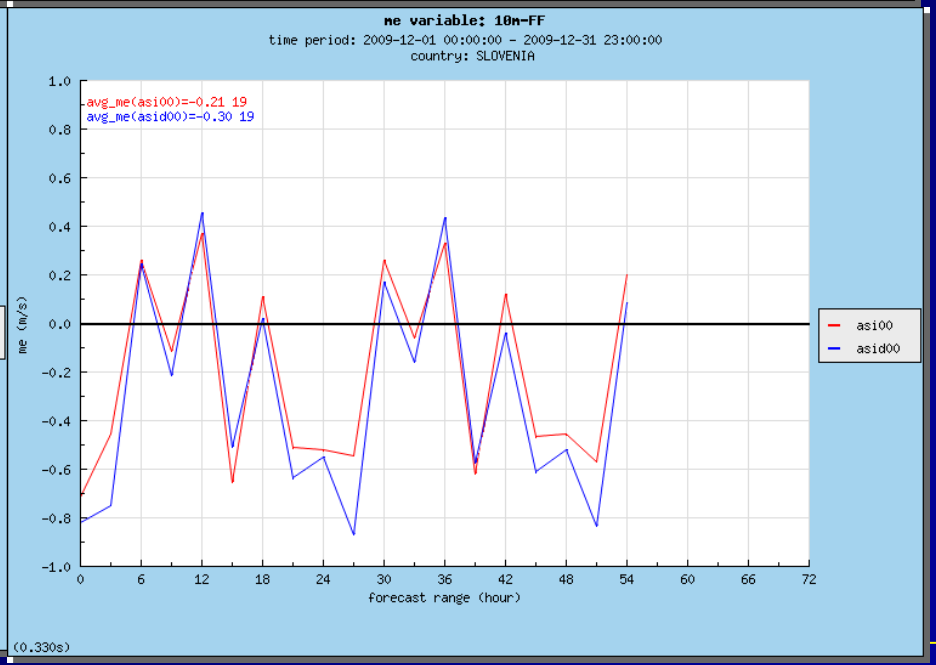

me variable: T2m
time period: 2009-12-01 00:00:00 - 2009-12-31 23:00:00
country: SLOVENIA
avg_me(asi00)=-1.33 19
avg_me(asid00)=-0.96 19
me (°C)
forecast range (hour)
asi00
asid00
(0.159s)

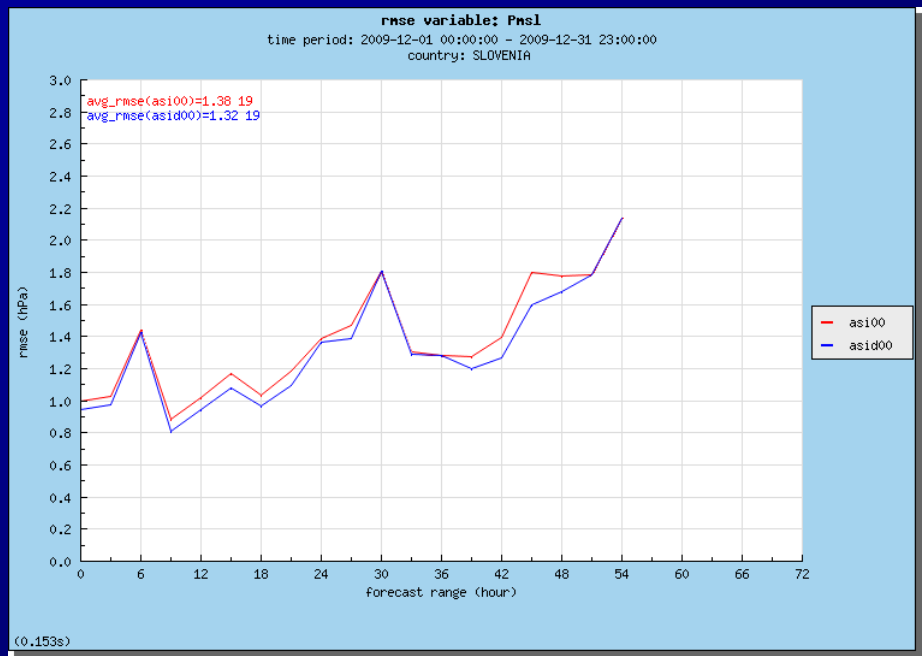

asi Forecasted t and observed t for period between 09-12-01 00UTC and 09-12-31 23UTC
14015 LJUBLJANA/BEZIGRAD SLOVENIA (NoData1=248,NoData2=243))
T [C]
15
10
5
0
-5
-10
-15
2009-12-01 00
2009-12-02 18
2009-12-04 12
2009-12-06 06
2009-12-08 00
2009-12-09 18
2009-12-11 12
2009-12-13 06
2009-12-15 00
2009-12-16 18
2009-12-18 12
2009-12-20 06
2009-12-22 00
2009-12-23 18
2009-12-25 12
2009-12-27 06
2009-12-29 00
2009-12-30 18
t[obs]
t[asi00]
asid Forecasted t and observed t for period between 09-12-01 00UTC and 09-12-31 23UTC
14015 LJUBLJANA/BEZIGRAD SLOVENIA (NoData1=240,NoData2=243))
T [C]

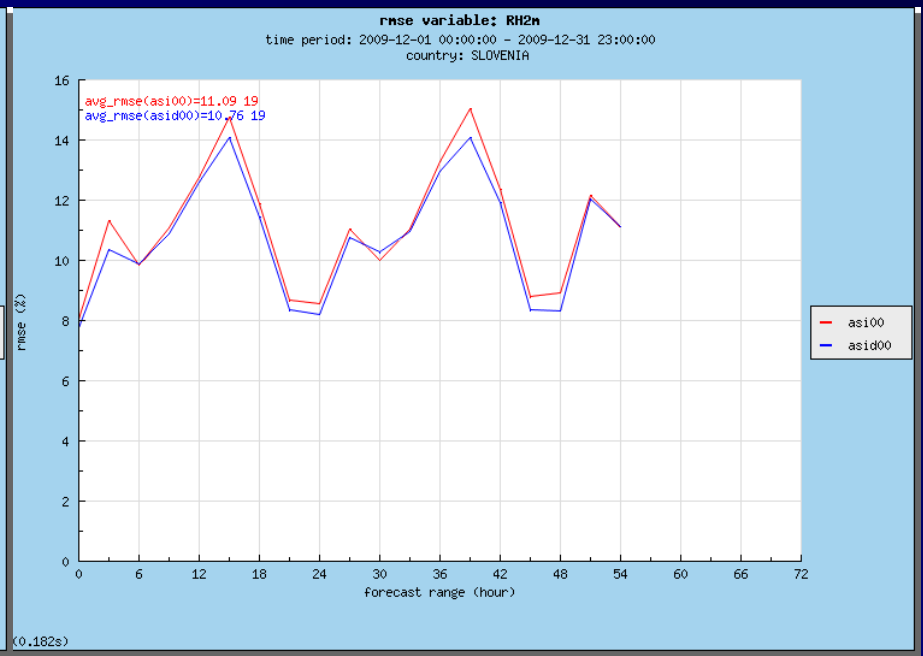

rmse variable: 10m-FF
time period: 2009-08-01 00:00:00 - 2009-08-31 23:00:00
country: SLOVENIA
avg_rmse(asi00)=1.66 19
avg_rmse(asid00)=1.69 19
rmse (m/s)
forecast range (hour)
asi00
asid00
(0.204s)

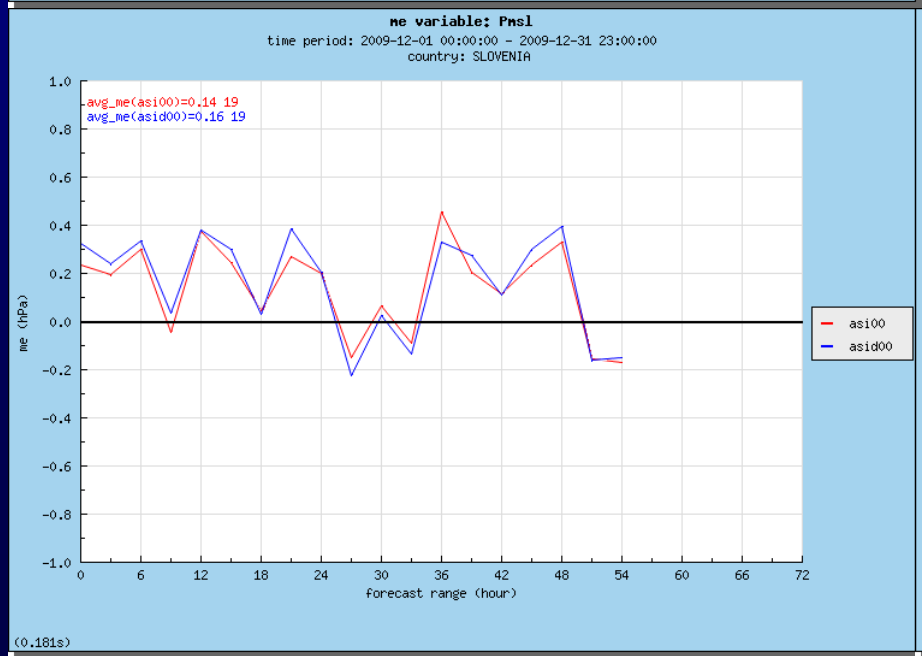

rmse variable: 10m-FF
time period: 2009-12-01 00:00:00 - 2009-12-31 23:00:00
country: SLOVENIA
avg_rmse(asi00)=2.23 19
avg_rmse(asid00)=2.39 19
rmse (m/s)
forecast range (hour)
asi00
asid00
(0.154s)

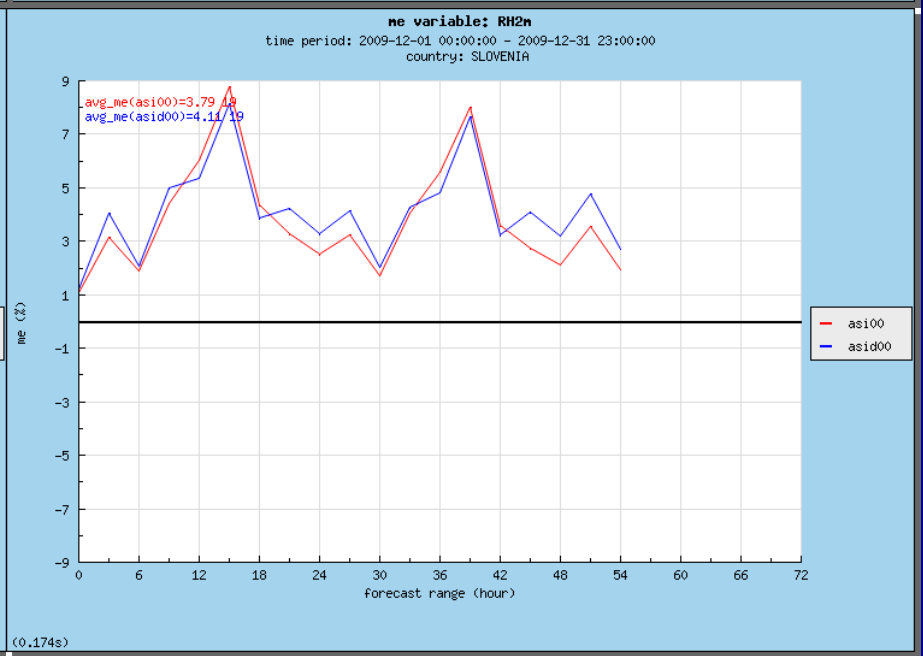

me variable: 10m-FF
time period: 2009-08-01 00:00:00 - 2009-08-31 23:00:00
country: SLOVENIA
avg_me(asi00)=-0.16 19
avg_me(asid00)=-0.28 19
me (m/s)
forecast range (hour)
asi00
asid00
(0.281s)


me variable: 10m-FF
time period: 2009-12-01 00:00:00 - 2009-12-31 23:00:00
country: SLOVENIA
avg_me(asi00)=-0.21 19
avg_me(asid00)=-0.30 19
me (m/s)
forecast range (hour)
asi00
asid00
(0.330s)

