ALARO 0 experience in Croatia

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Meteorological and Hydrological Service

ALARO-1 Working days 2014, ZAMG, Vienna, Austria, 12 - 14 May 2014

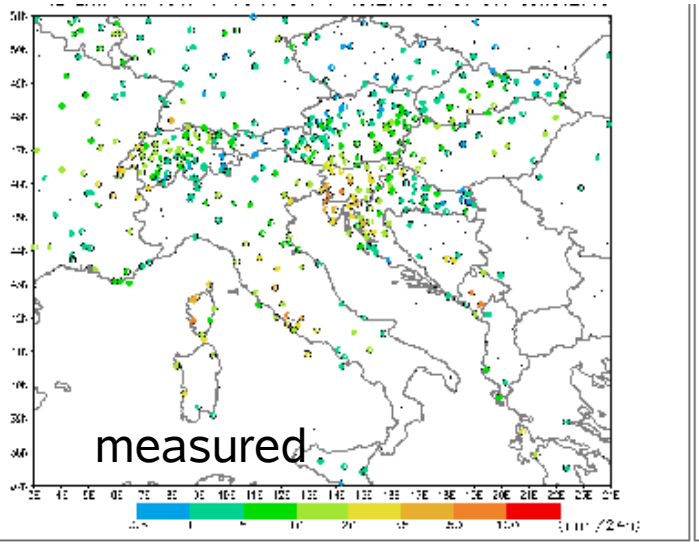
Outline

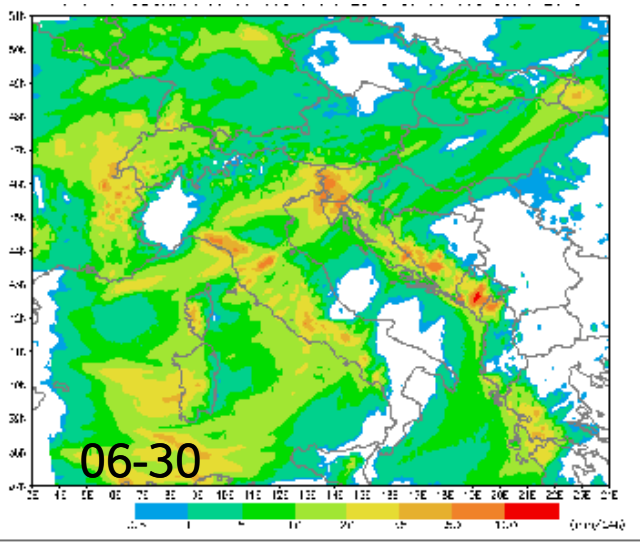
Operational versions
    AL32T3 for 8 km run, AL36T1 for 2 km NH run
Experiences with precipitation
    Too much over mountains?
Wind and turbulence
    Different wind and different fluxes in different resolutions
And radiation
    And other factors contributing to T2m
Plans

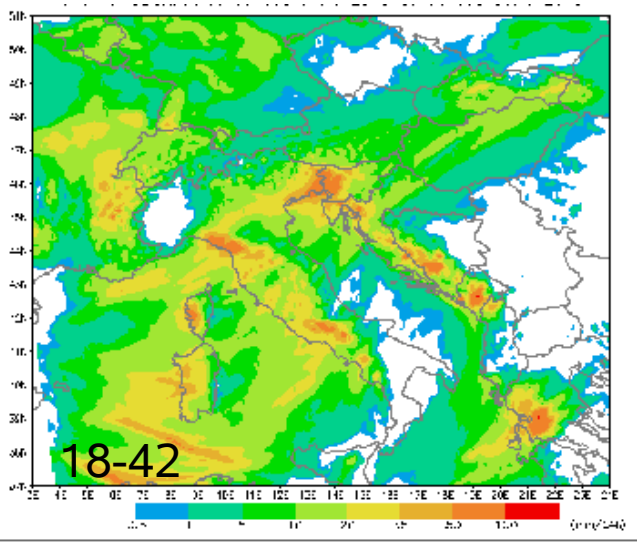
Rainfall validation

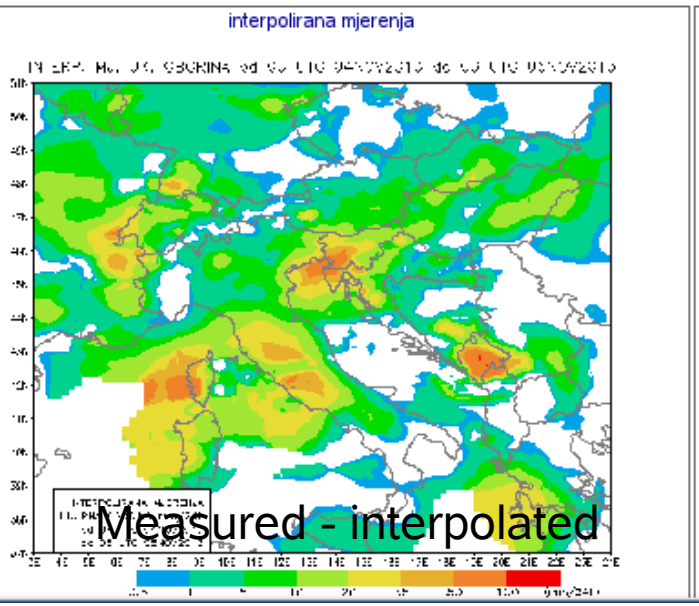
- Only inland Croatia is covered by radars (+ Istria)
- Cca 400 gauges, 24 h accumulated precipitation, shape not fit SAL
- Does it rain above the sea surface?
- TRMM data: 24 hourly from 3B42RT from 06 UTC is combined with rain-gauges
- Alternatives: 3B42 (3h), 3B41RT (1h)

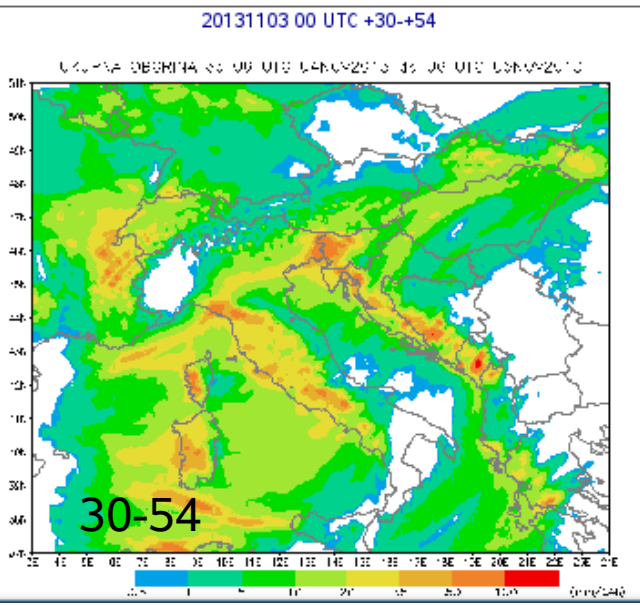
No TRMM data 04-05 Nov 2013

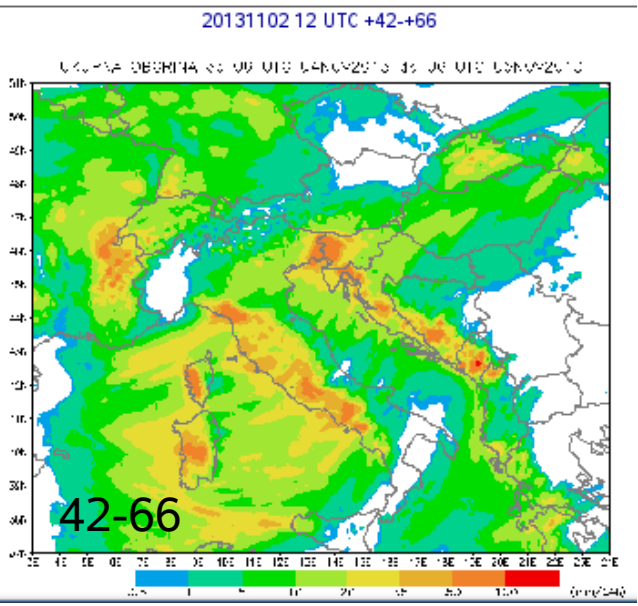












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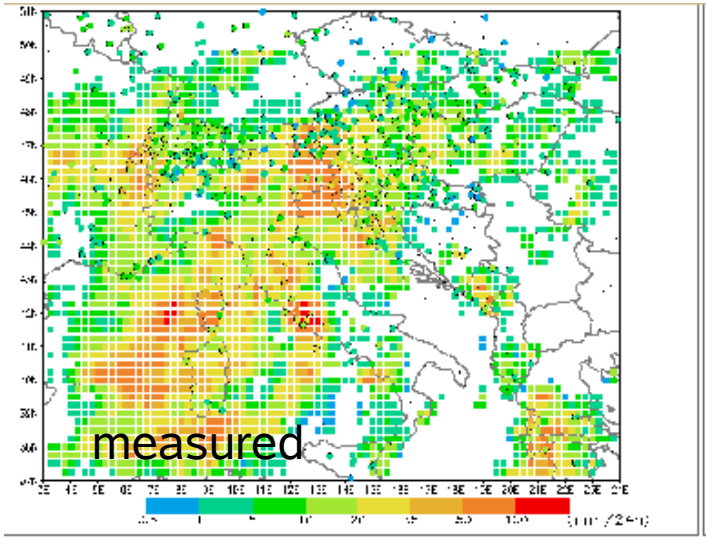

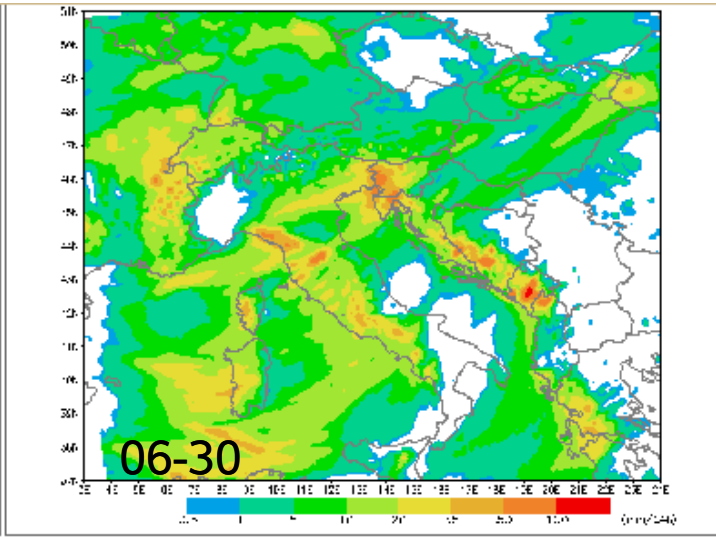

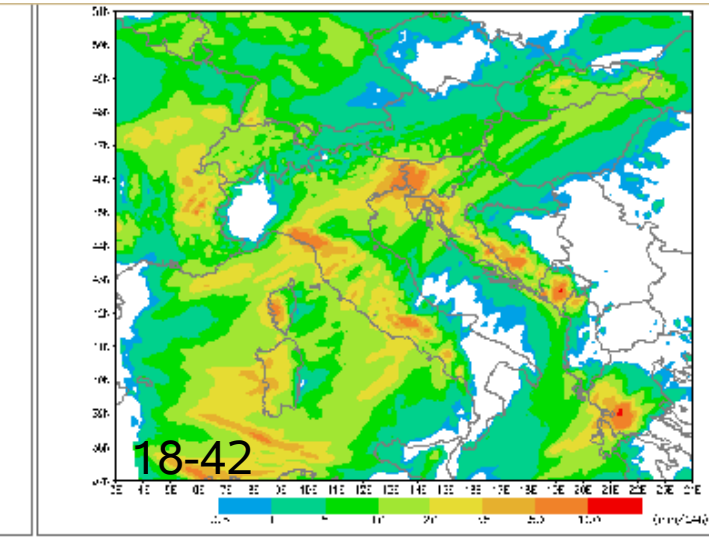

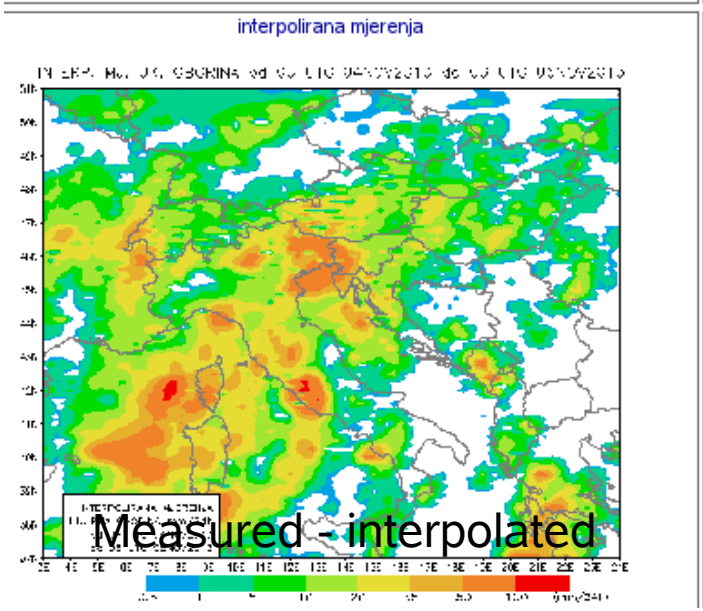

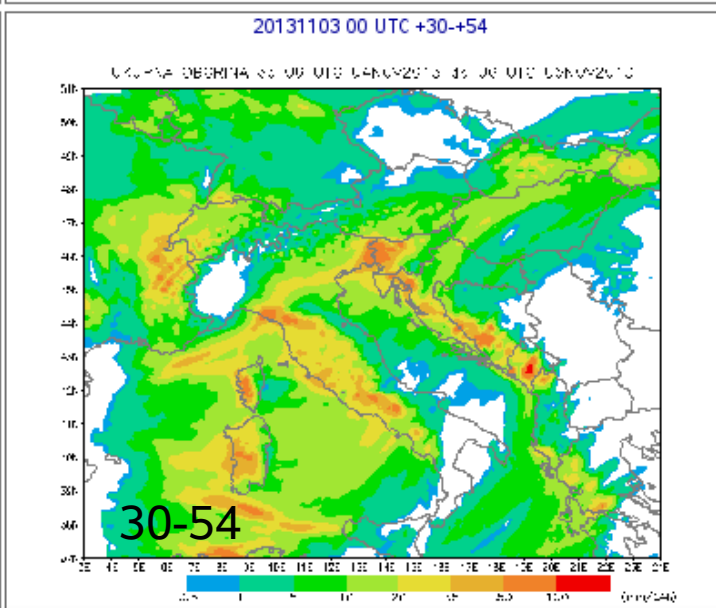

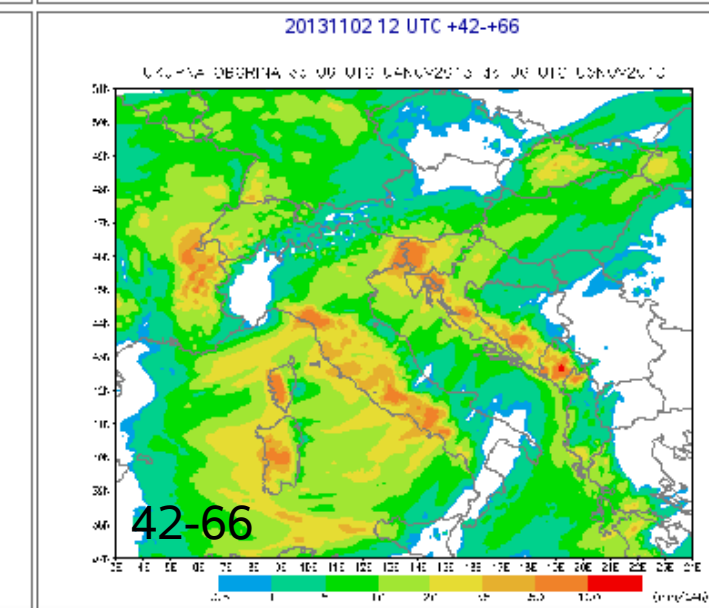

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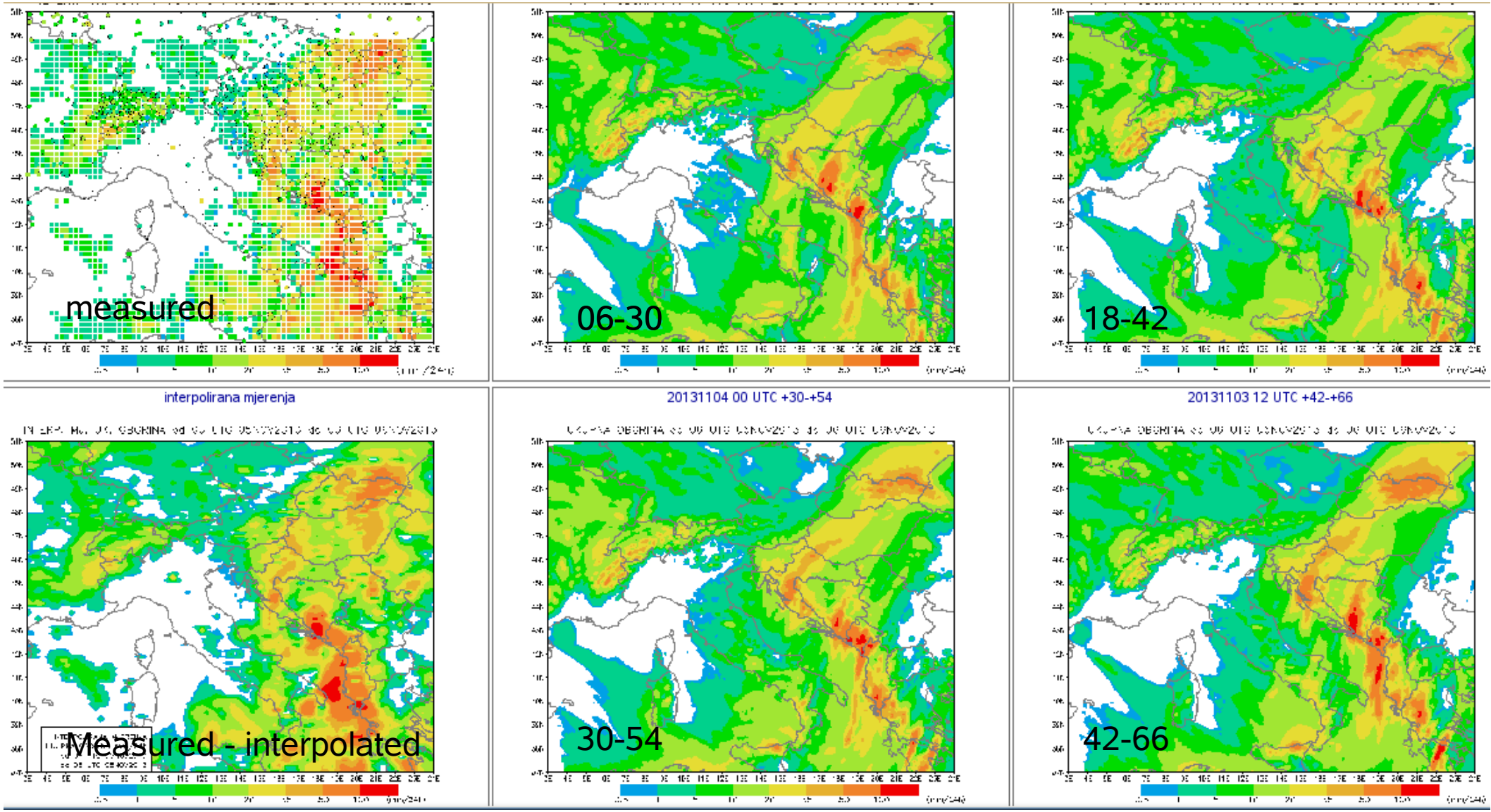
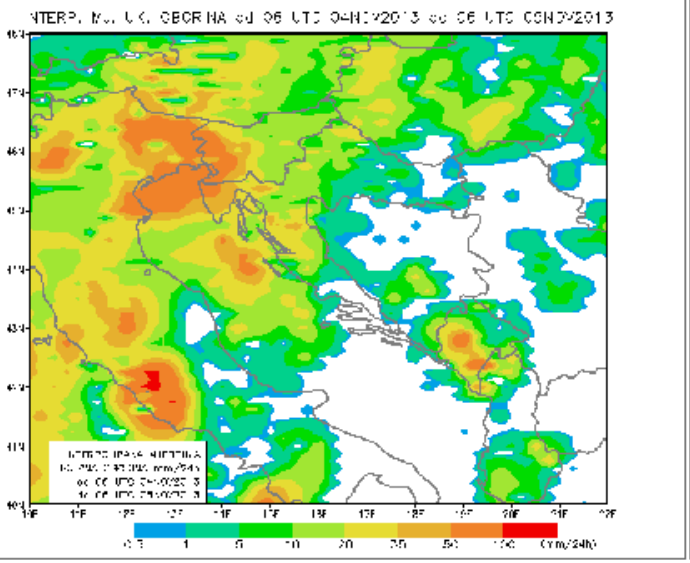
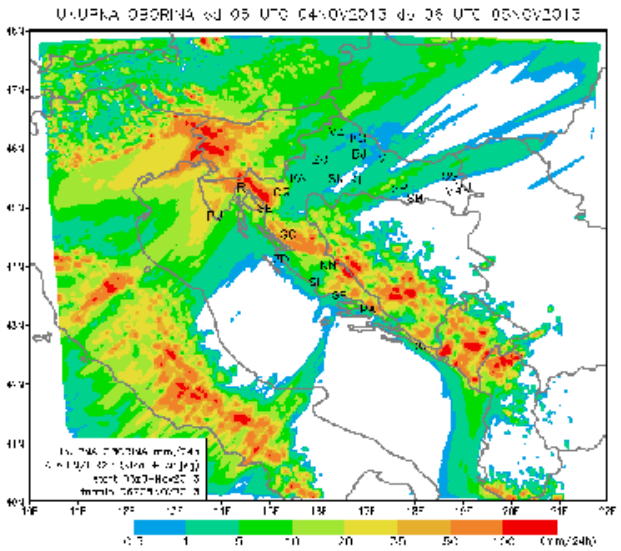


The contribution from 2 km run

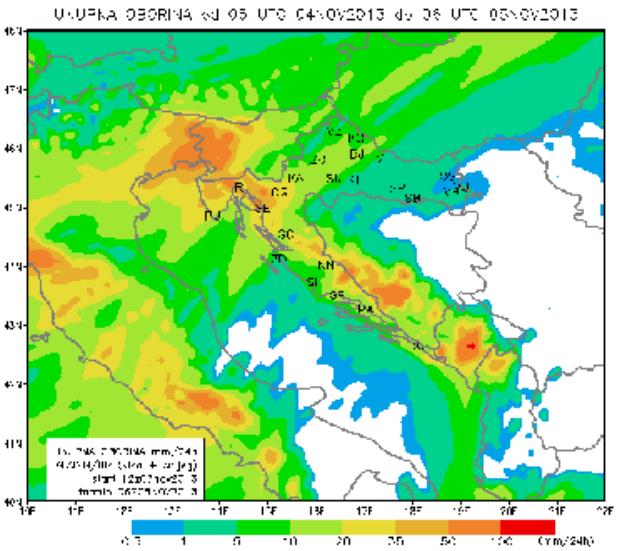
interpolirana mjerenja



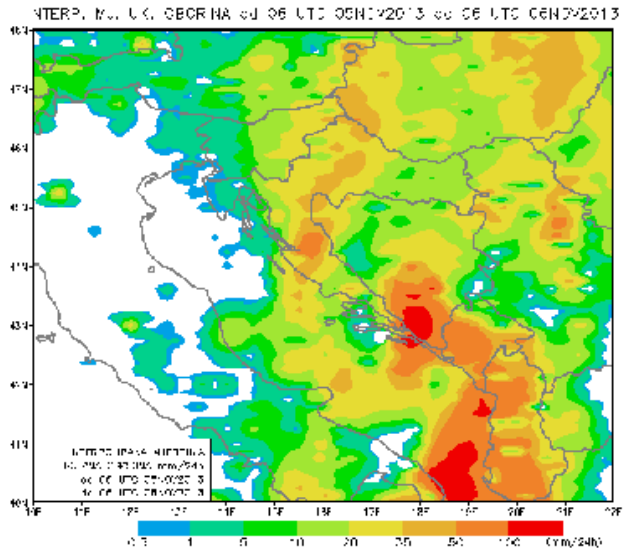
20131104 hr22



20131103 12 UTC +18-+42



interpolirana mjerenja



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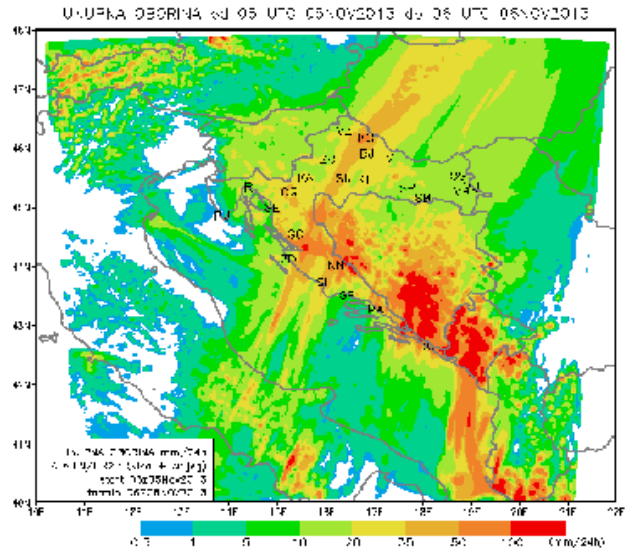

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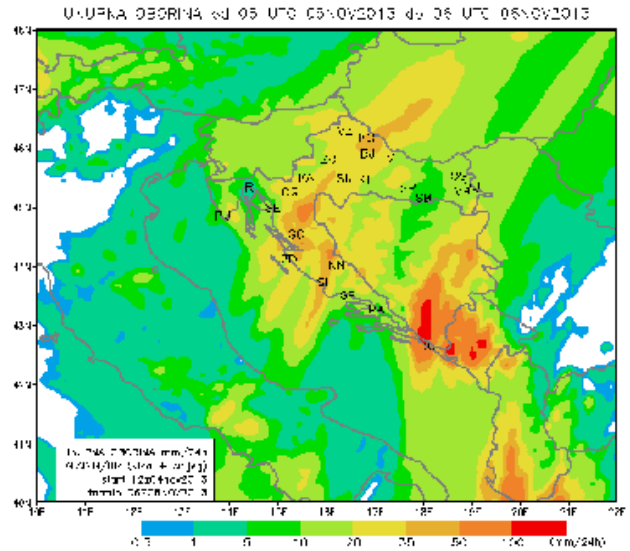
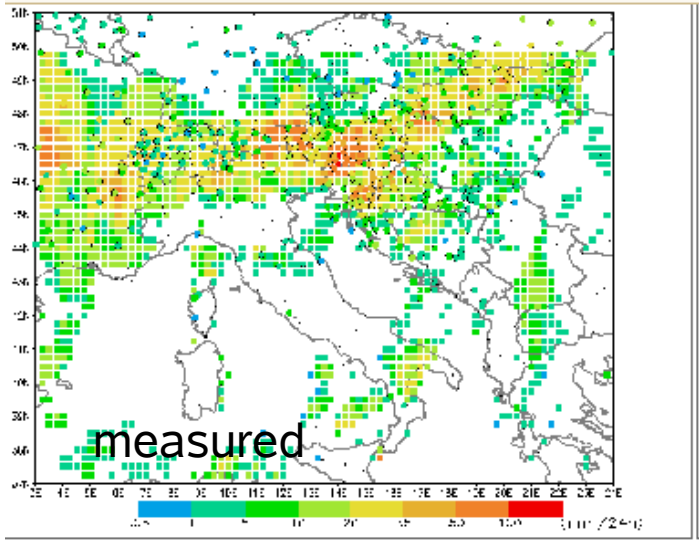
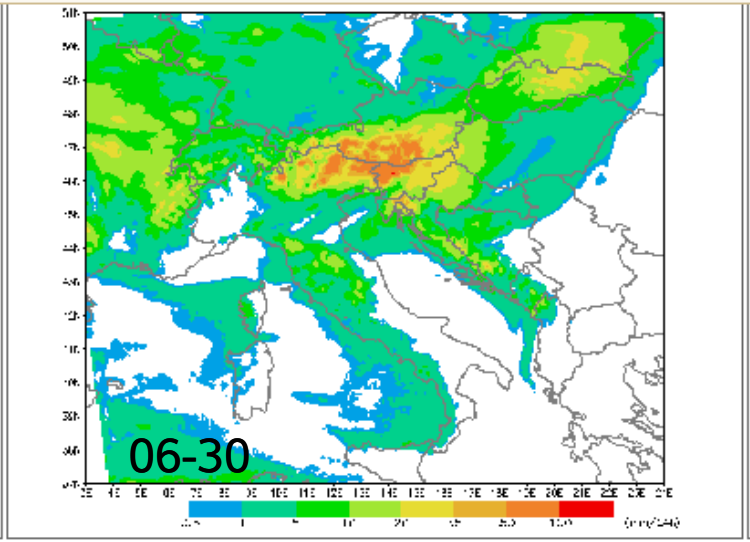
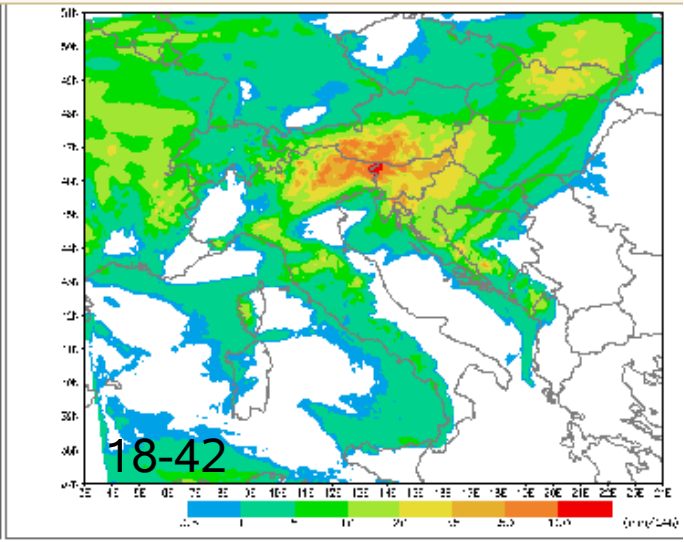
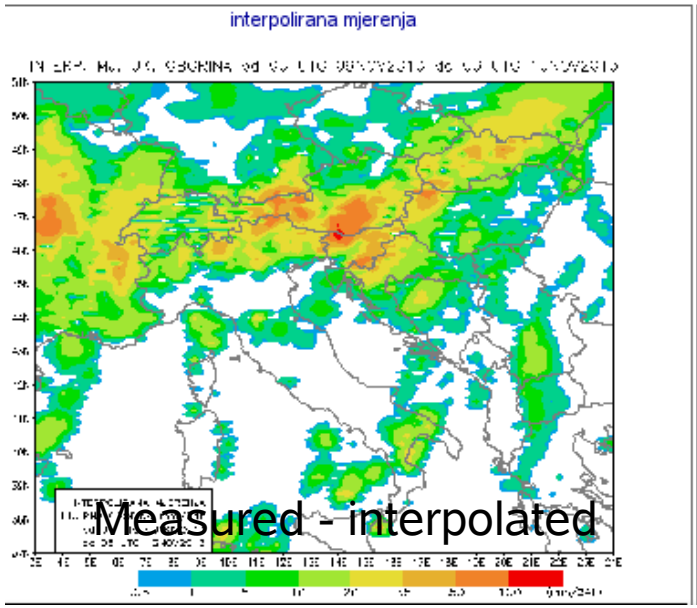