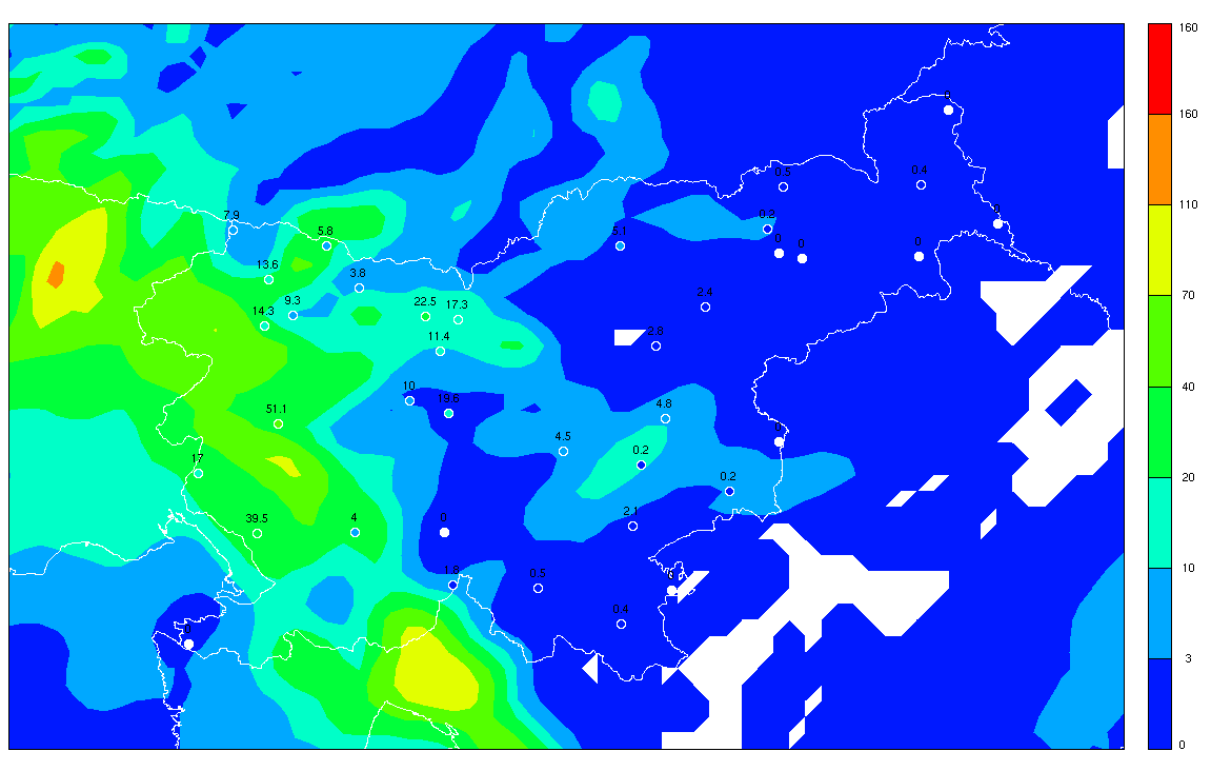

rmse variable: Pmsl
time period: 2009-12-01 00:00:00 - 2009-12-31 23:00:00
country: SLOVENIA
avg_rmse(asi00)=1.38 19
avg_rmse(asid00)=1.32 19
rmse (hPa)
forecast range (hour)
asi00
asid00
(0.153s)


rmse variable: RH2m
time period: 2009-12-01 00:00:00 - 2009-12-31 23:00:00
country: SLOVENIA
avg_rmse(asi00)=11.09 19
avg_rmse(asid00)=10.76 19
rmse (%)
forecast range (hour)
asi00
asid00
(0.182s)


me variable: Pmsl
time period: 2009-12-01 00:00:00 - 2009-12-31 23:00:00
country: SLOVENIA
avg_me(asi00)=0.14 19
avg_me(asid00)=0.16 19
me (hPa)
forecast range (hour)
asi00
asid00
(0.181s)


me variable: RH2m
time period: 2009-12-01 00:00:00 - 2009-12-31 23:00:00
country: SLOVENIA
avg_me(asi00)=3.79 19
avg_me(asid00)=4.11 19
me (%)
forecast range (hour)
asi00
asid00
(0.174s)