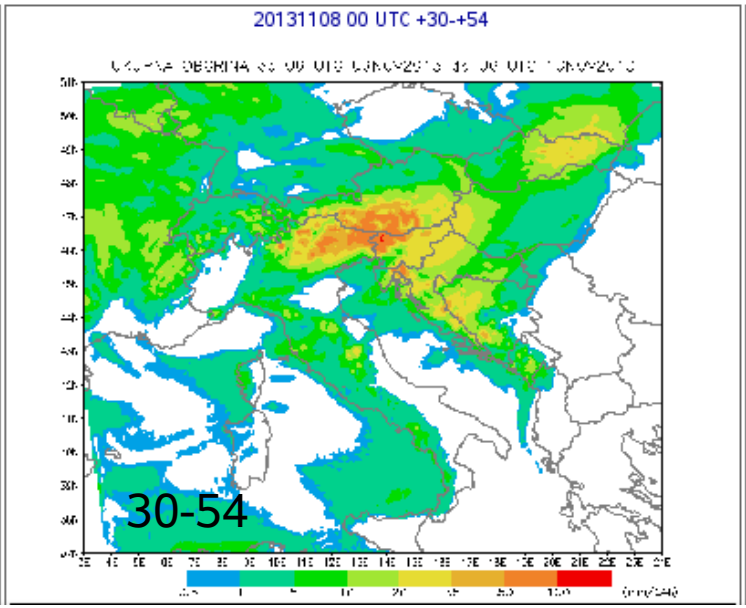
With TRMM data 09-10 Nov 2013

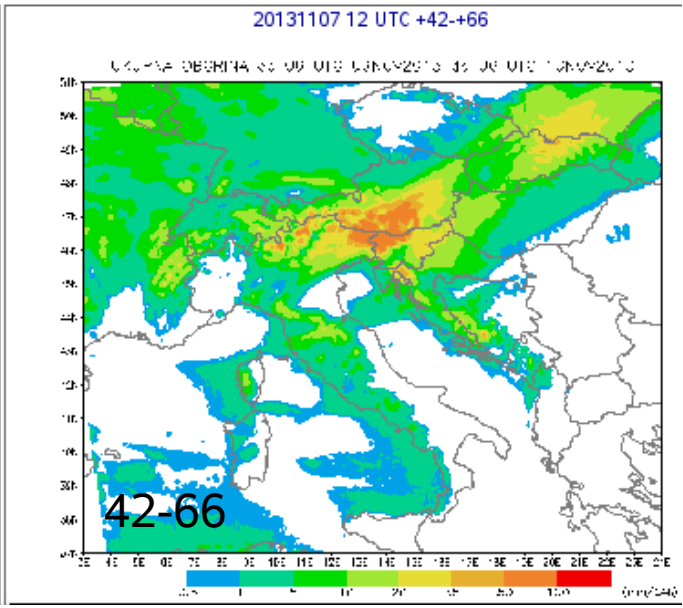




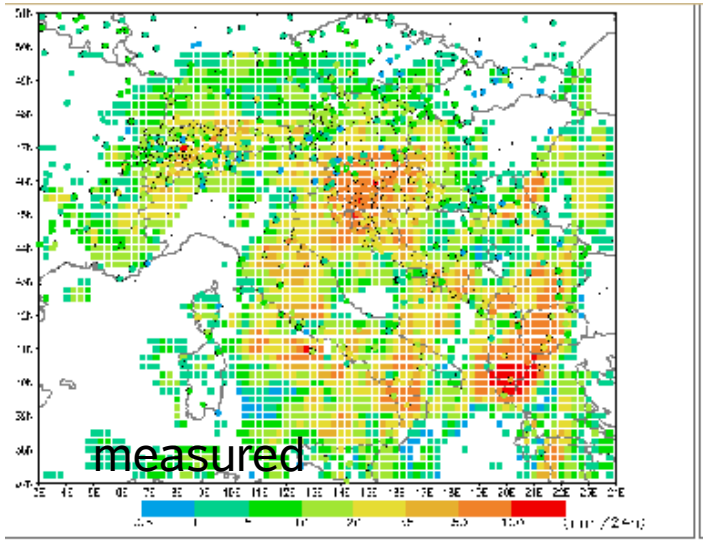


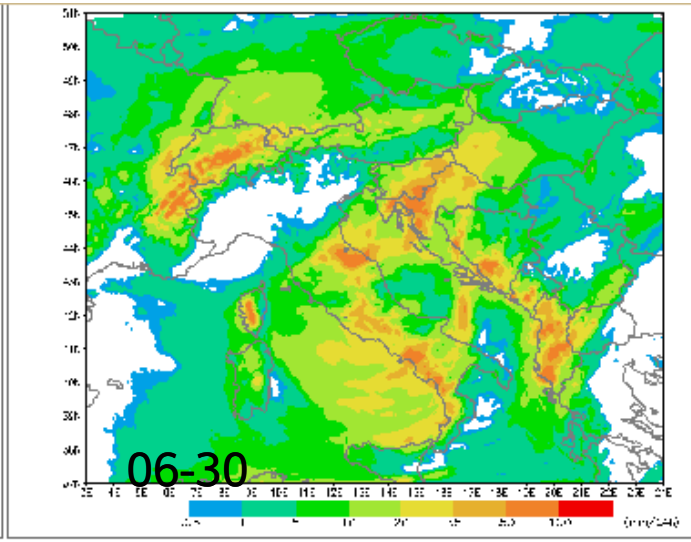


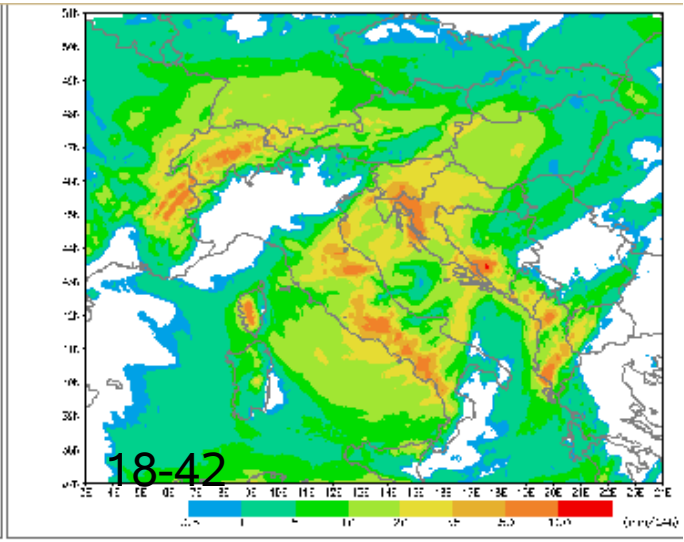


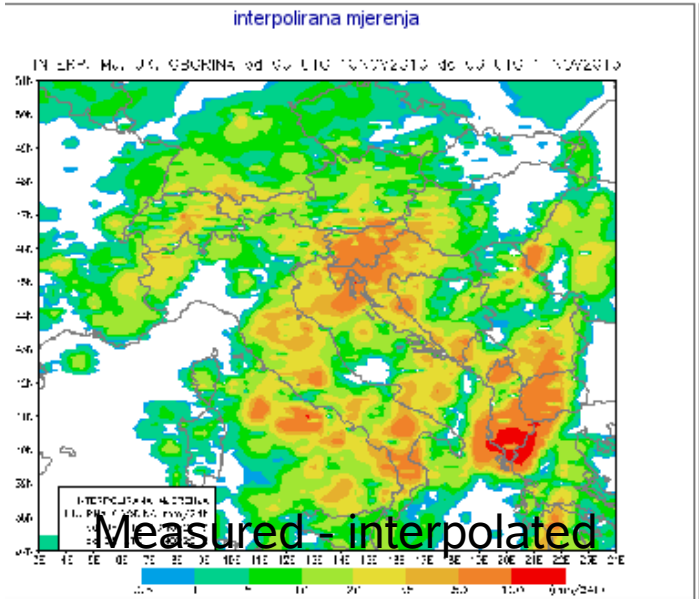


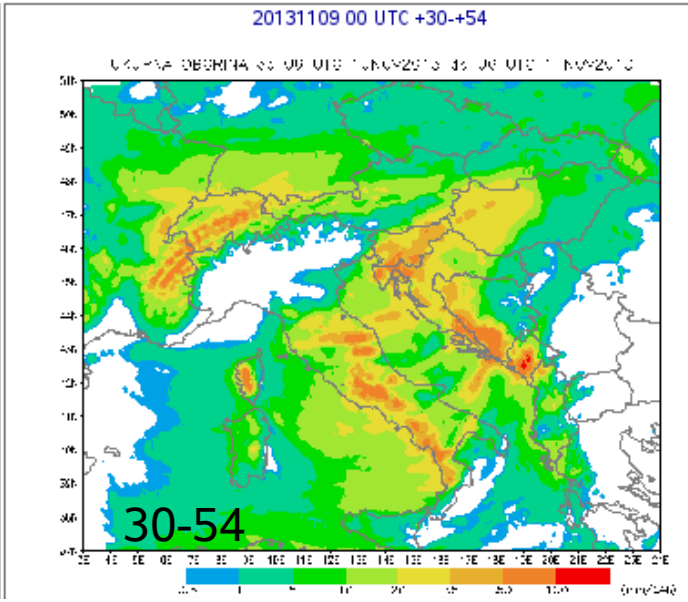
With TRMM data 10-11 Nov 2013

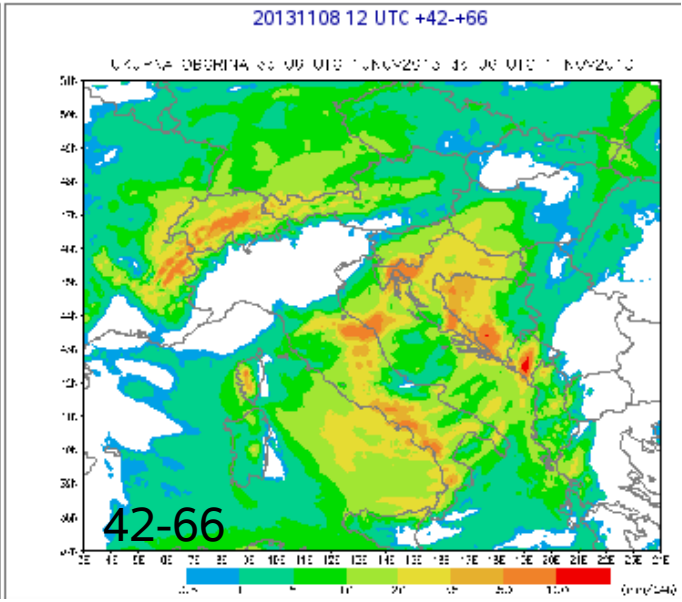




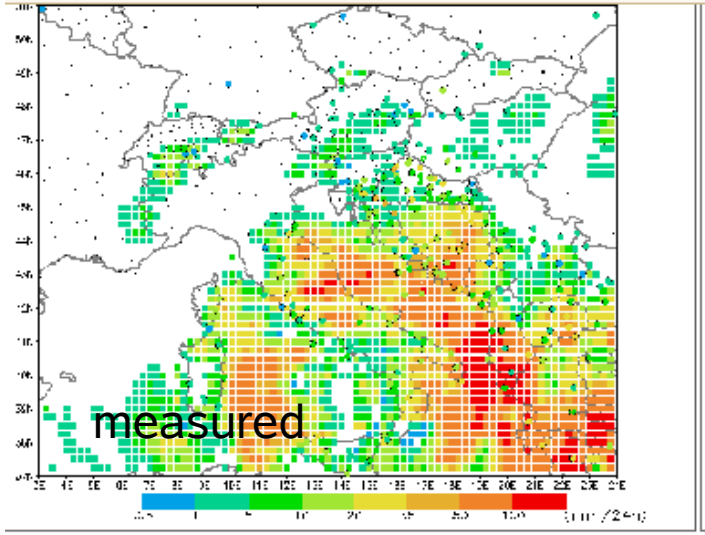


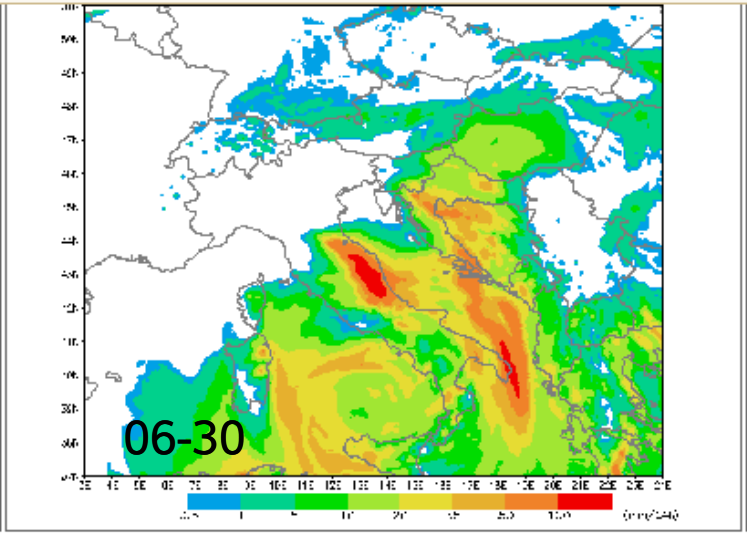


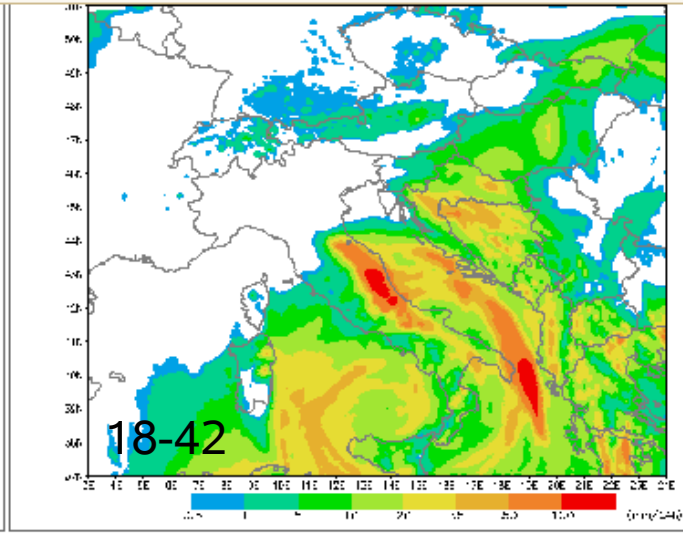


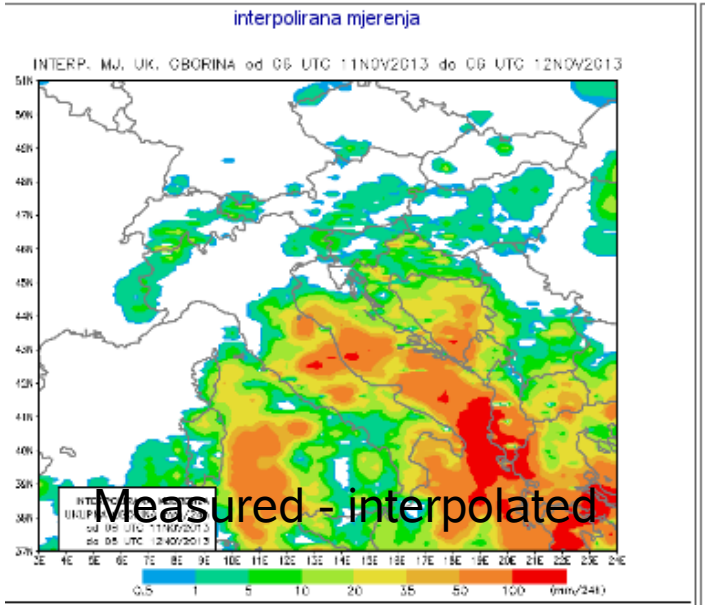


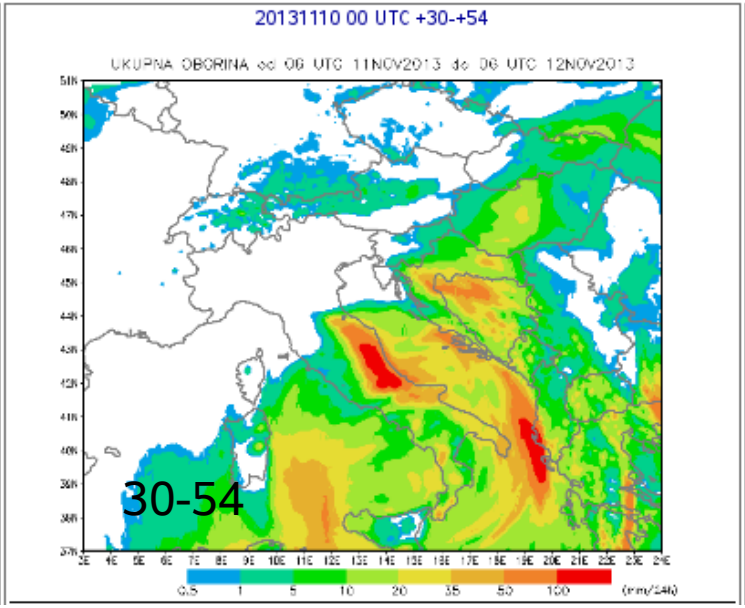
With TRMM data 11-12 Nov 2013

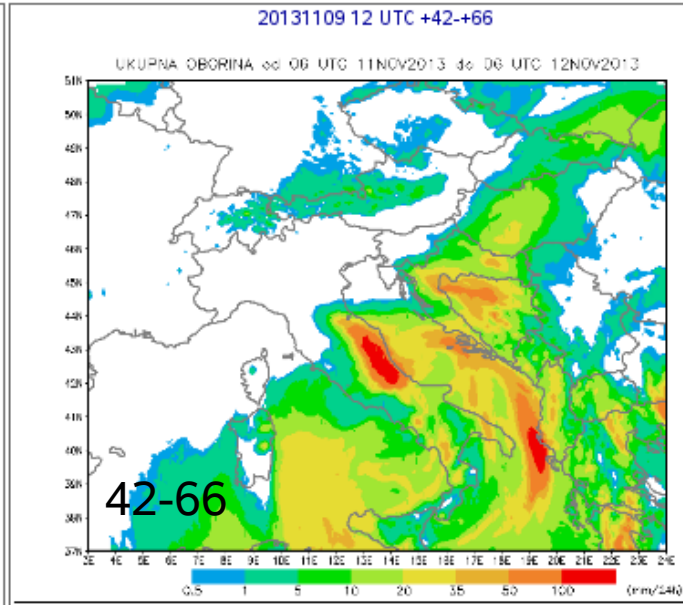




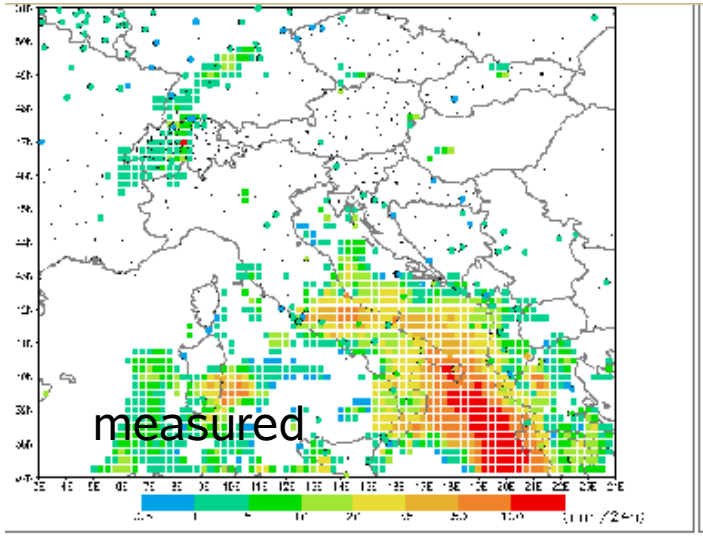


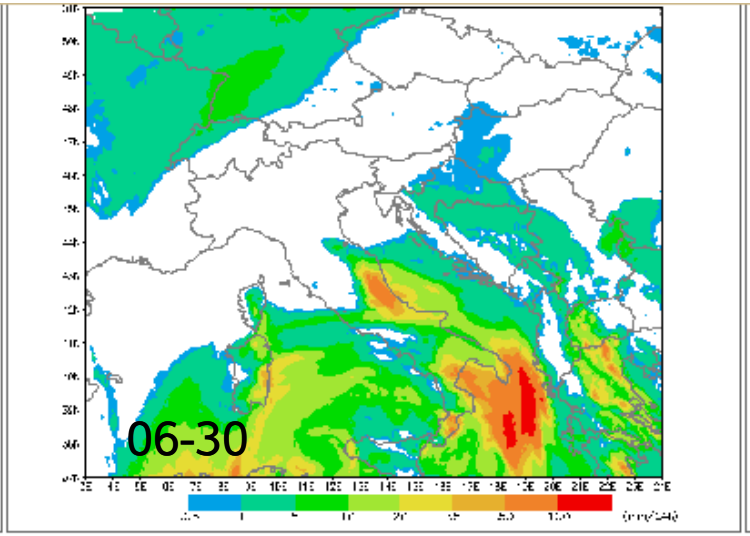


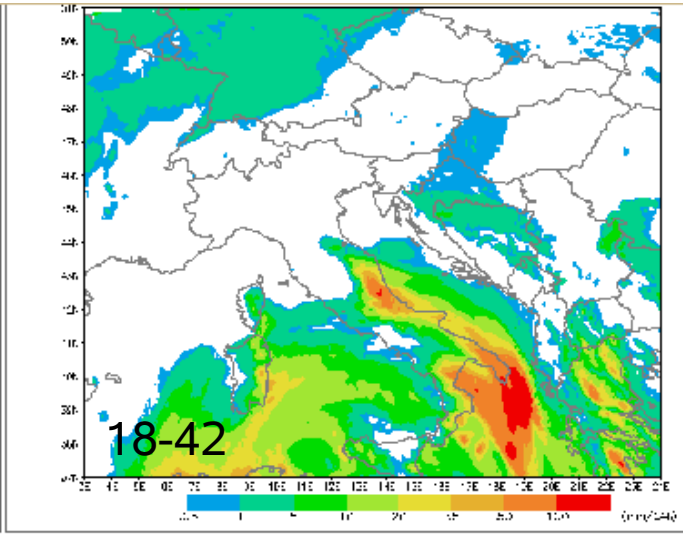


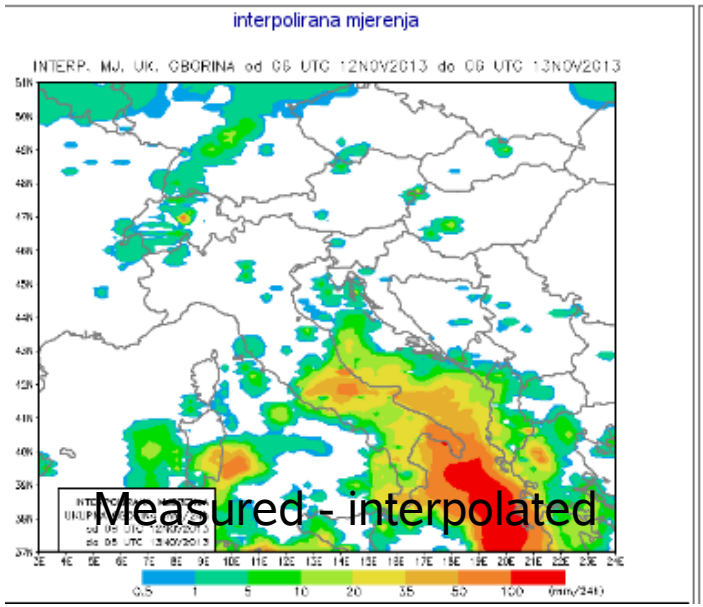


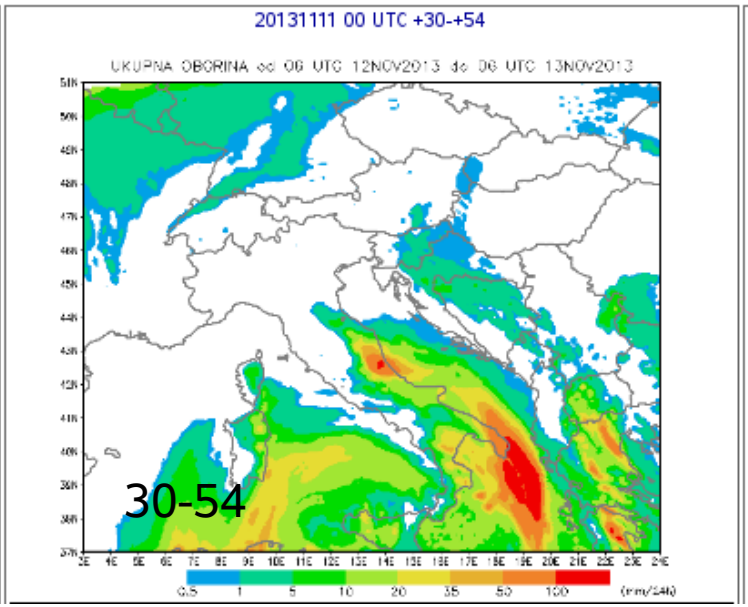
With TRMM data 12-13 Nov 2013

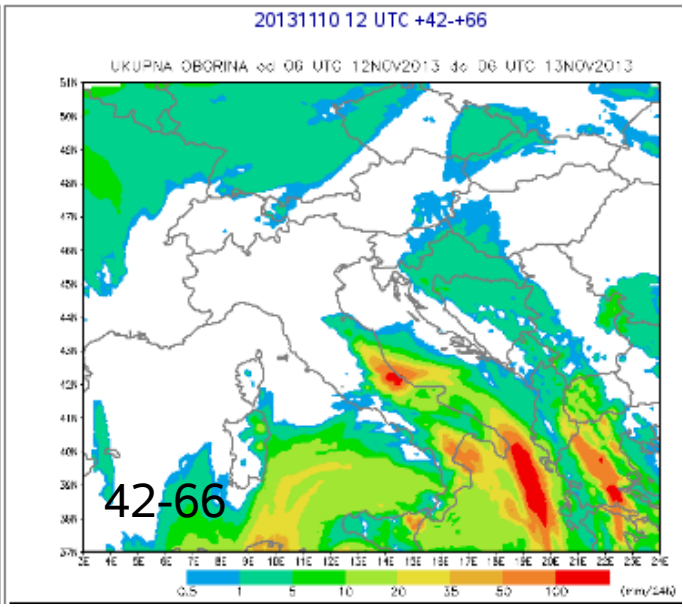




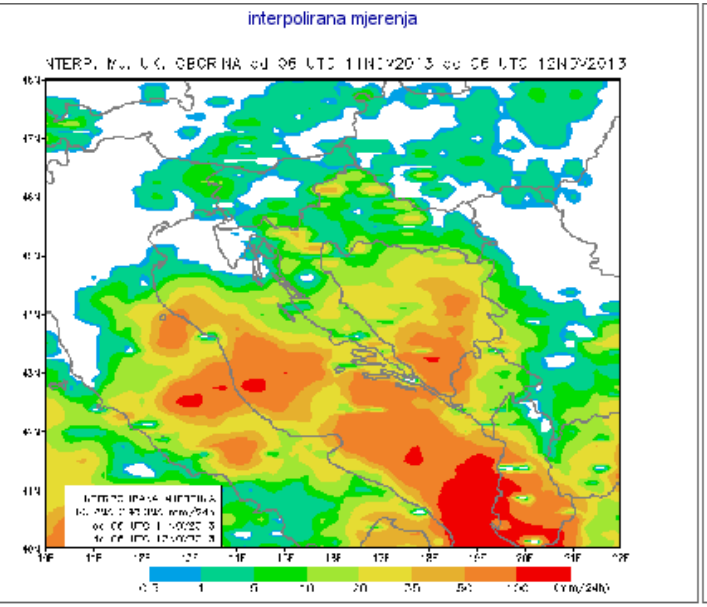


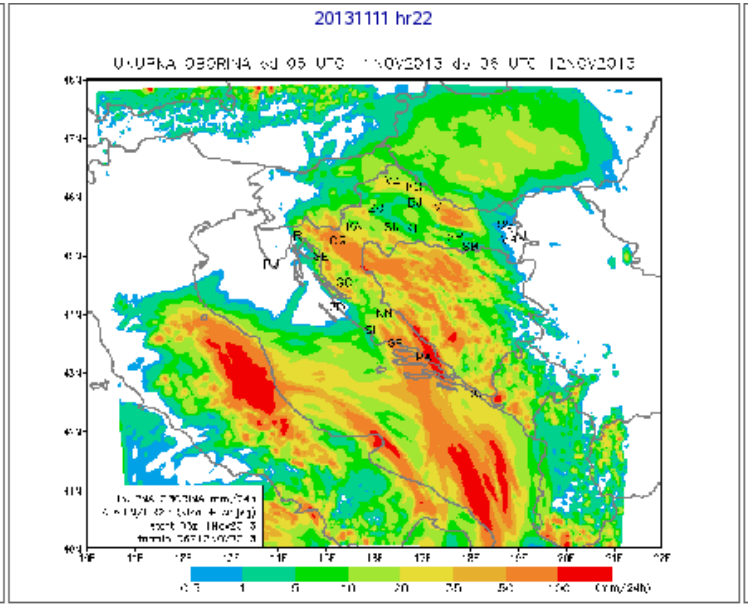


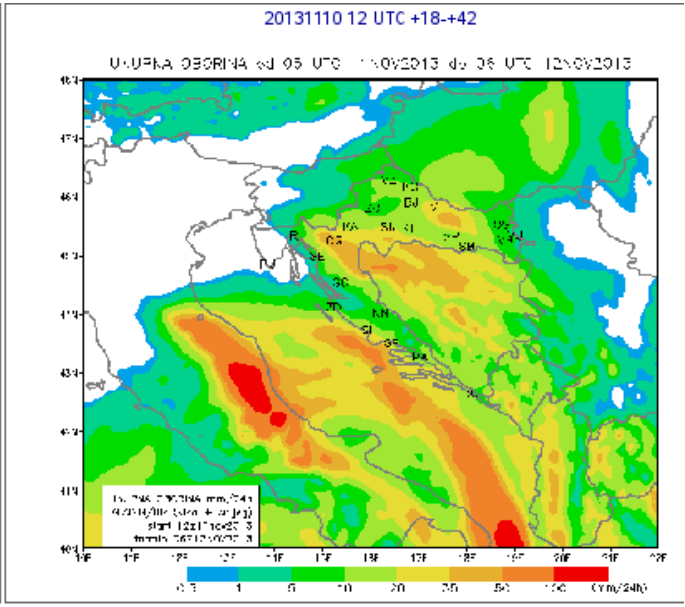




The 2 km run 11-12 Nov 2013

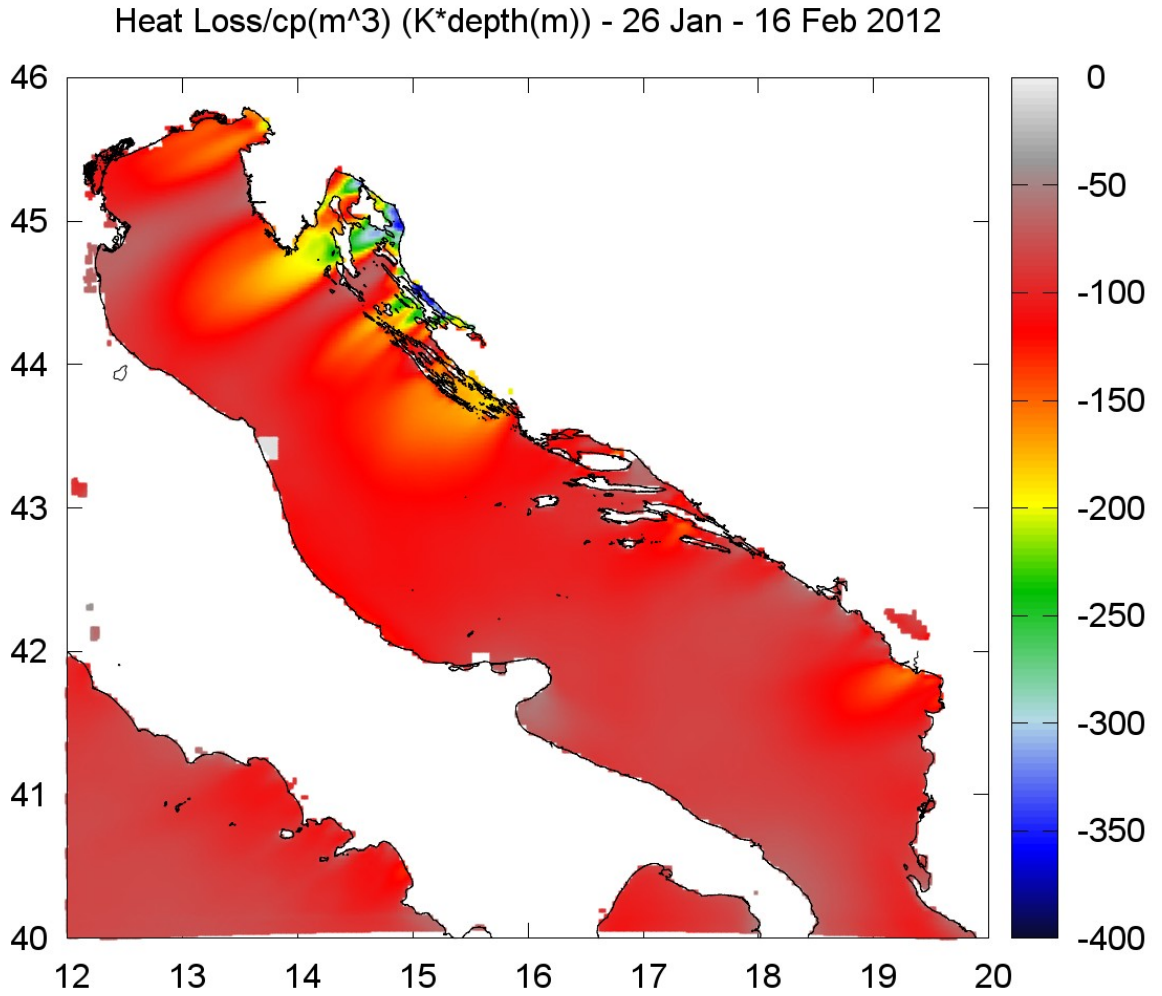




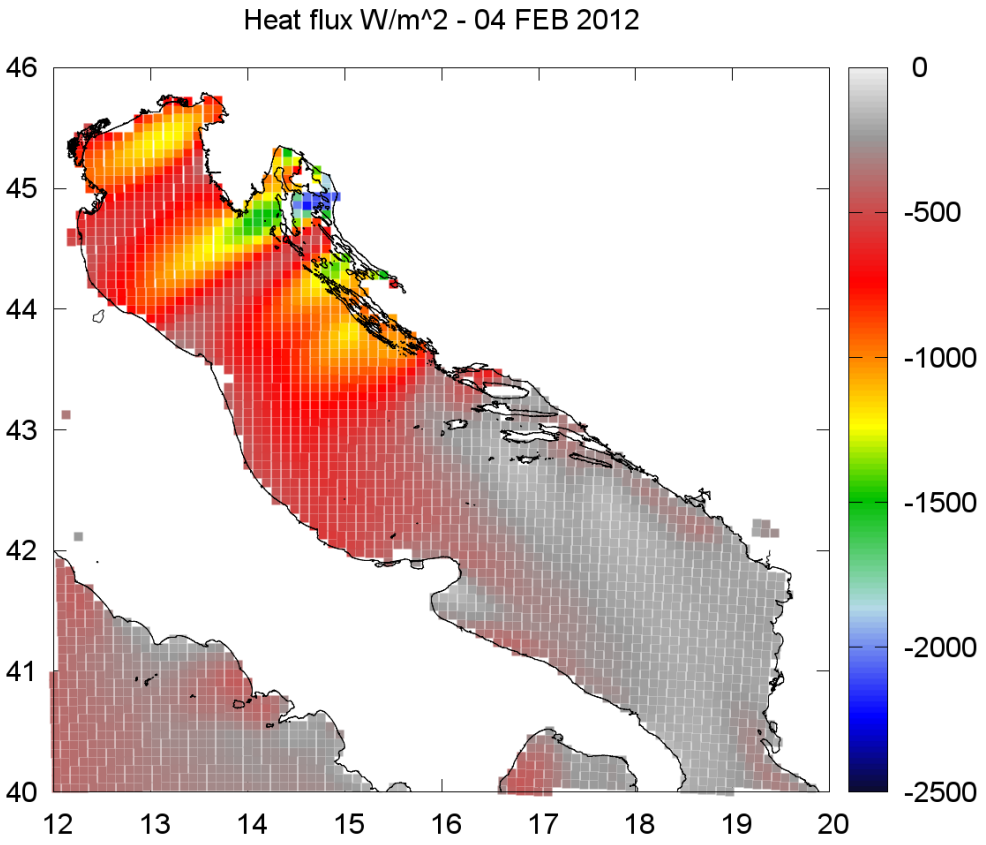


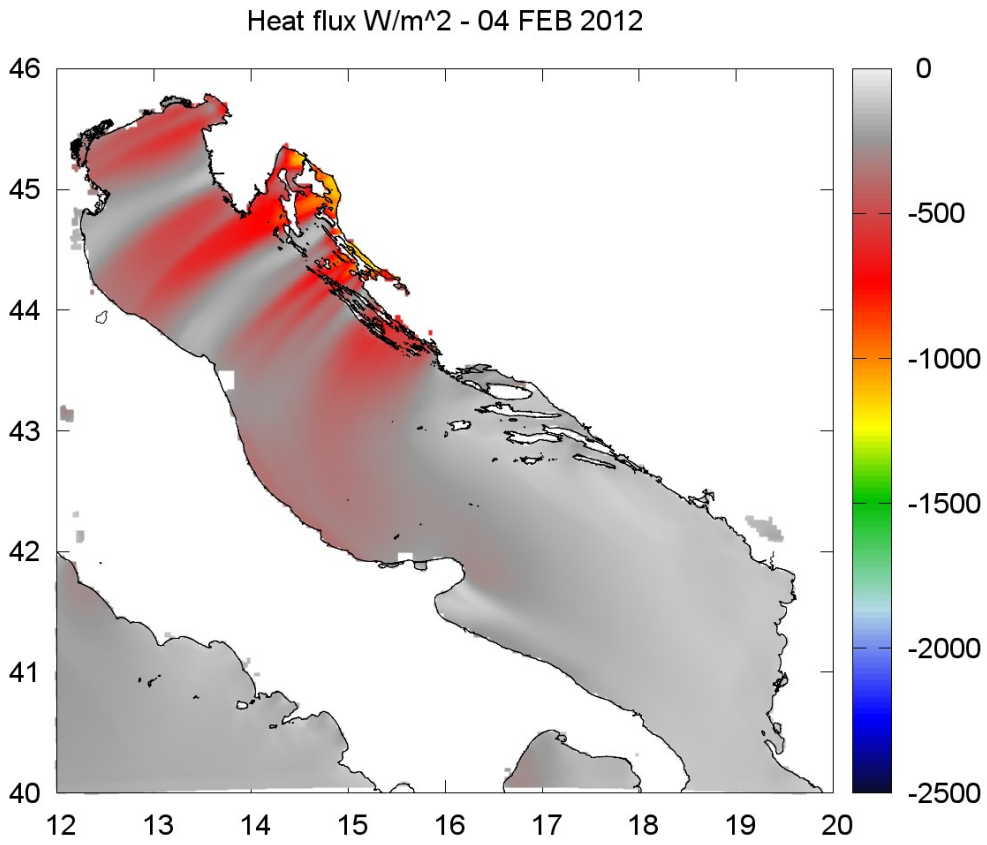
Surface fluxes above the sea

Heat fluxes accumulated during 3 weeks from 2 km resolution NH run. The 3 weeks were characterized by continuous severe bura wind, heavy snow on the seaside and extremely cold conditions.