ALARO 5 km



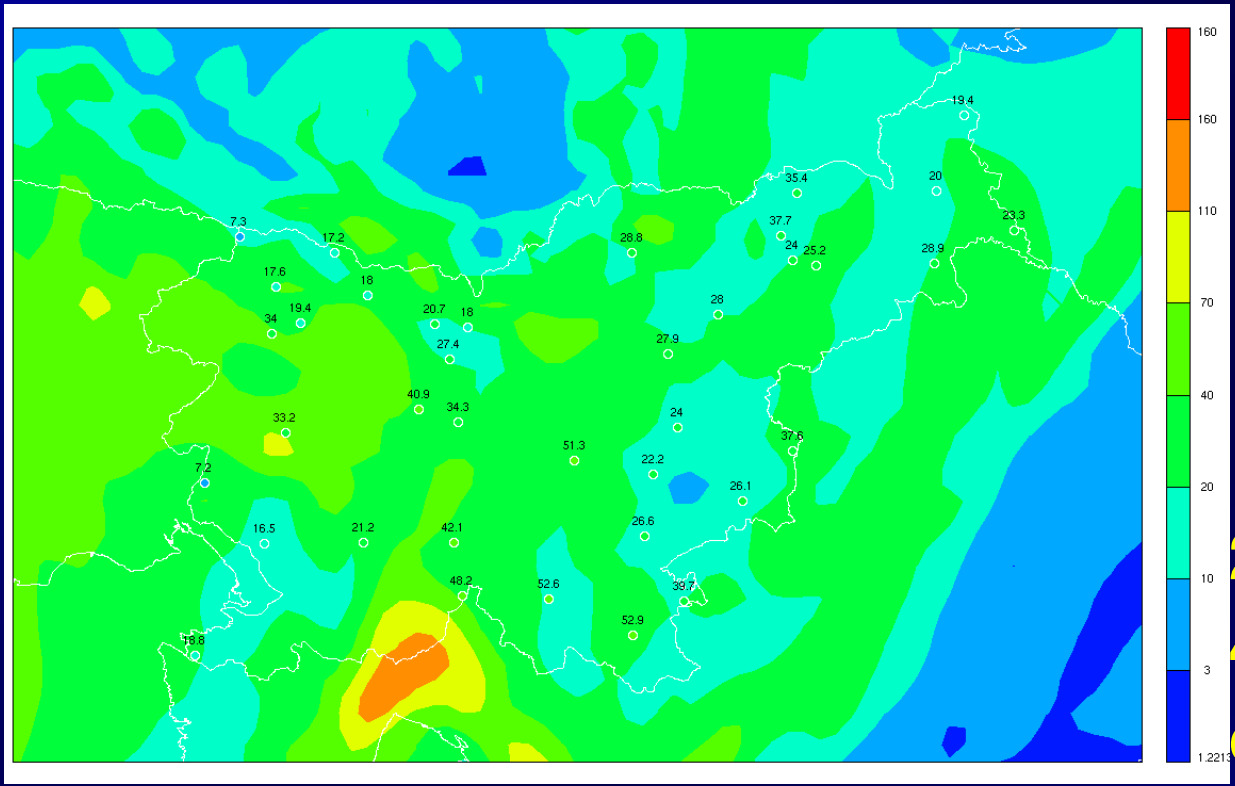
24 hours accum.prec

15 June 2007

SW flow

Good agreement

ALARO 5 km



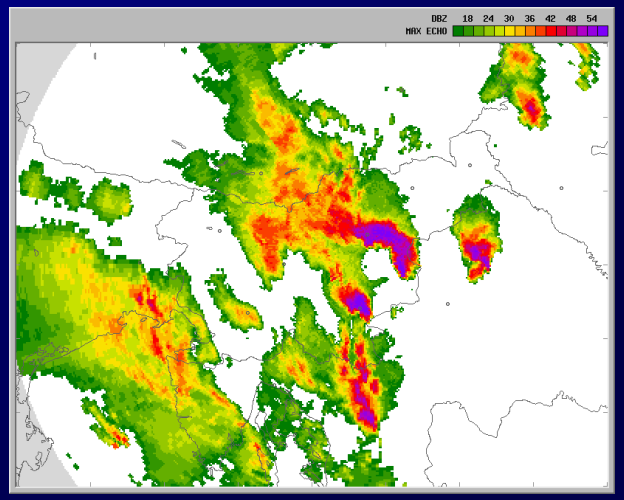
24 hours accum.prec

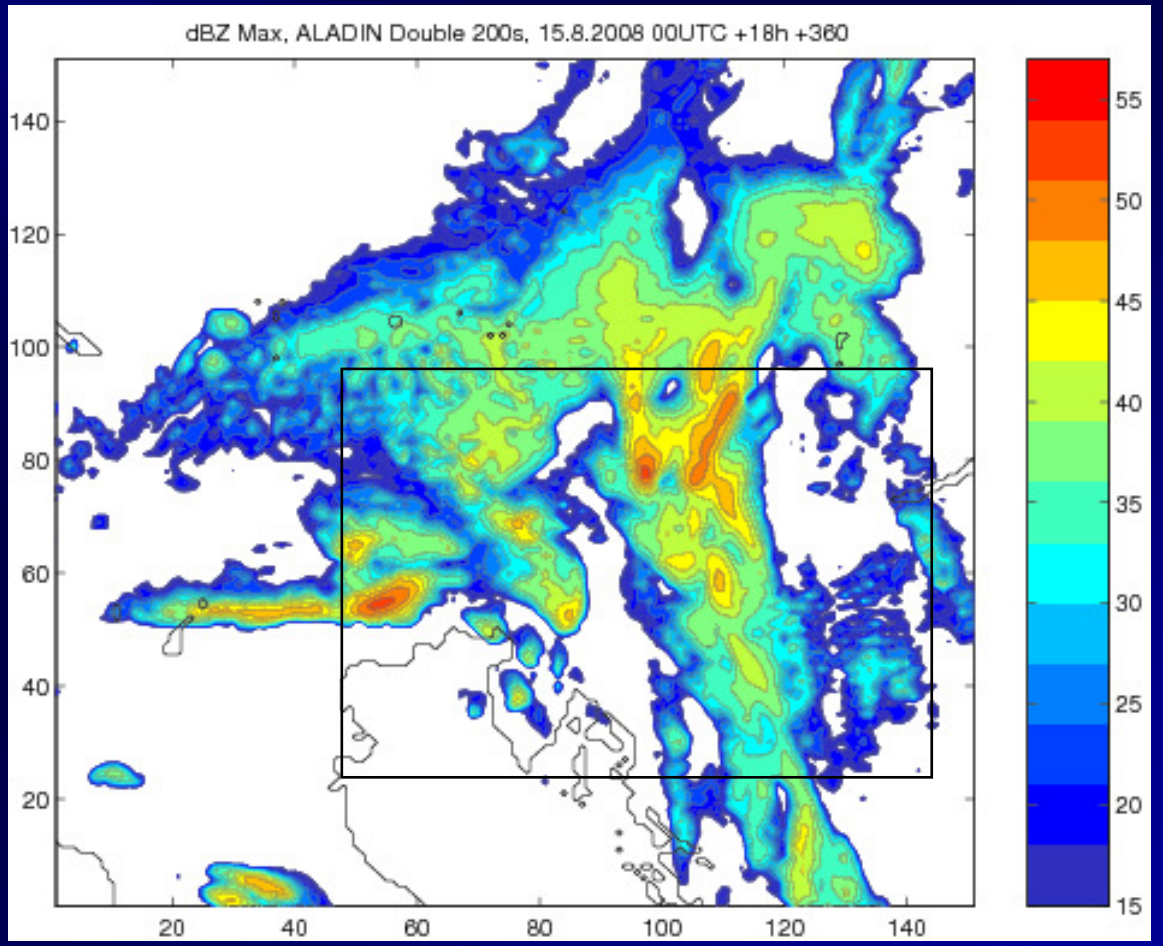
4 May 2007

cyclone

Over-forecasted in west, under-forecasted in east

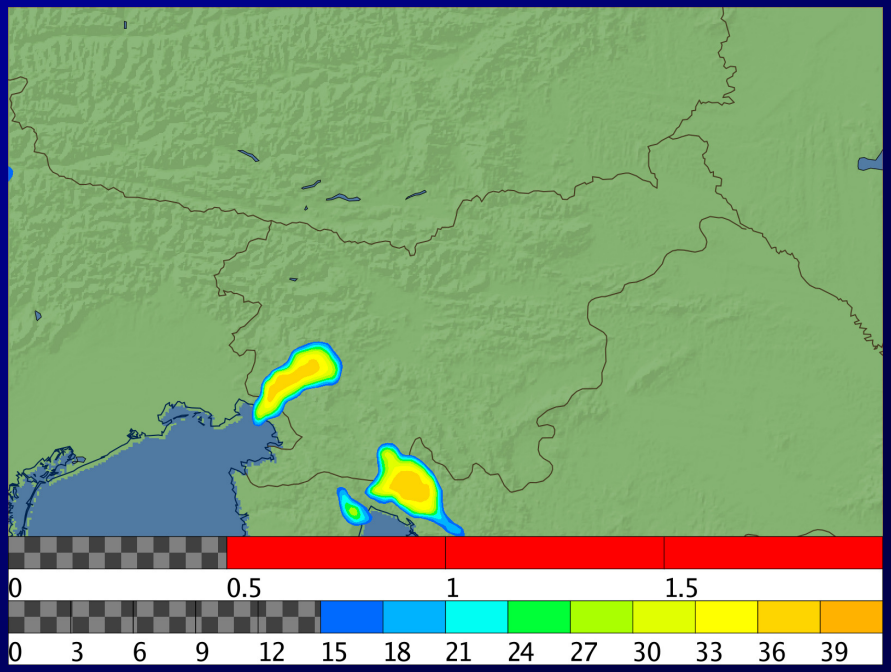
ALARO 5 km convection

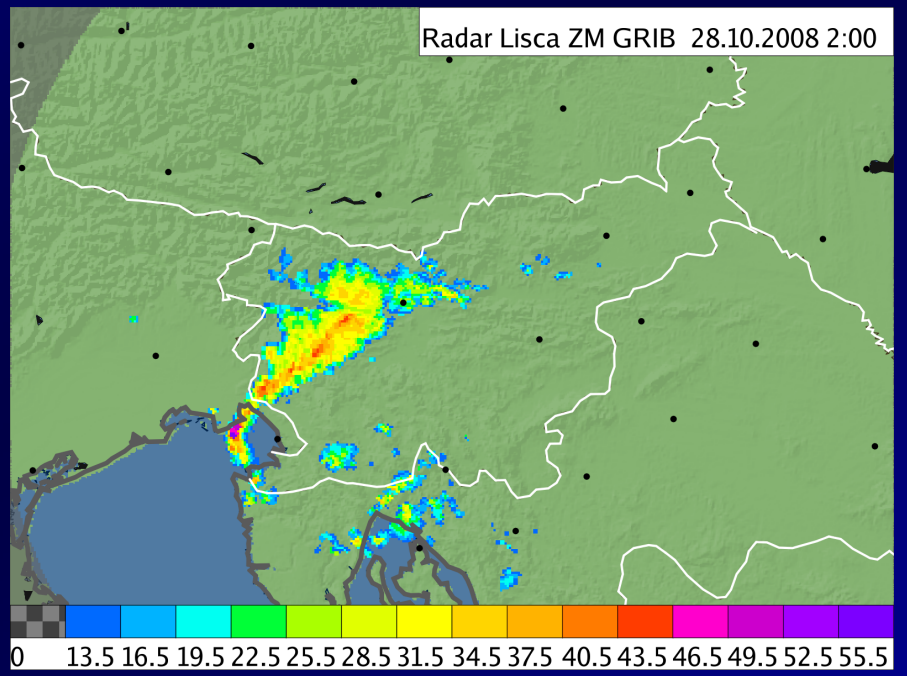