In 8 and 2 km resolutions

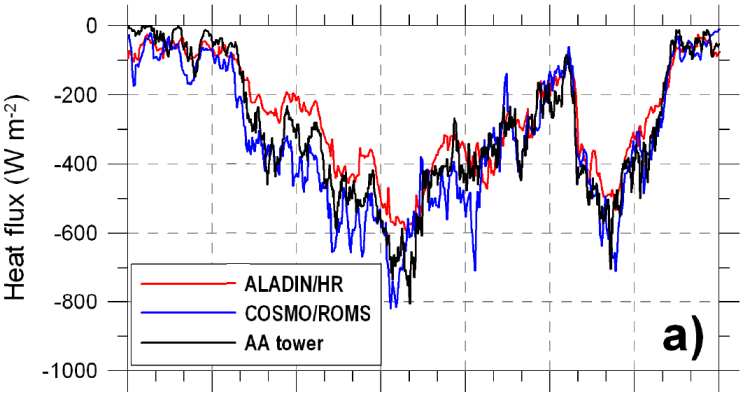


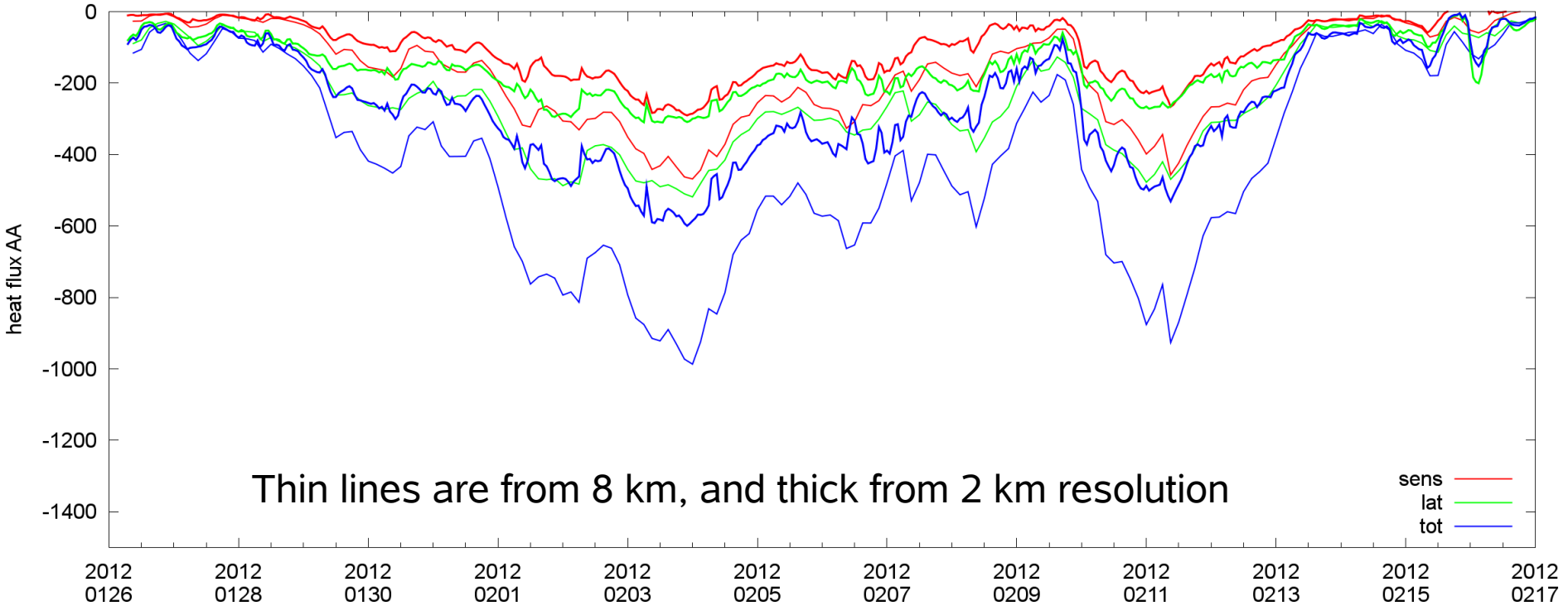


Heat fluxes from 8 km model are stronger than from the 2 km. Can we interpret the difference as part of the turbulence that is resolved in higher resolution?

2 km is closer to reality

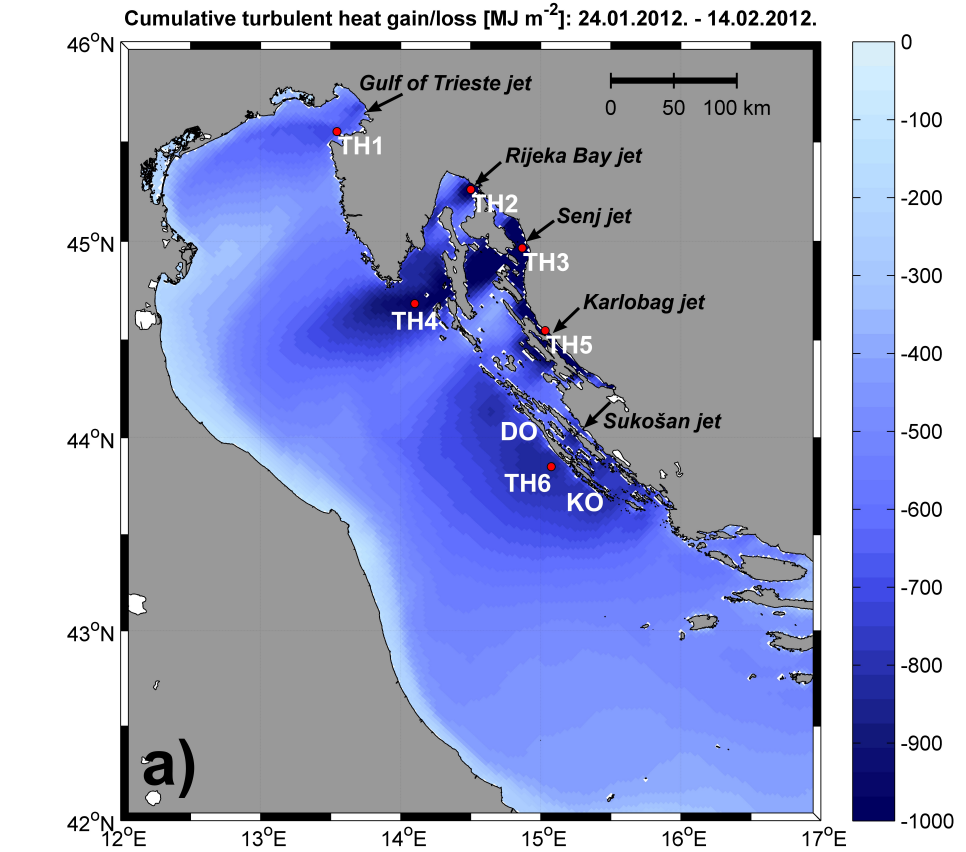
Fluxes from 2 km run are compared to the measurements on the Aqua Alta tower (published in Ocean Science) and with 8 km run (below).

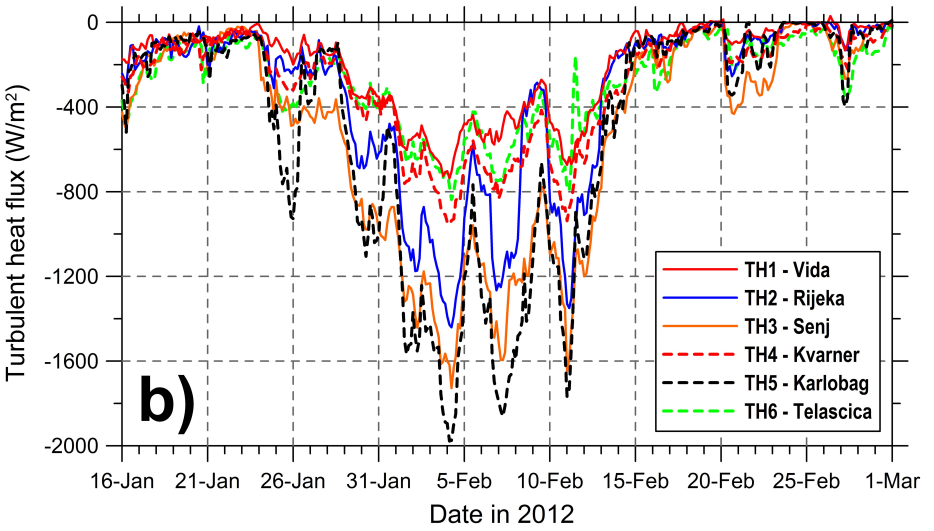




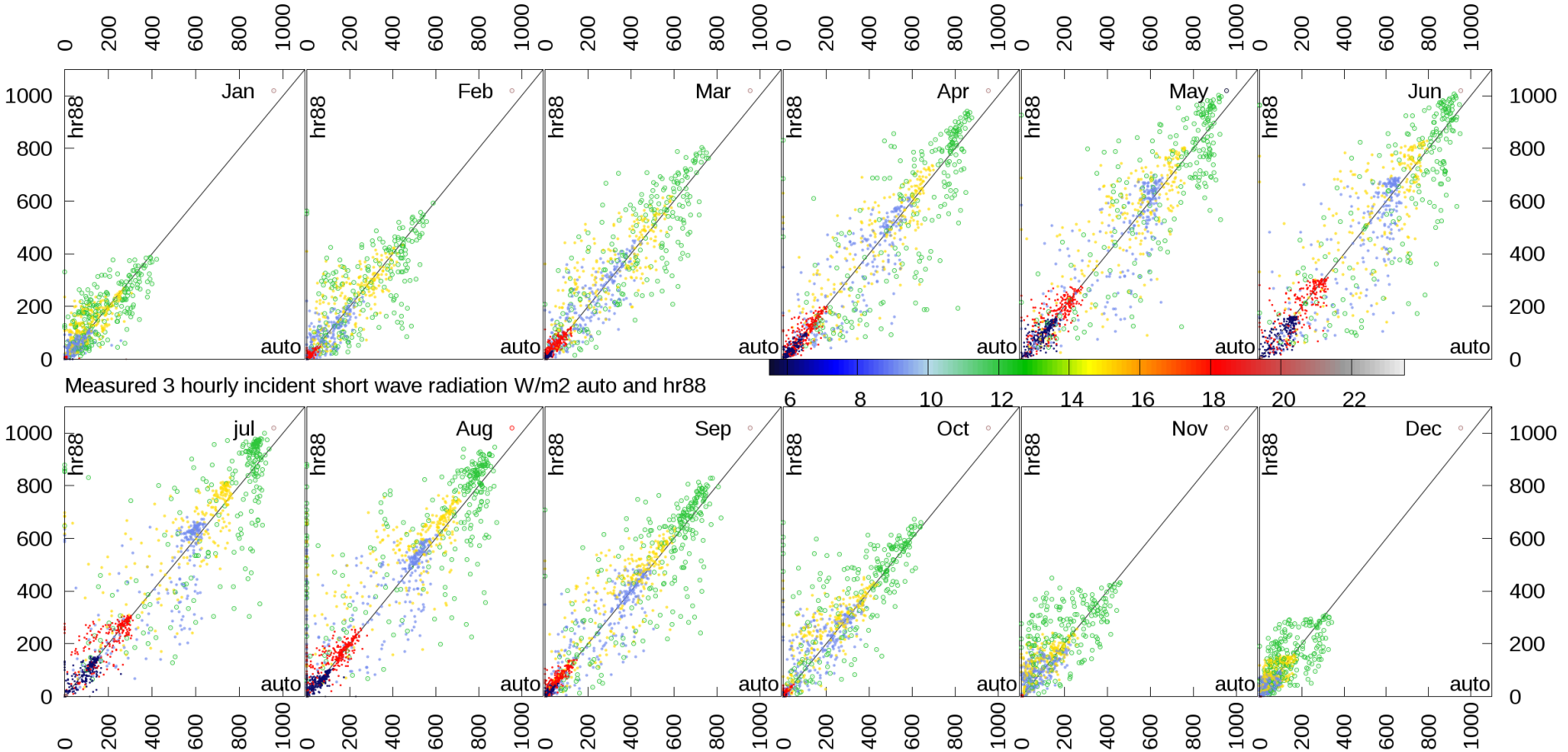
And agrees with ROMS

These are the heat fluxes computed by the ocean model run using wind from the 2 km run as a driver. (Published in JGR Oceans)



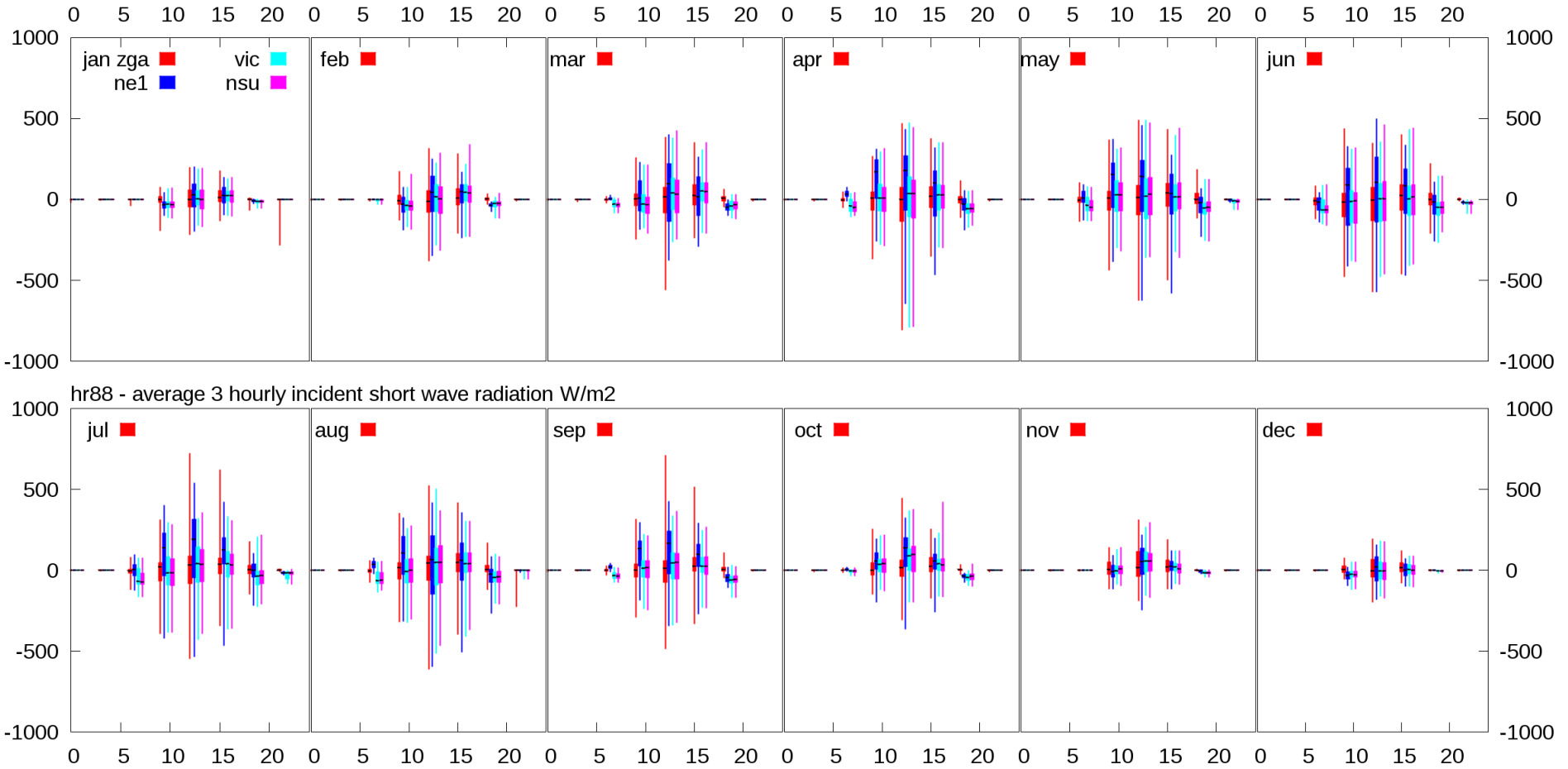


Radiation from 8 km



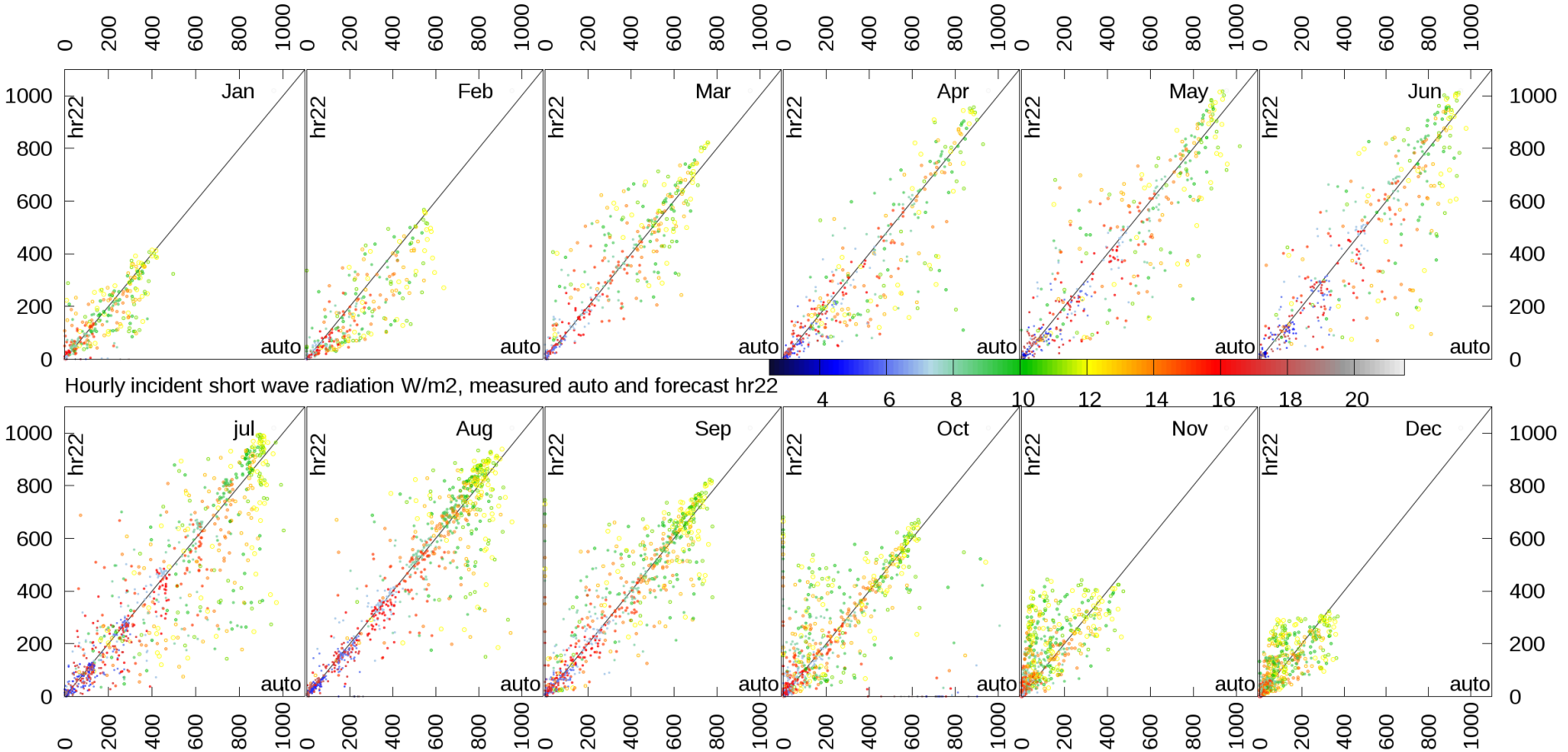
Scatter plots of most recent model forecast 3 hourly average incident short-wave radiation (W/m2) and measurements on automatic station in Zagreb Maksimir for various months in a year. The data are for the period from 1st August 2005 until 30th September 2012. The color scale represents hours in the day.

Radiation forecast compared to different datasets



The diurnal cycle of the error computed as the difference in 3 hourly average short wave radiation from the ALADIN model (3-12 hour forecast) and measured on automatic station for various data (different colors, red from automatic station) and months of the year (different panels).

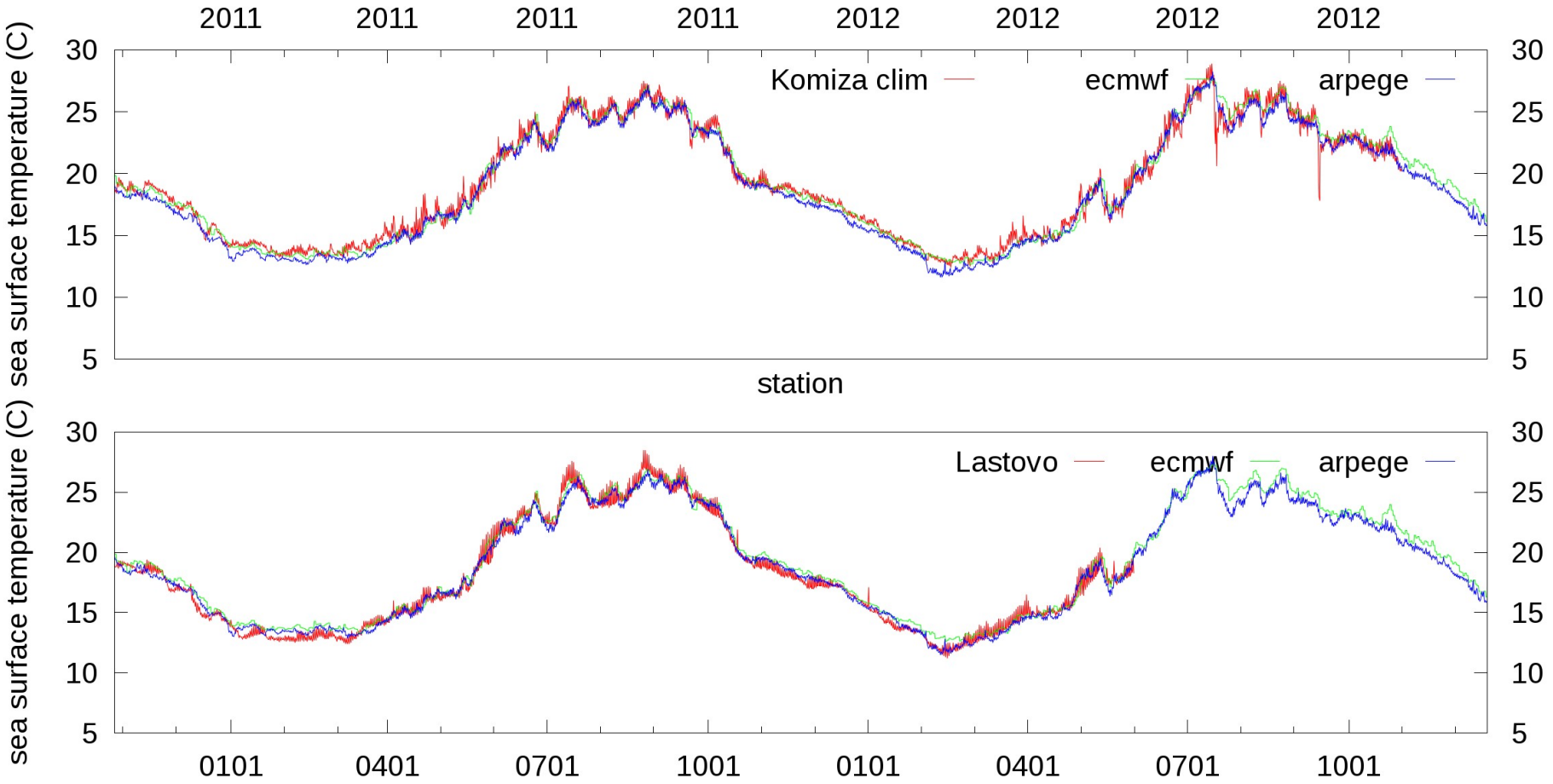
And in 2 km resolution



Hourly incident short-wave radiation (W/m2) as computed from the operational forecast model ALADIN in 2 km resolution (hr22) for Zagreb area and measured on automatic station (auto) for the period from 1st July 2011 until 9th January 2013. The color scale represents hours in the day.

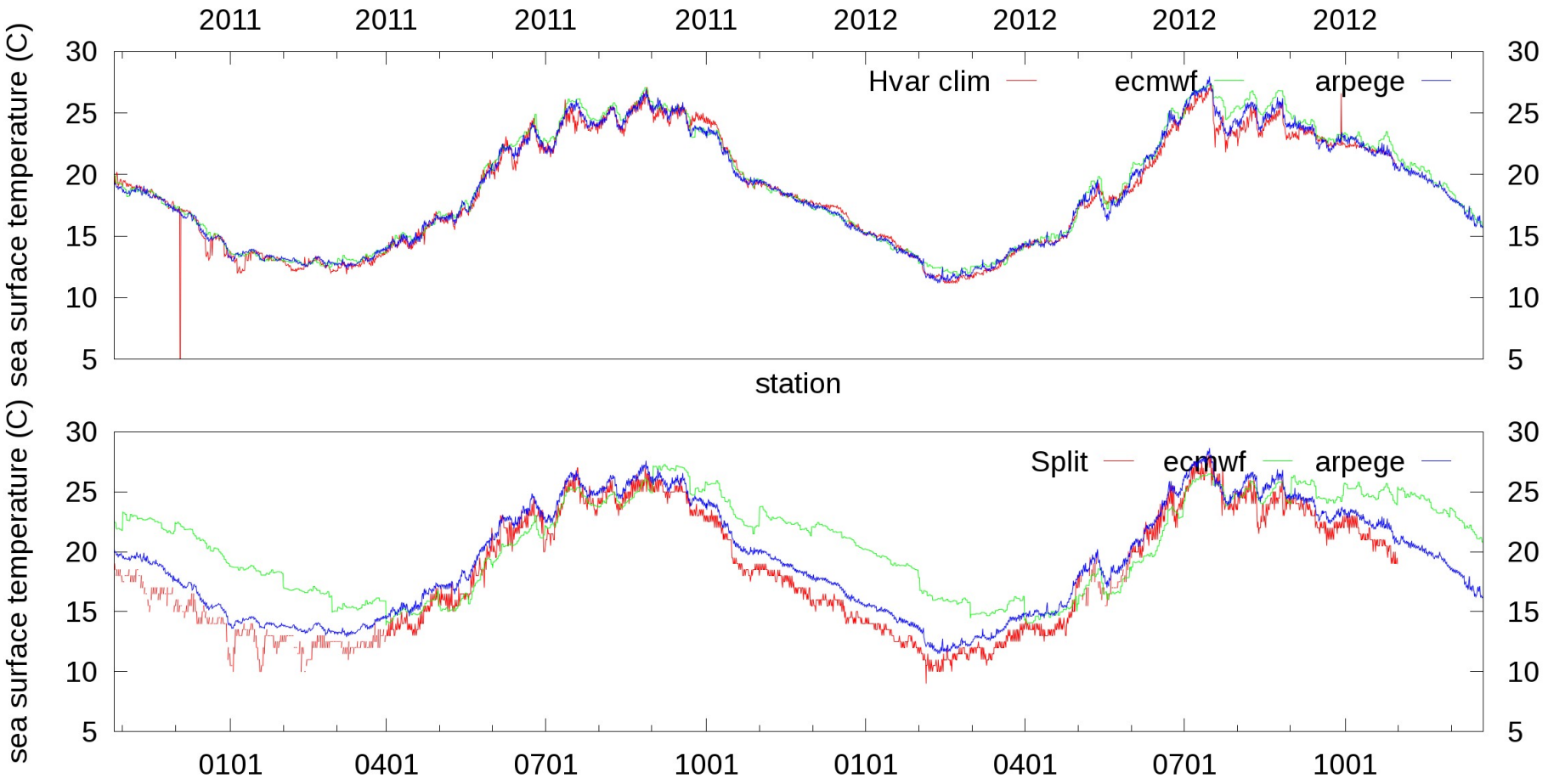
Some SST issues

How much can we improve the forecast with physics if the surface is wrong?

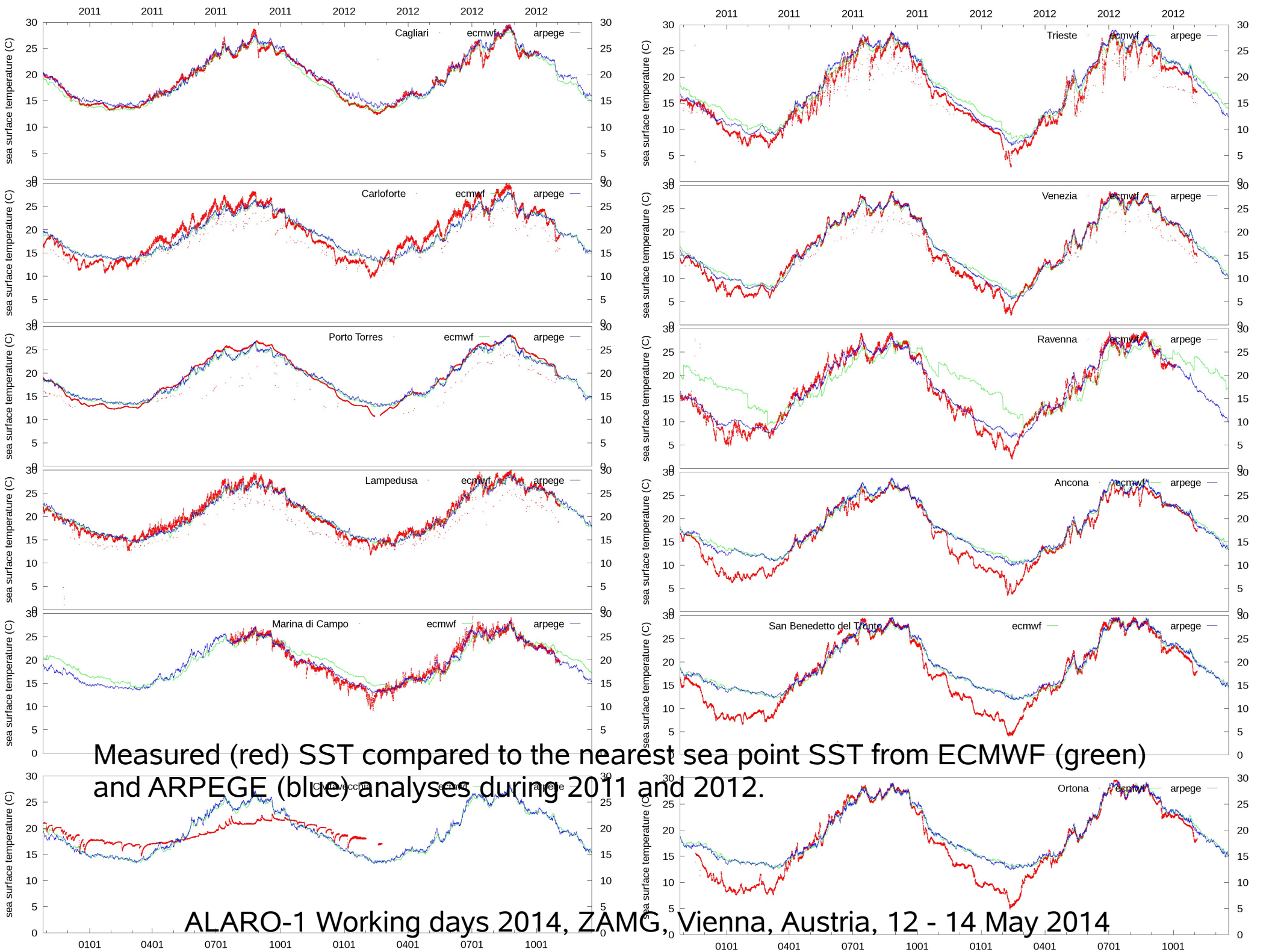


Measured (red) SST compared to the nearest sea point SST from ECMWF (green) and ARPEGE (blue) analyses during 2011 and 2012.