Radar reflectivity

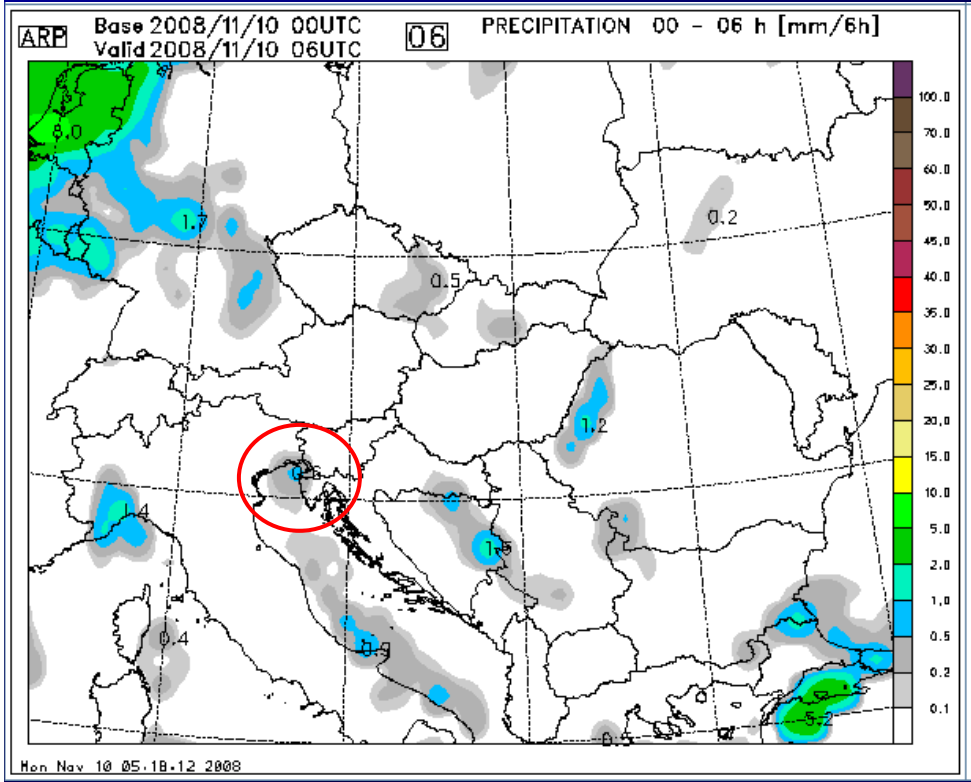
ALARO 5 km convection

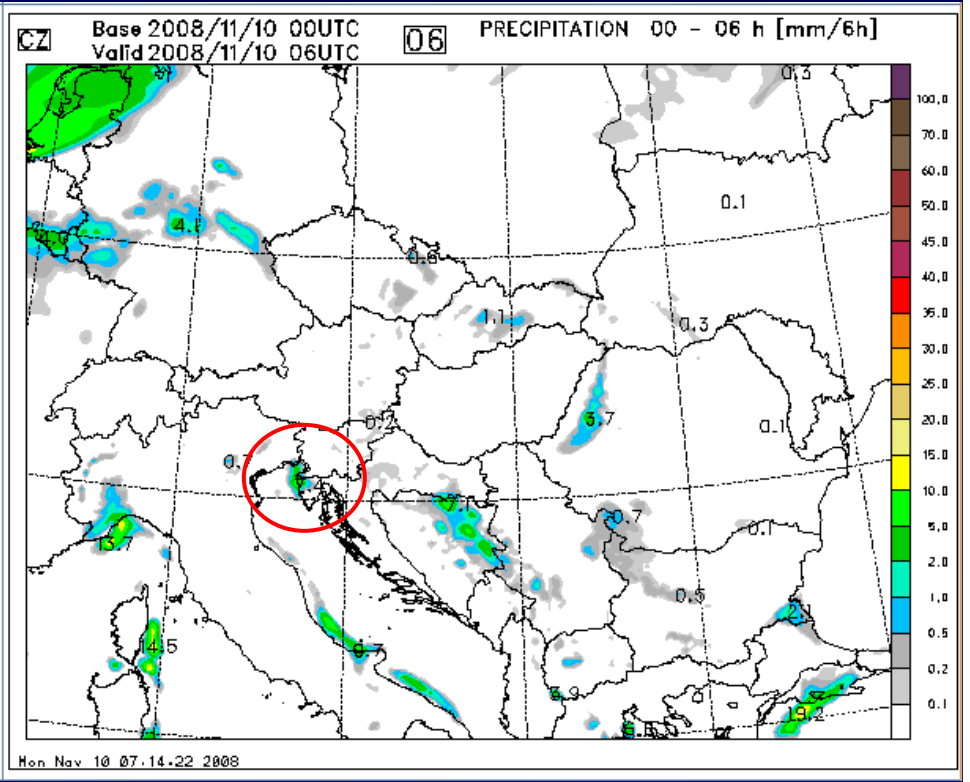




Structure of the convective cell

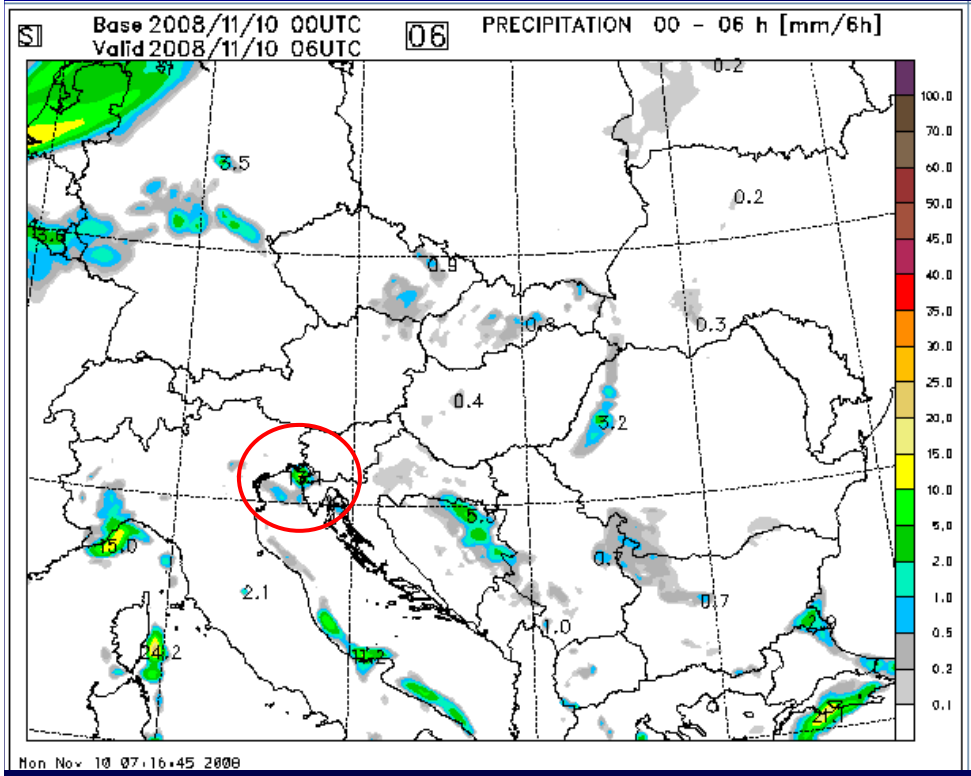
ALARO 10km /5 km

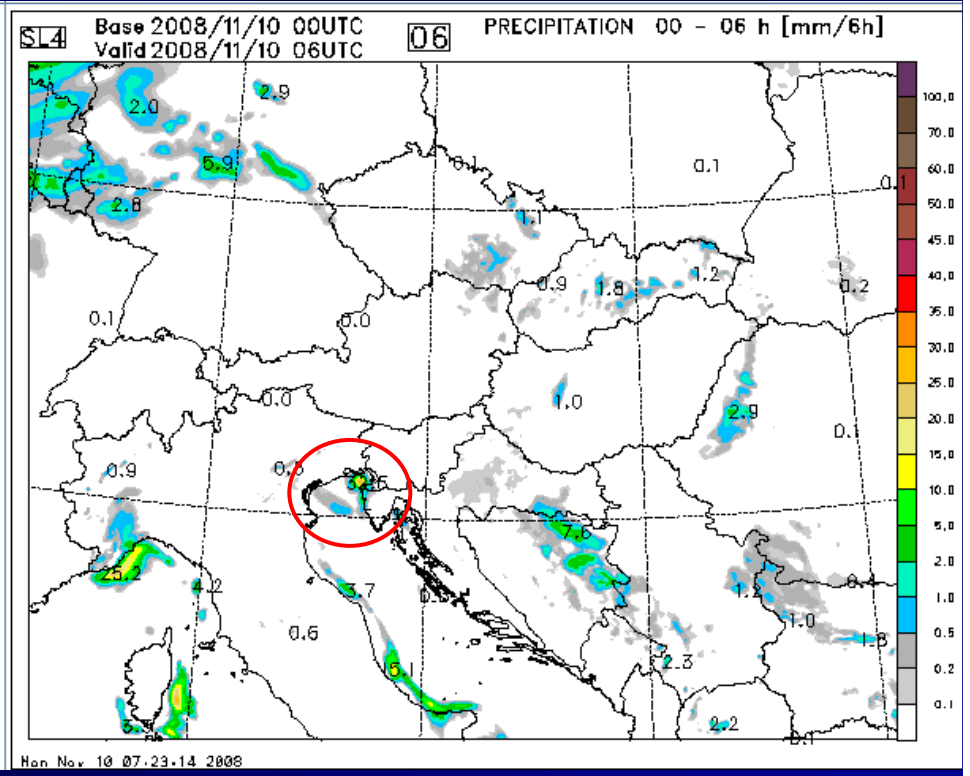




First steps

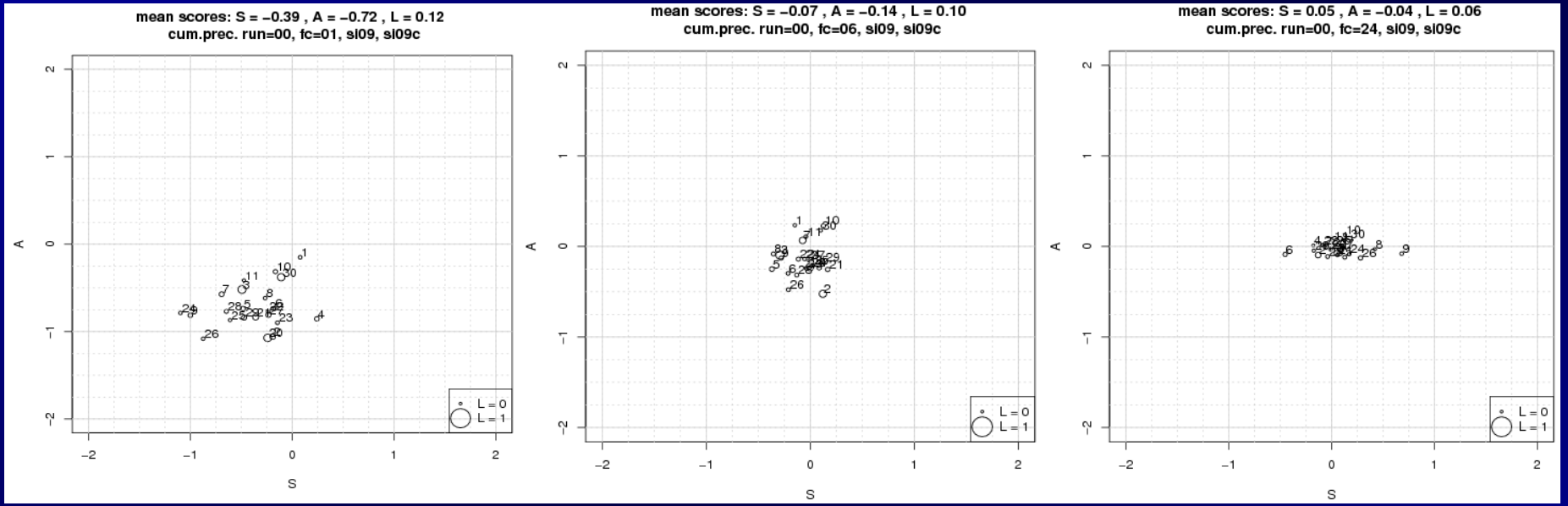
ALARO 10km /5 km



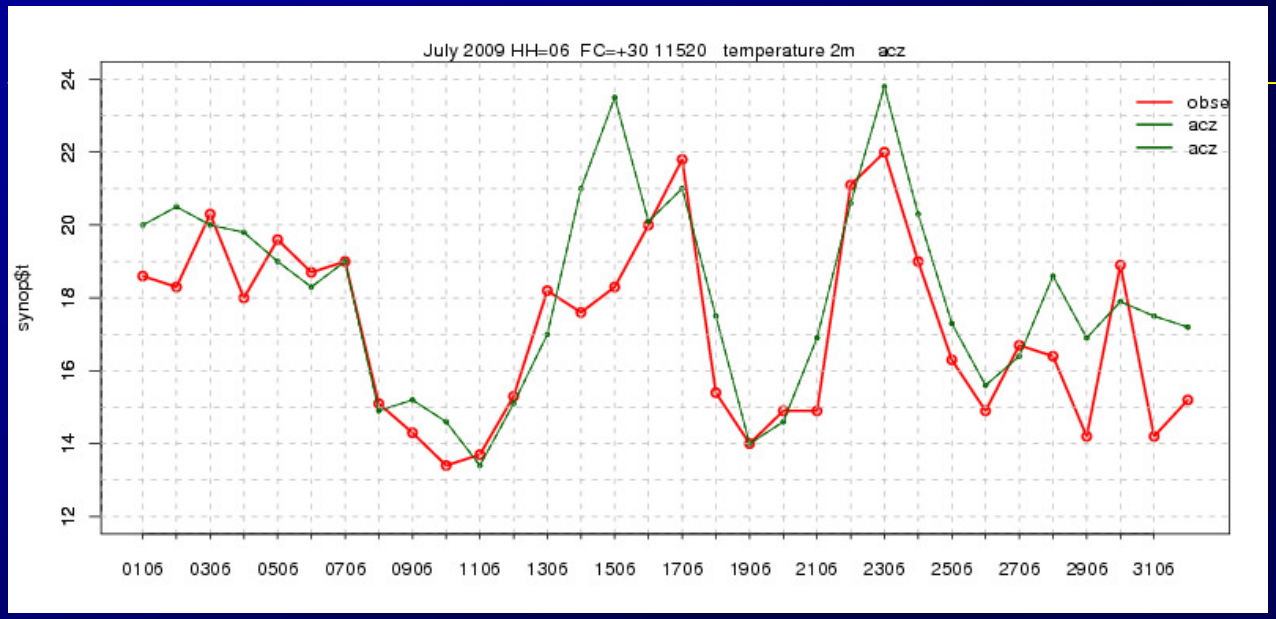