SST can be far from reality



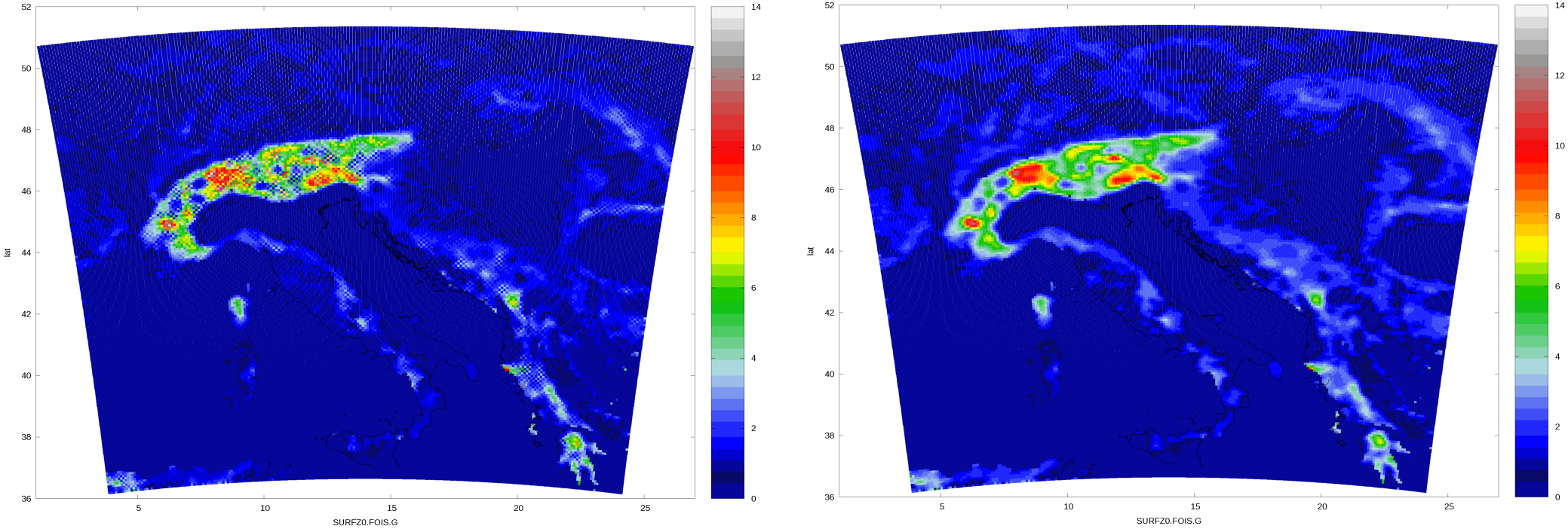
Measured (red) SST compared to the nearest sea point SST from ECMWF (green) and ARPEGE (blue) analyses during 2011 and 2012.



Measured (red) SST compared to the nearest sea point SST from ECMWF (green) and ARPEGE (blue) analyses during 2011 and 2012.

Fields in “clim” files

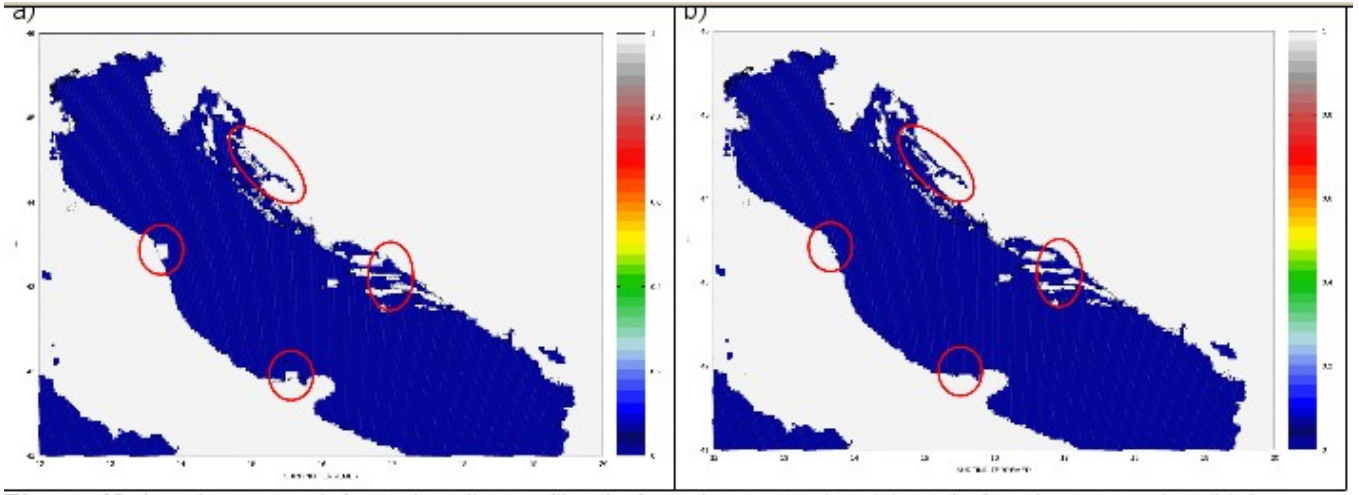
How much can we improve the forecast with physics if the surface is wrong?



Roughness length – chessboard pattern over mountains – can be fixed with lots of smoothing

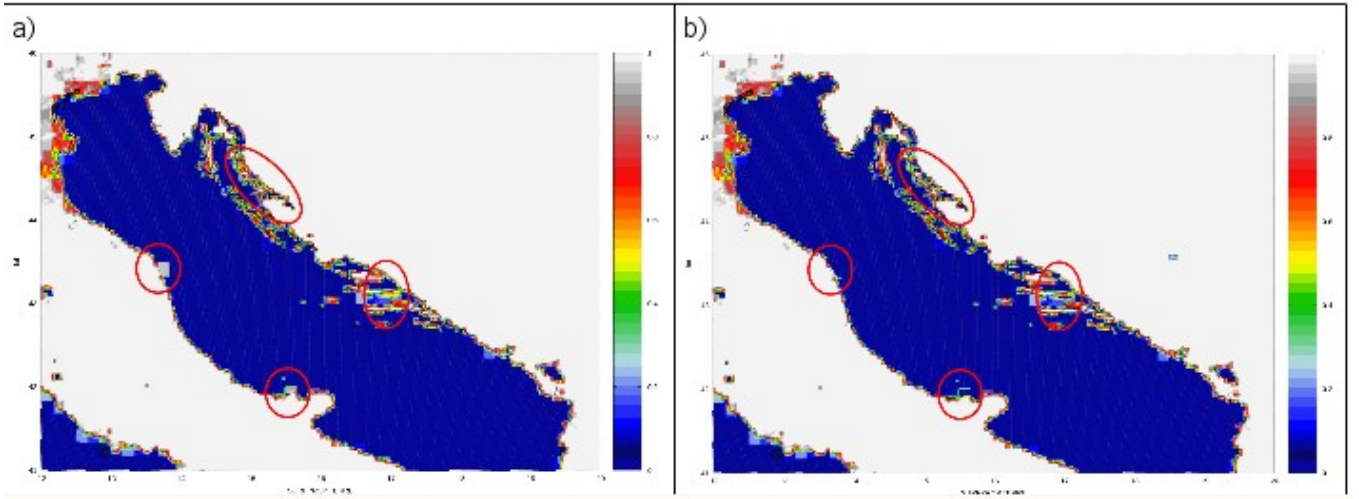
Land sea mask

False peninsulas



Land-sea mask

Figure 19. Land-sea mask from the climate files before the correction (a) and after the correction (b) for domain HR22 in 2 km resolution.



Percentage of land

Soil types

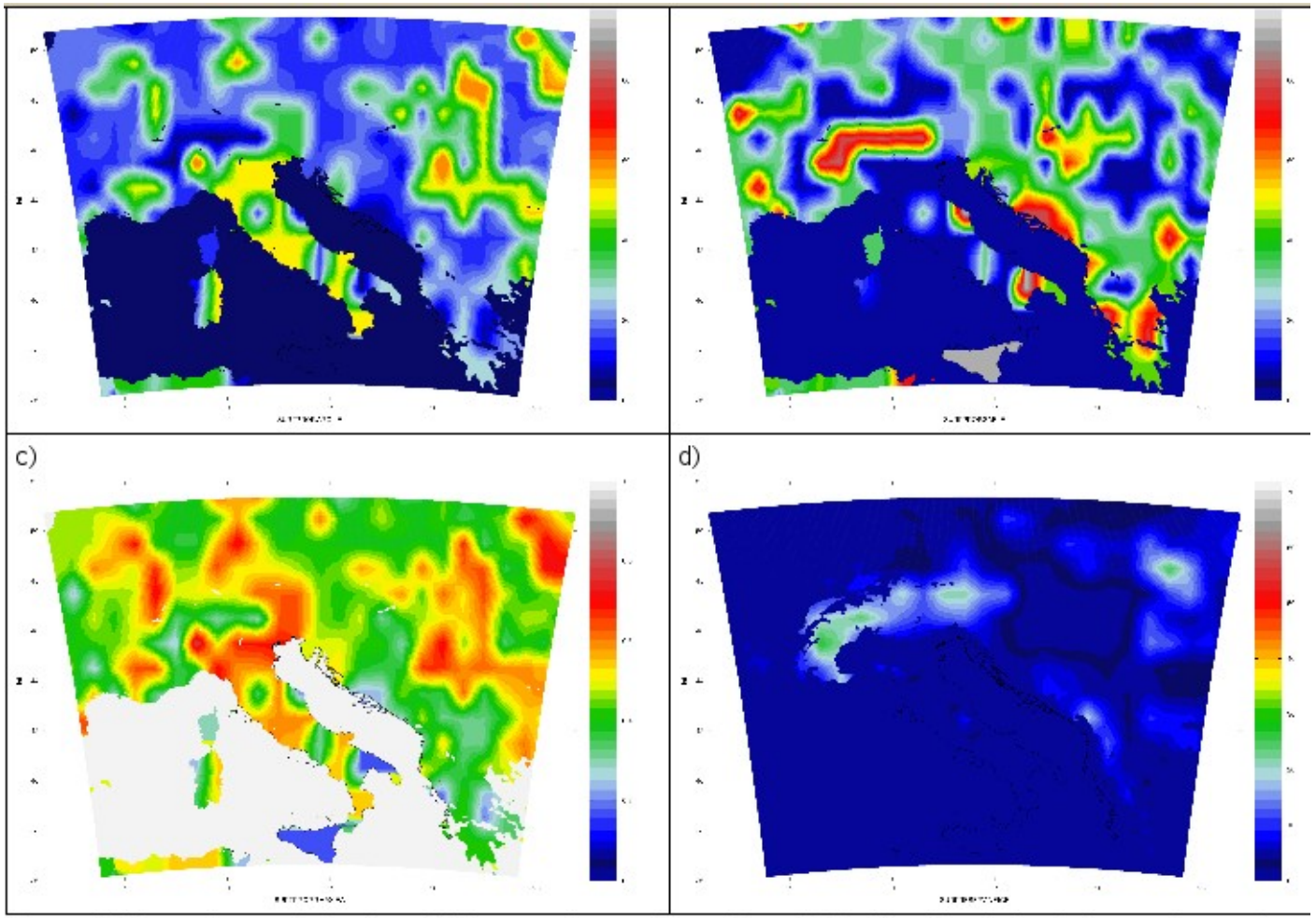


Figure 7. Percentage of clay in soil (a), percentage of sand in soil (b), climatological relative surface soil wetness (c) and snow depth (d) for the HR88 domain in 8 km resolution.

Albedo

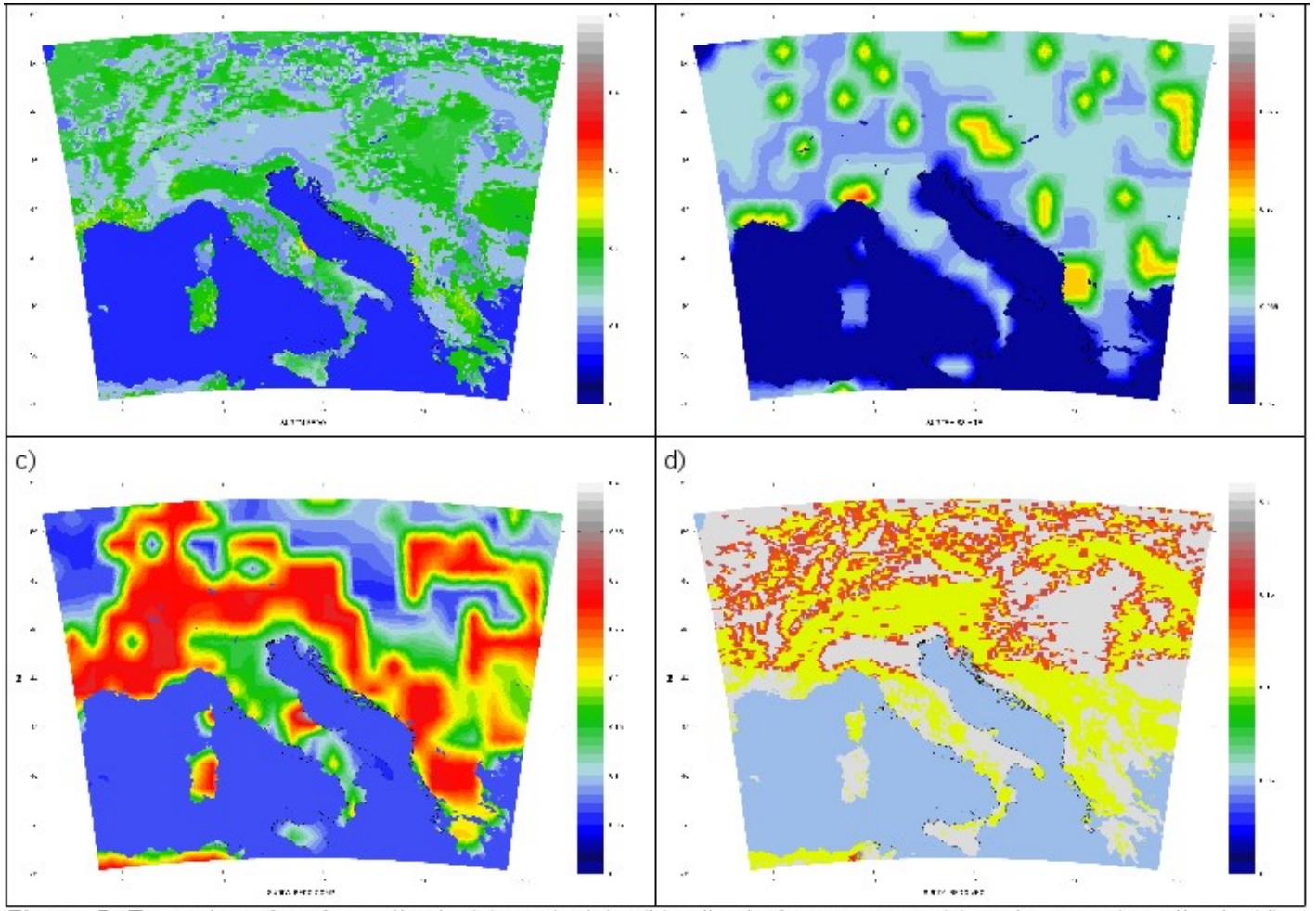
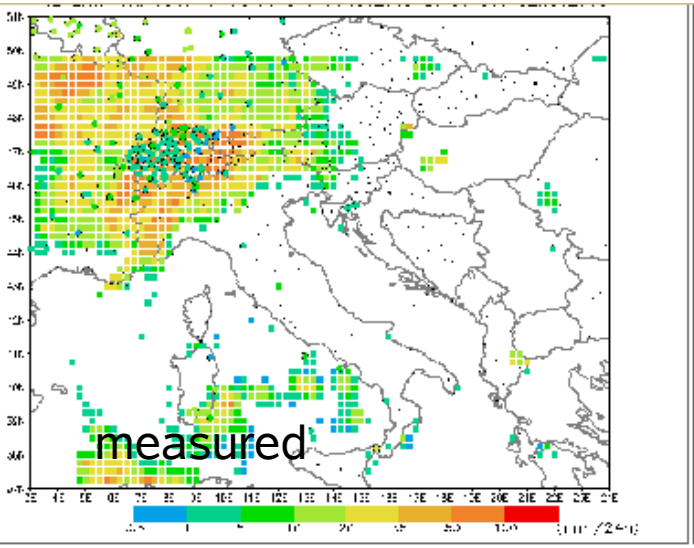


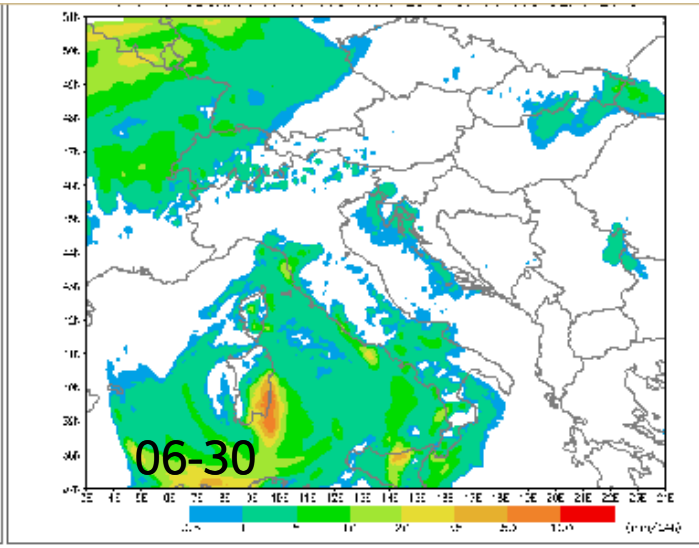
Figure 5. Examples of surface albedo (a), emissivity (b), albedo for non snow (c) and vegetation albedo (d) for the HR88 domain in 8 km resolution.