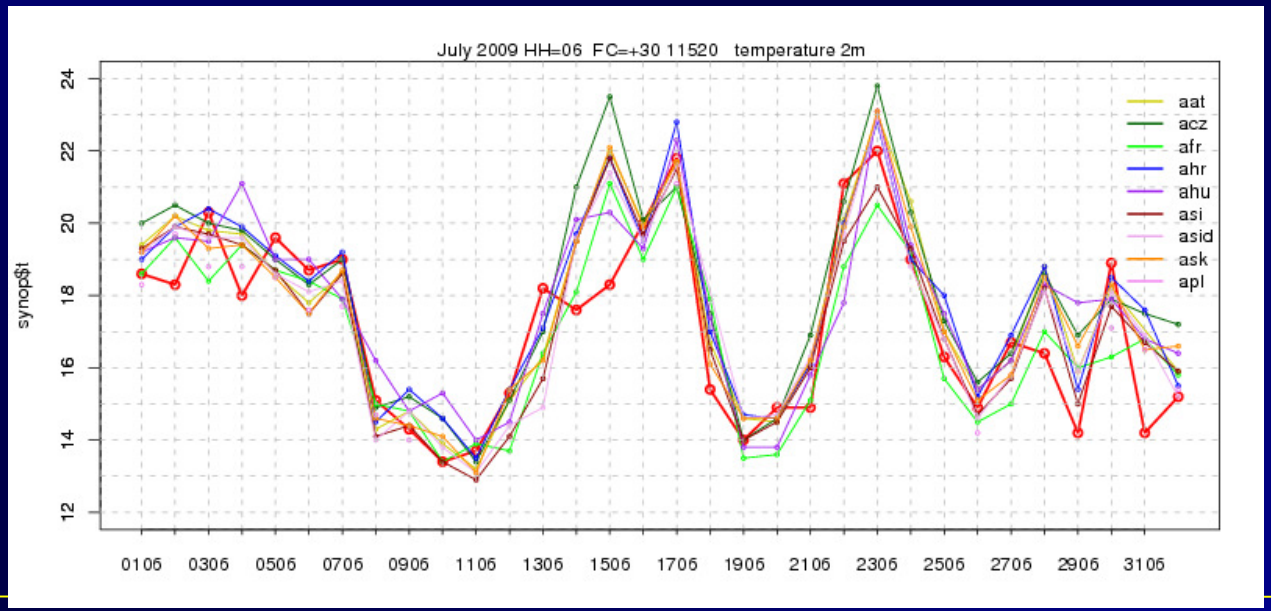
First steps

6-hour cycling of the hydrometeors period 2009062000 - 2009071700.



- non-zero initial values of the hydrometeors lead to increasing the total precipitation in first hours, while differences are not so significant for longer forecast ranges.





July 2009

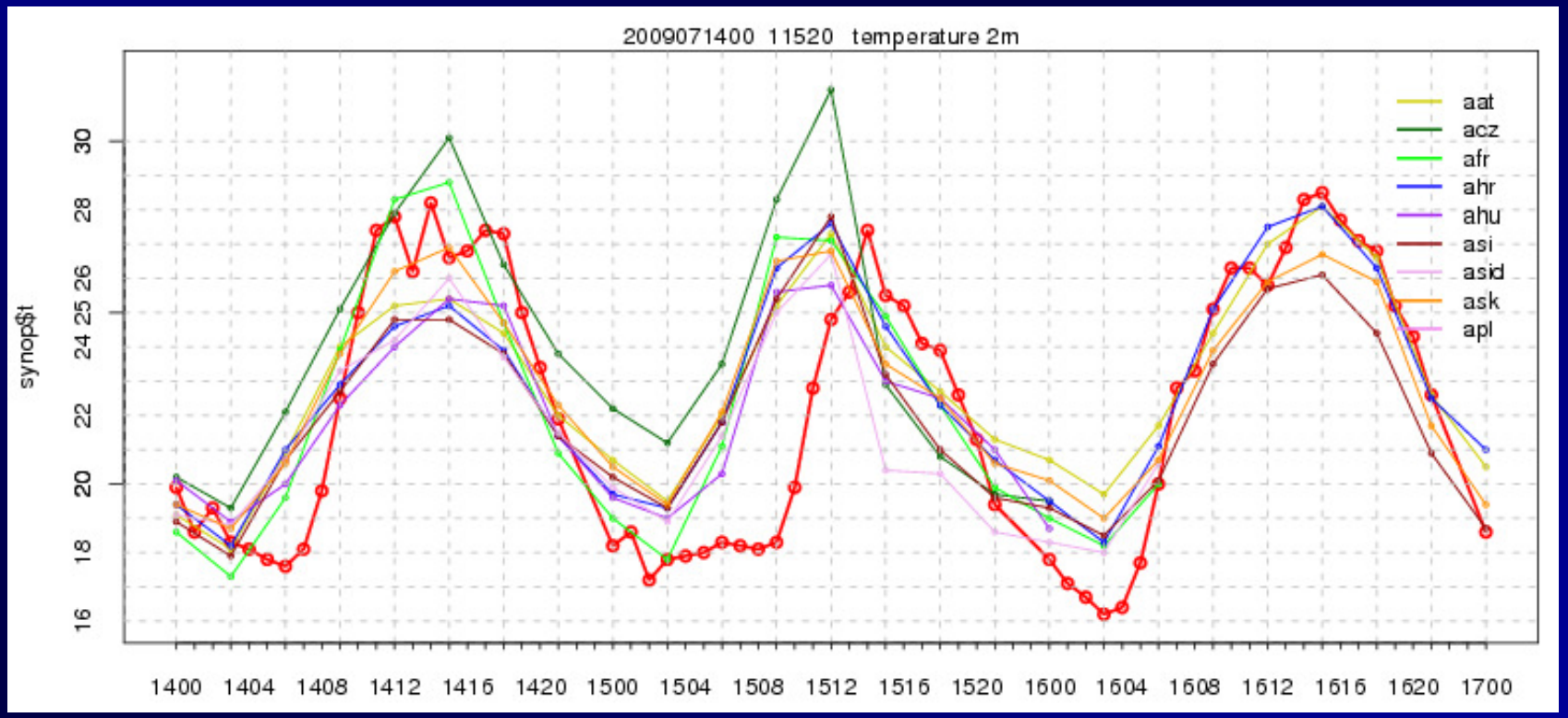
T 2m (6UTC, 00+30)

Station Prague

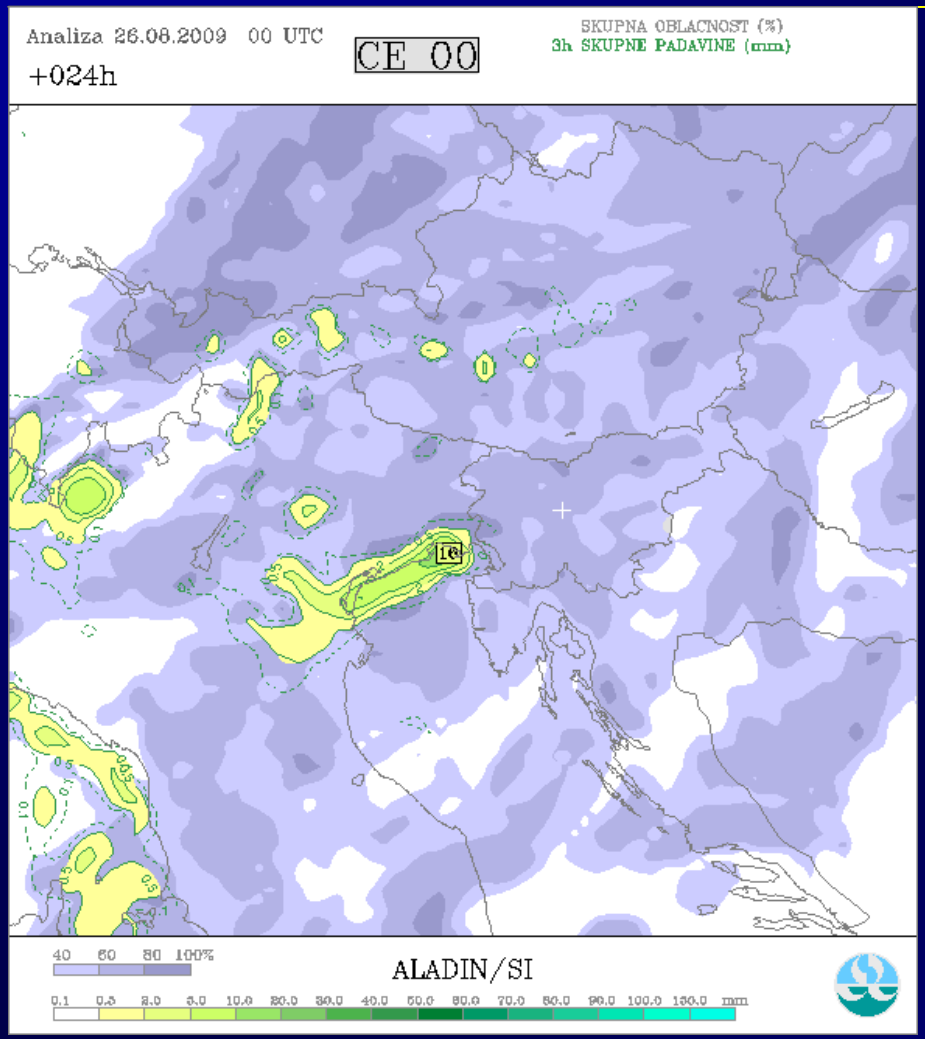
2009071400

T 2m

Station: Prague



SST – sea surface presentation

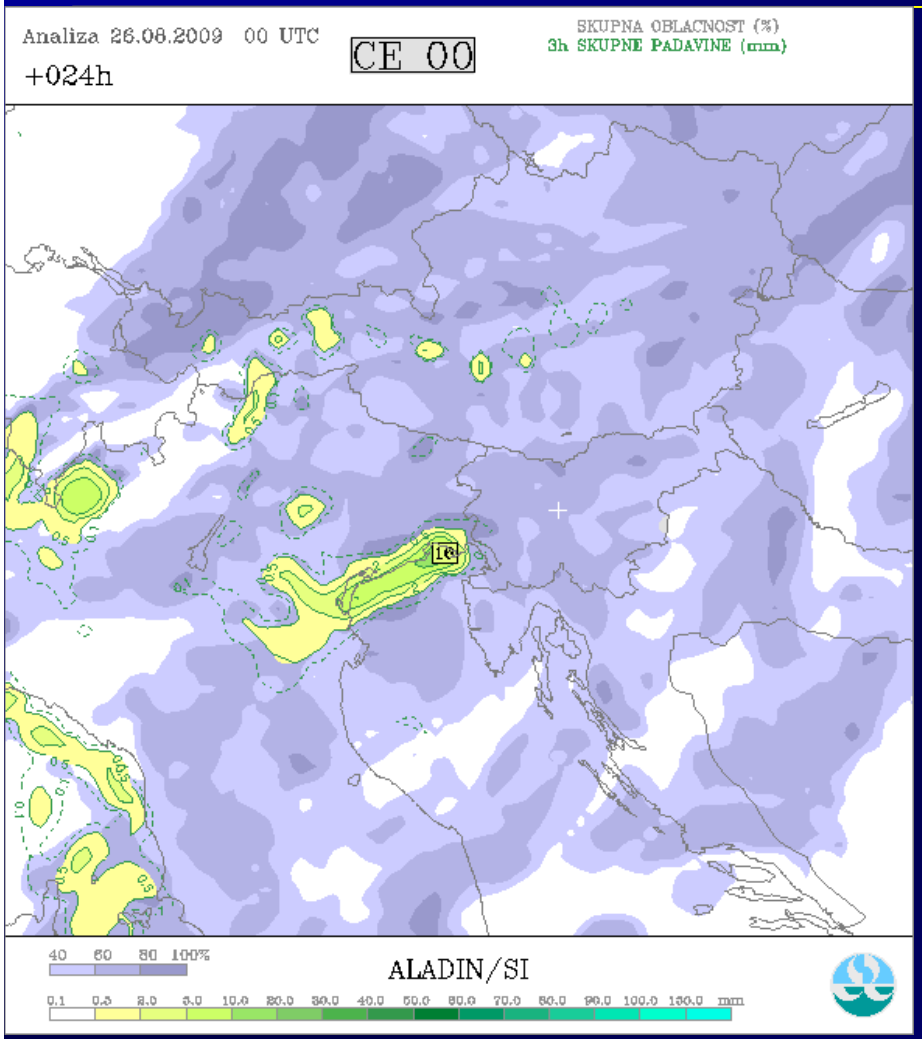


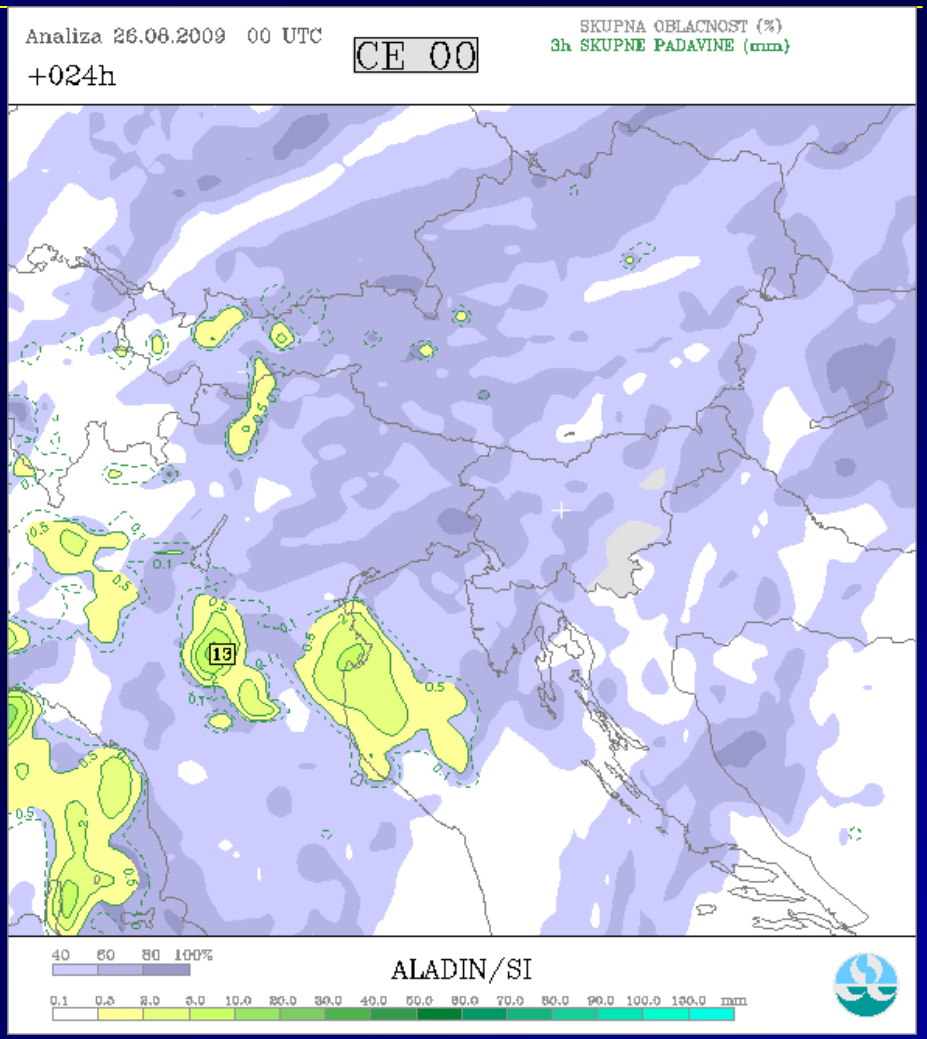
3 hours accum.prec.

26 August 2009

Unrealistic amount of precipitation near coast line

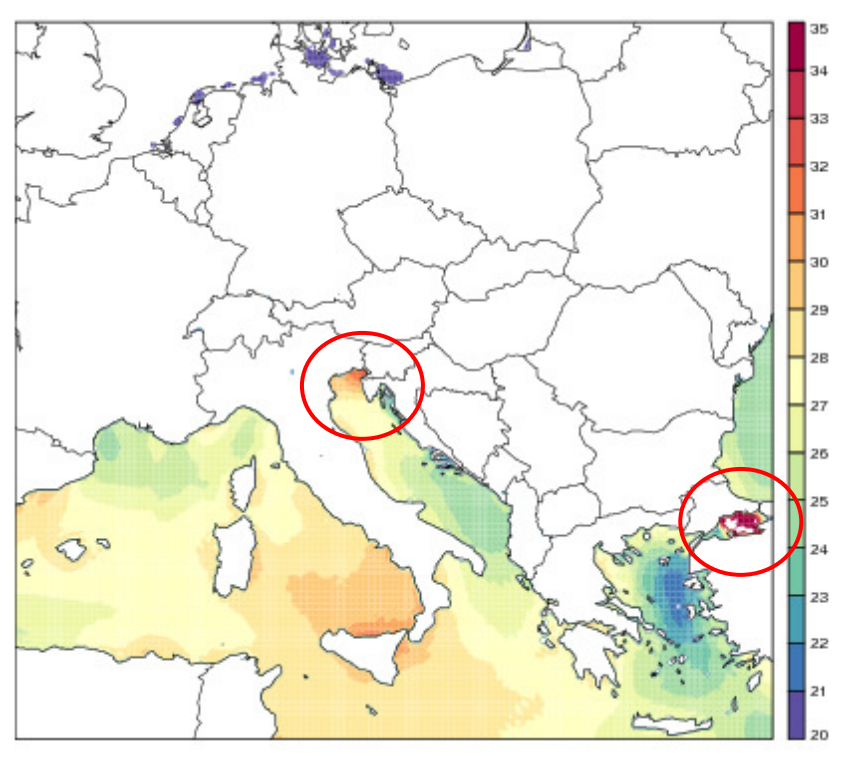
SST





ARPEGE **3 hours accum.prec.** **ECMWF**

SST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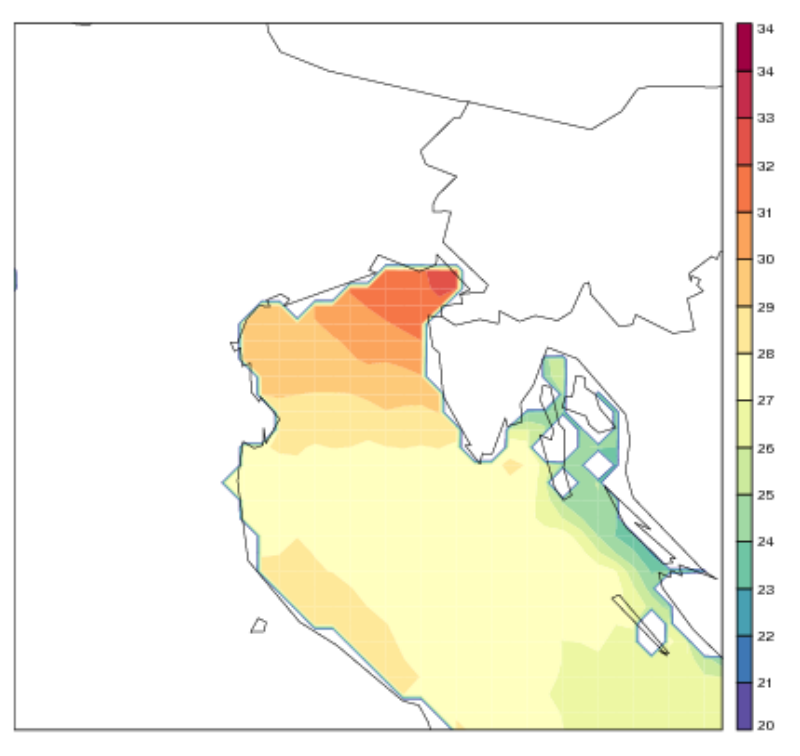
34
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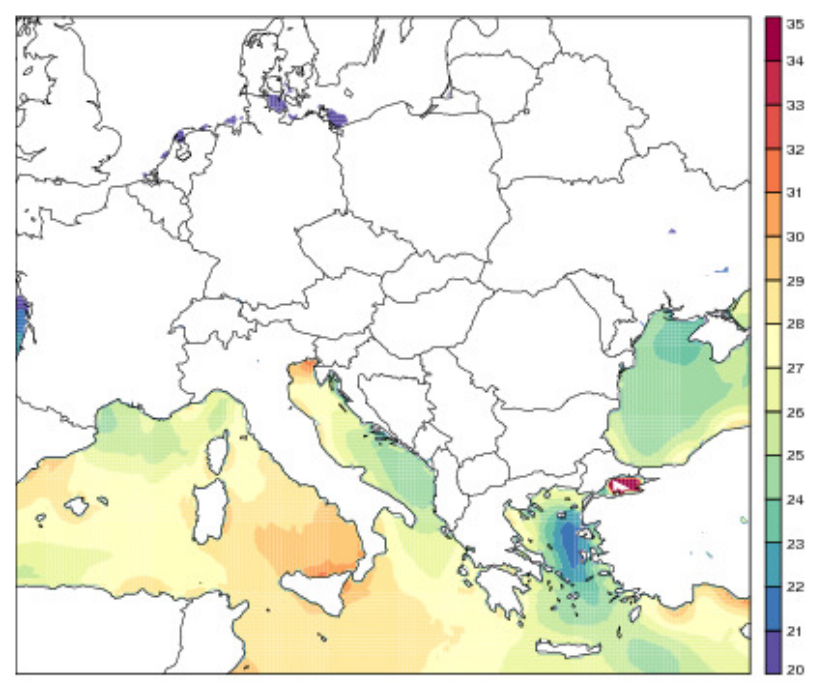
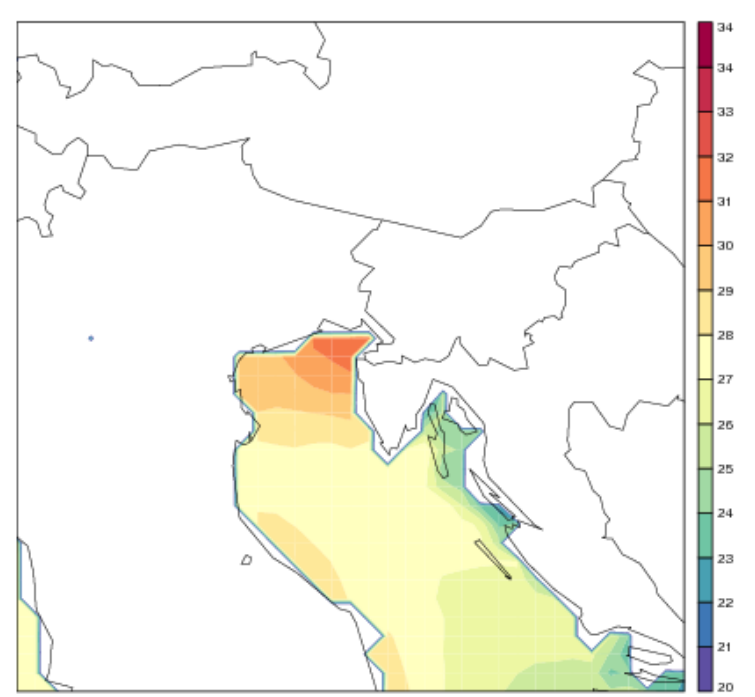
20

ALADIN

SST

ARPEGE coupling file

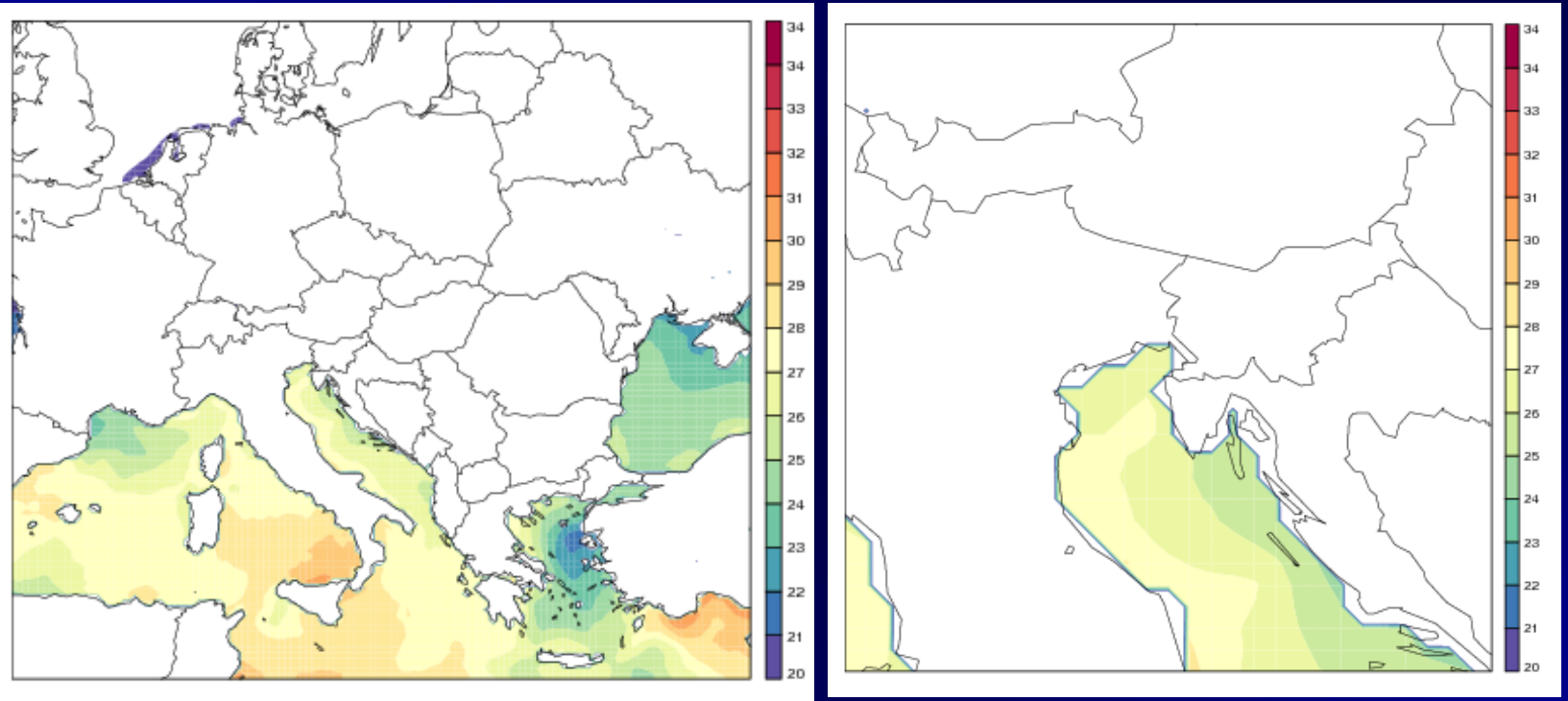




NESDIS analysis

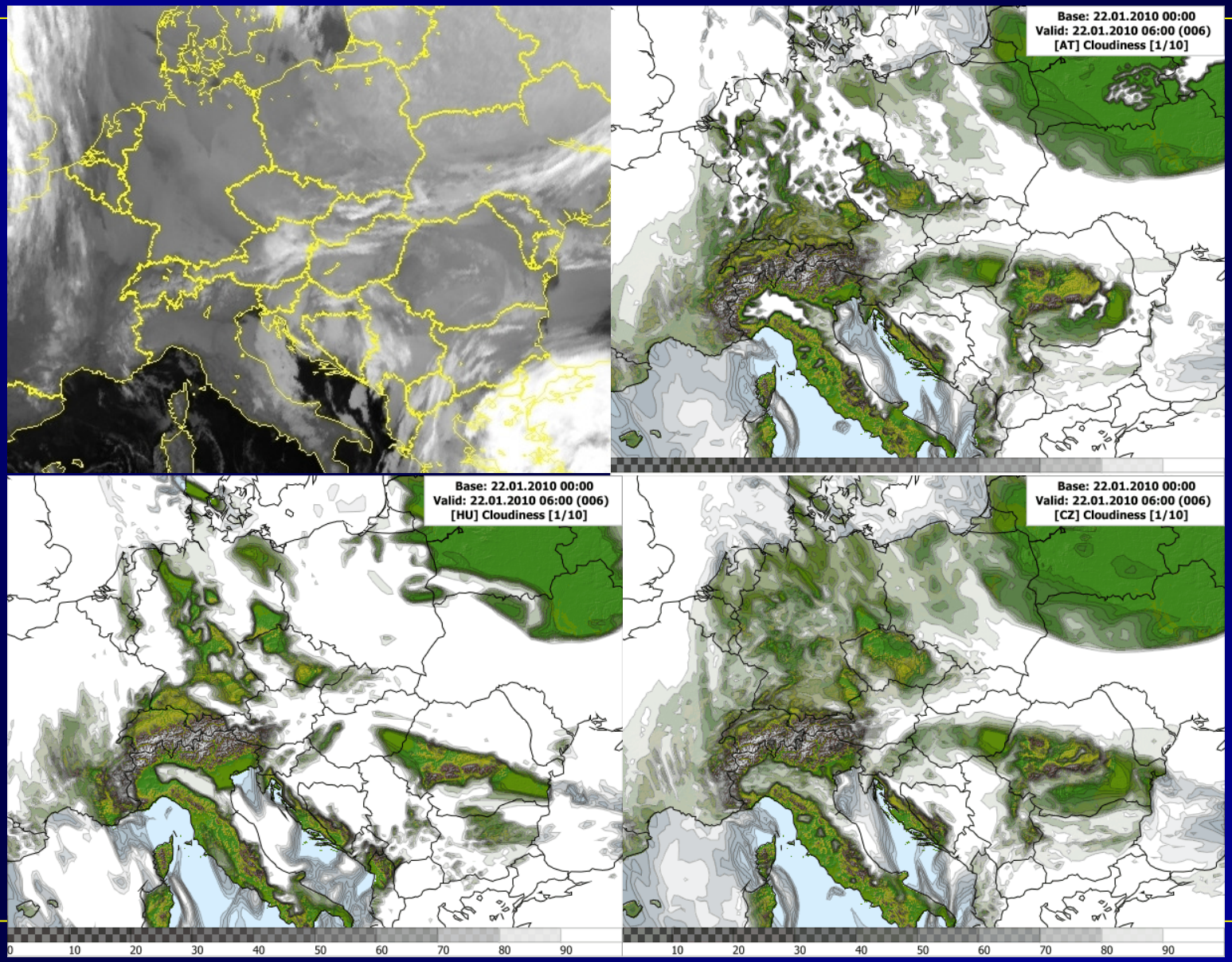
SST

ECMWF coupling file

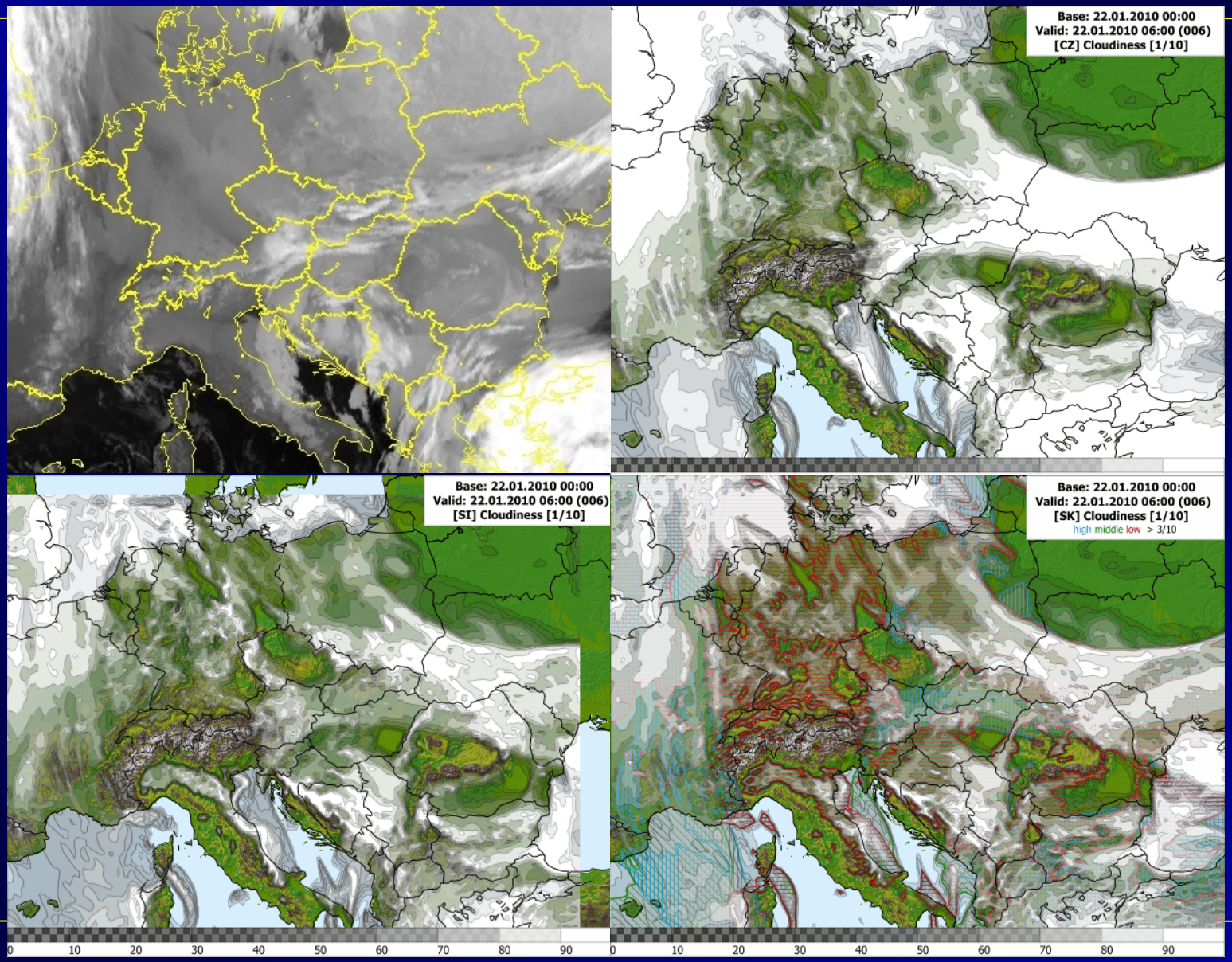


OSTIA analysis (Met Office)

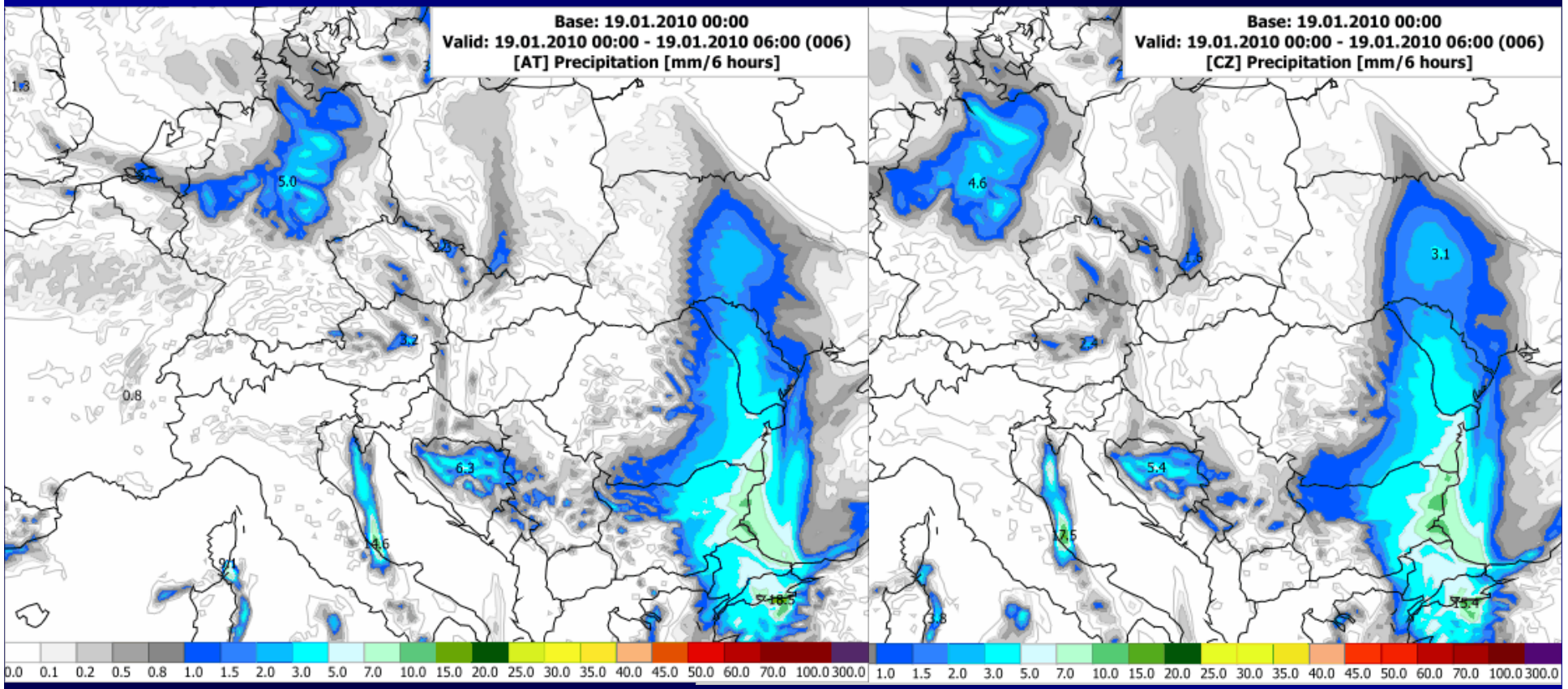
Total cloud cover – an example



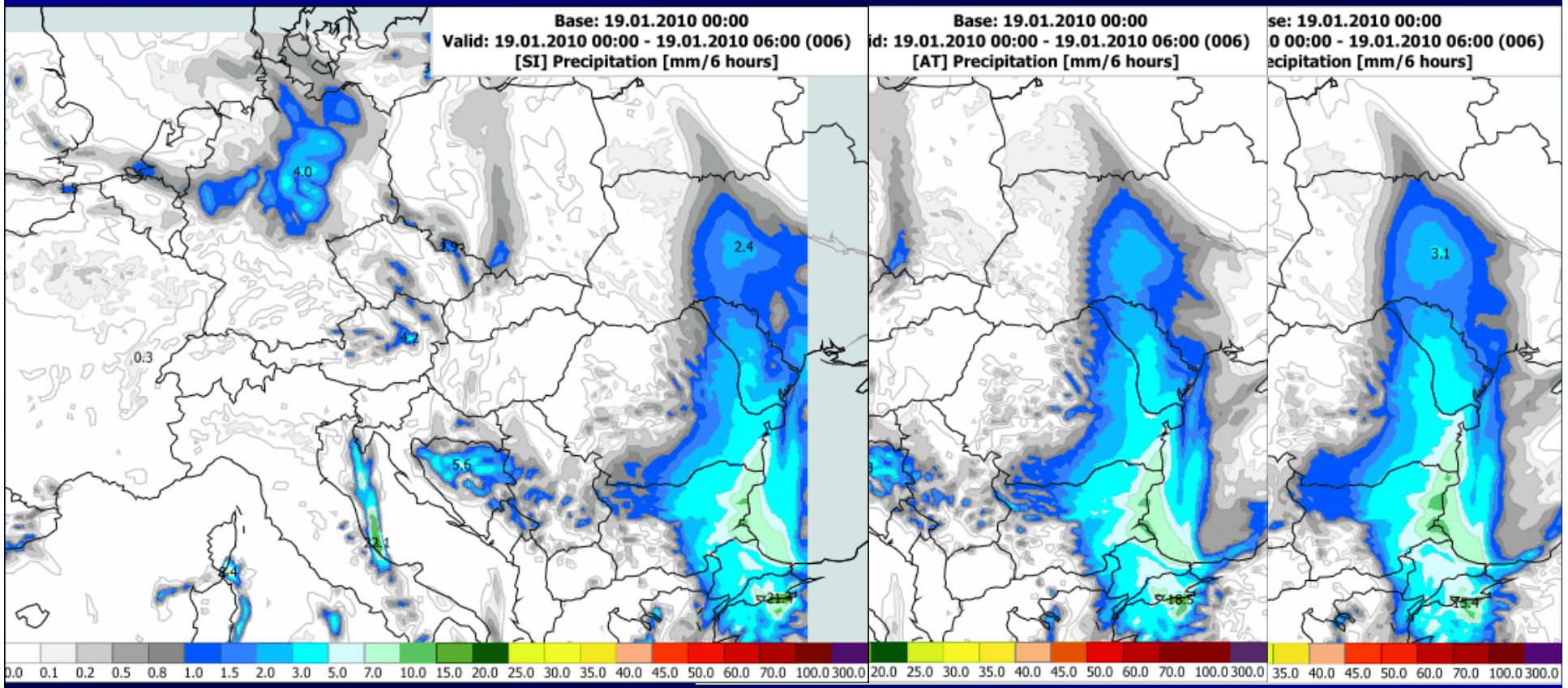
Total cloud cover – an example



Precipitation – an example



Precipitation – an example



Time step

- Surprise in December in parallel suite (4.4 km)
- Few days in a row
- Abort in physics routines

- Change of the time step from 200 s to 180 s

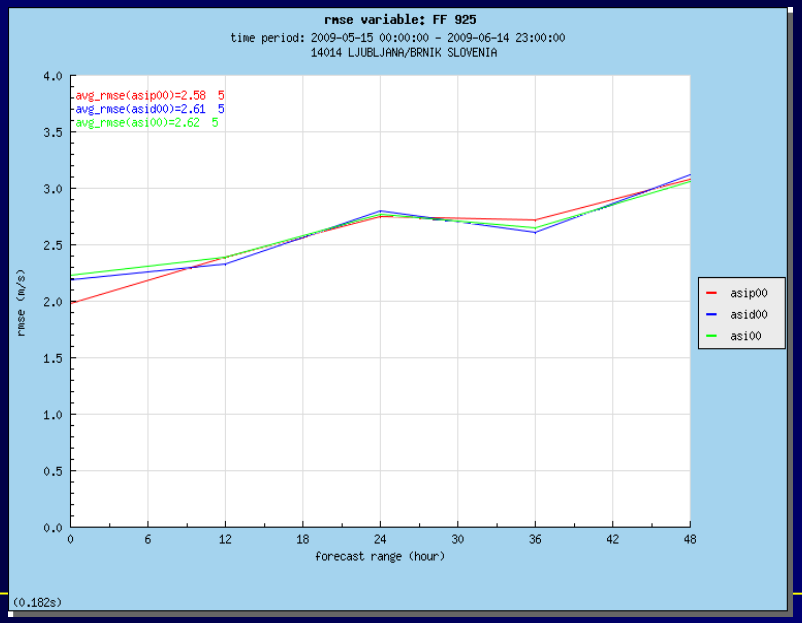
Assimilation suite

- 3D-Var, CANARI, 6h frequency, 4.4 km
- All OPLACE observation + local SYNOP data
- Sea analysis from ARPEGE
- Long cut-off ARPEGE LBC, DFI
- Optional cycling of hydrometeors
- Constant bias correction (VarBC under testing)
- B-matrix derived using ARPEGE assimilation ensemble

Assimilation suite performance

- So far experienced:
  - improved near-surface fields
  - neutral to slightly positive impact on low-level wind forecasts (mostly in the first 12 hours)

Wind 925 hPa



Temperature 2m