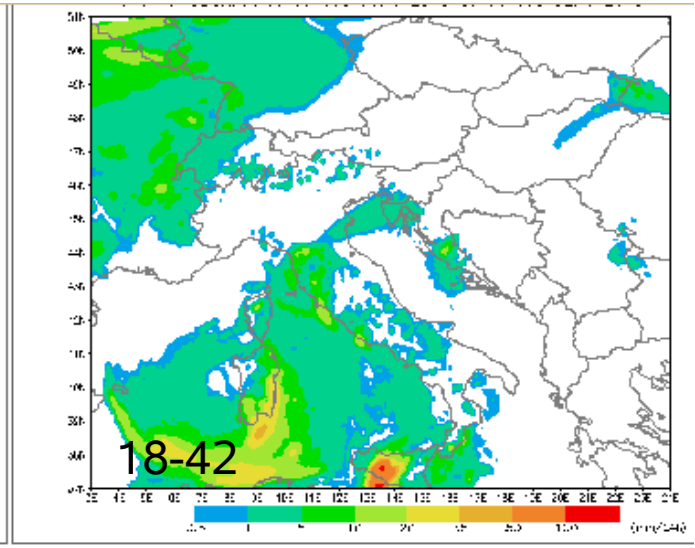
Plans

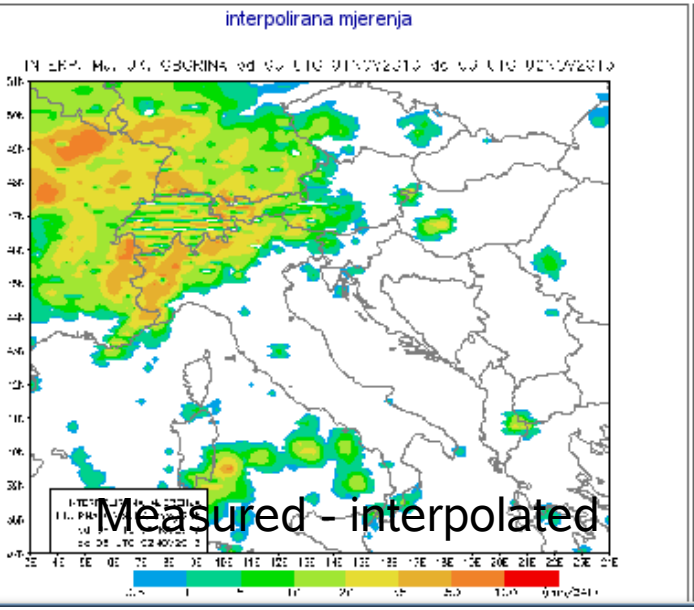
- From current AL32T3 to AL38T1 (8 km)
- From current 8 km 37 levels to 4 km resolution 73 levels (NH)
- From current 2 km and 15 levels dynamical adaptation of wind to 1 km and 20 levels (NH)
- Improve the roughness length and SST?
- Big jump, lots of tuning, B matrices etc.

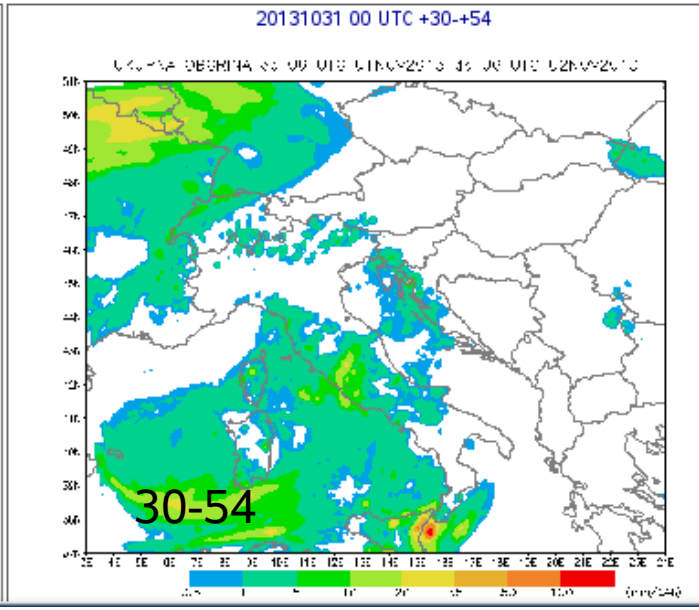
With TRMM data 01-02 Nov 2013

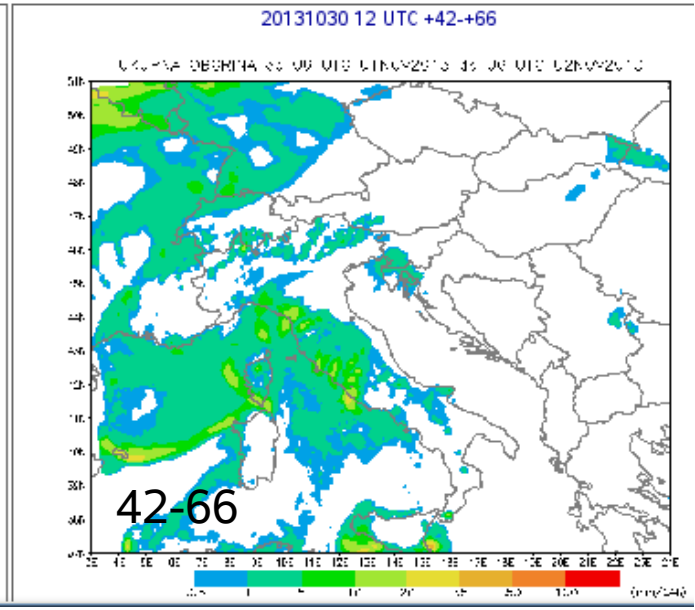




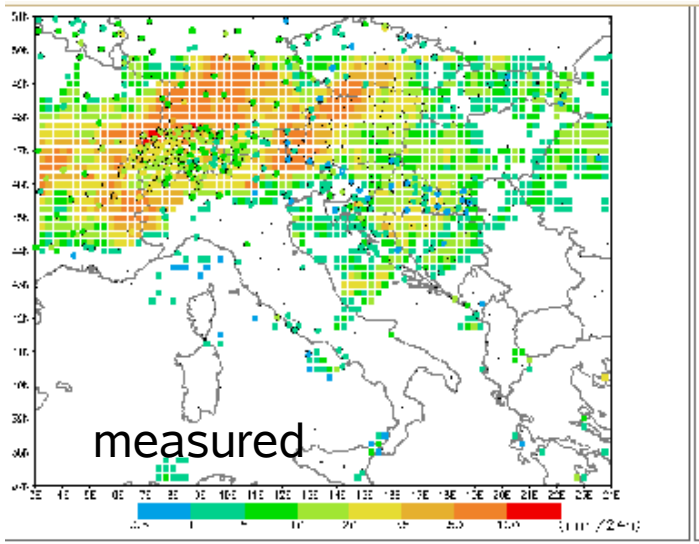


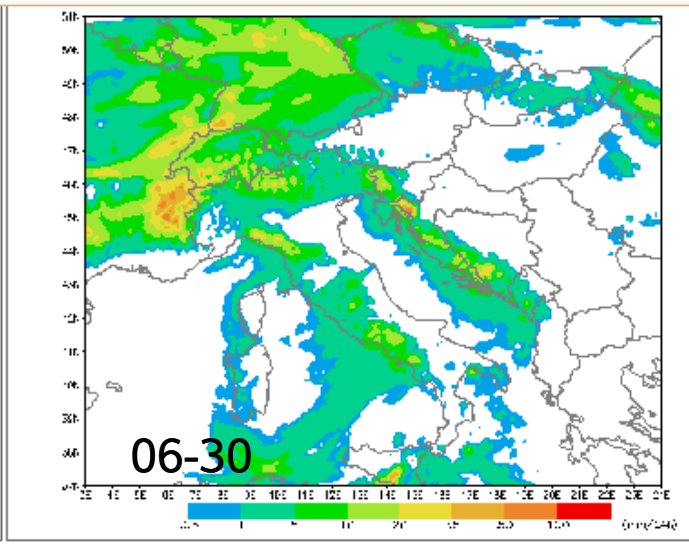


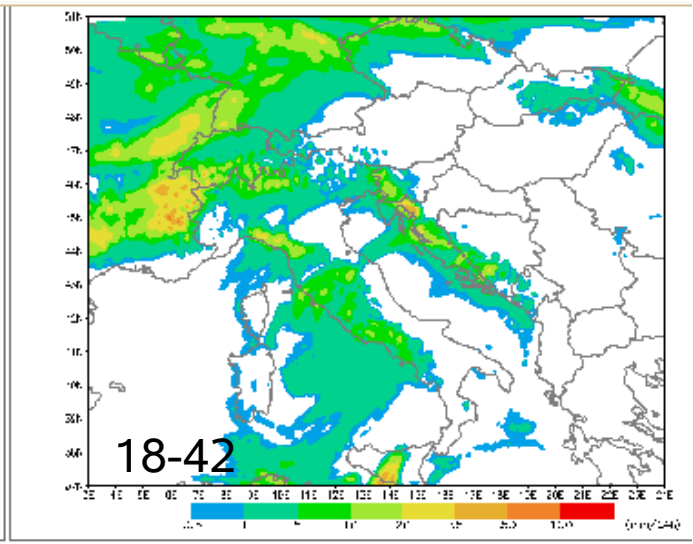


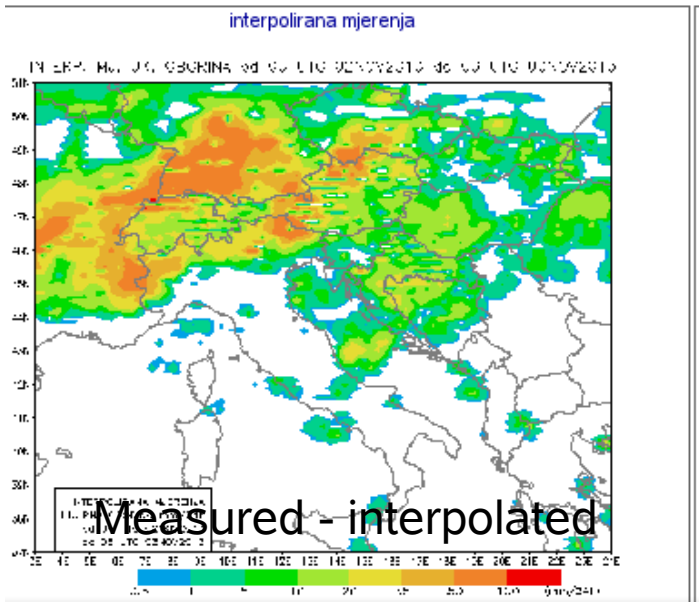


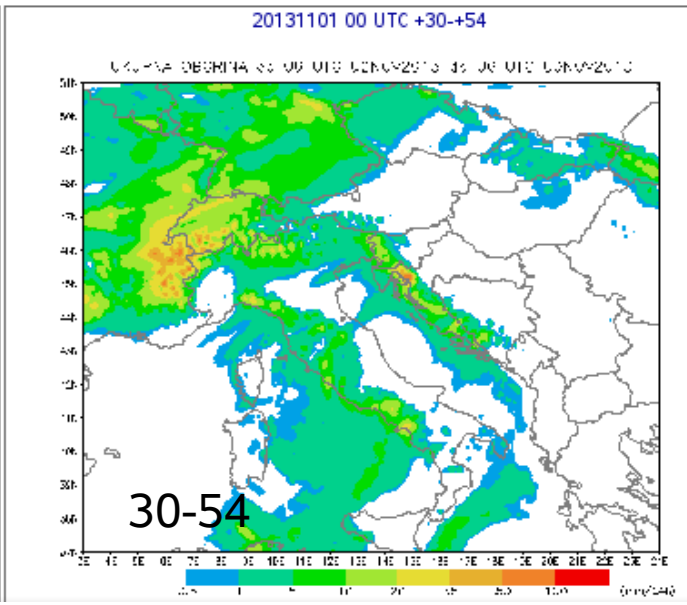
With TRMM data 02-03 Nov 2013

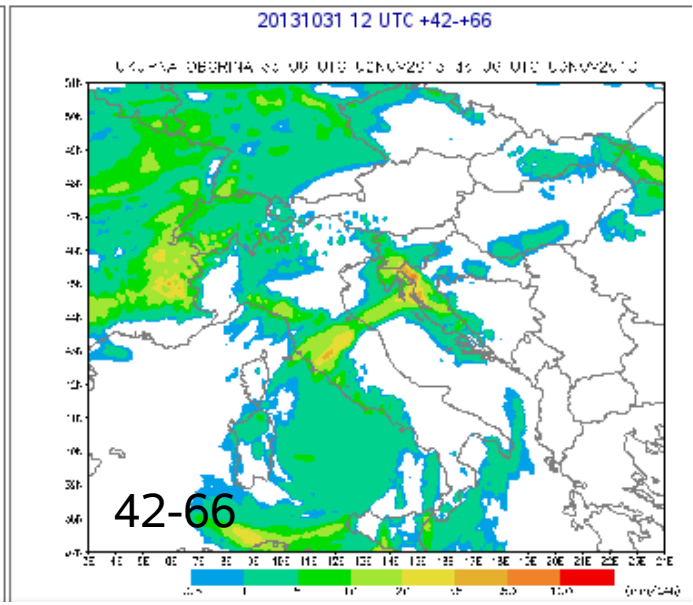




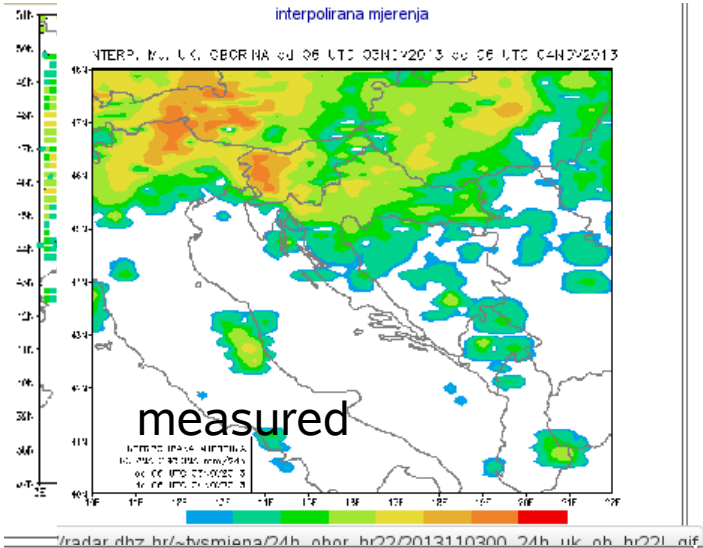


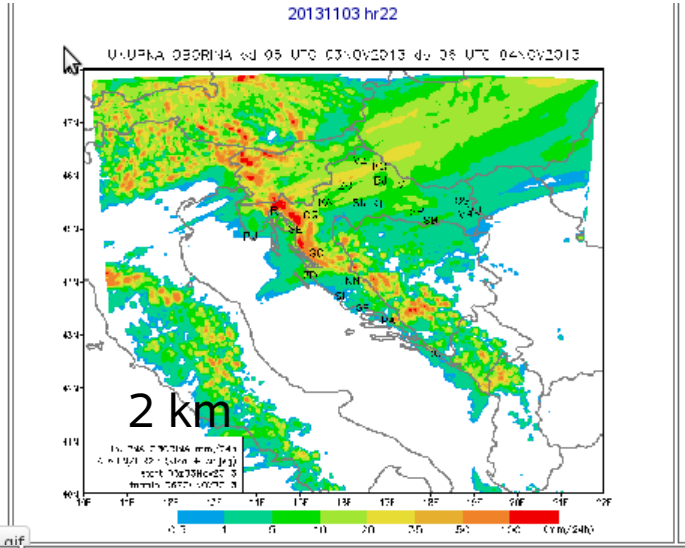


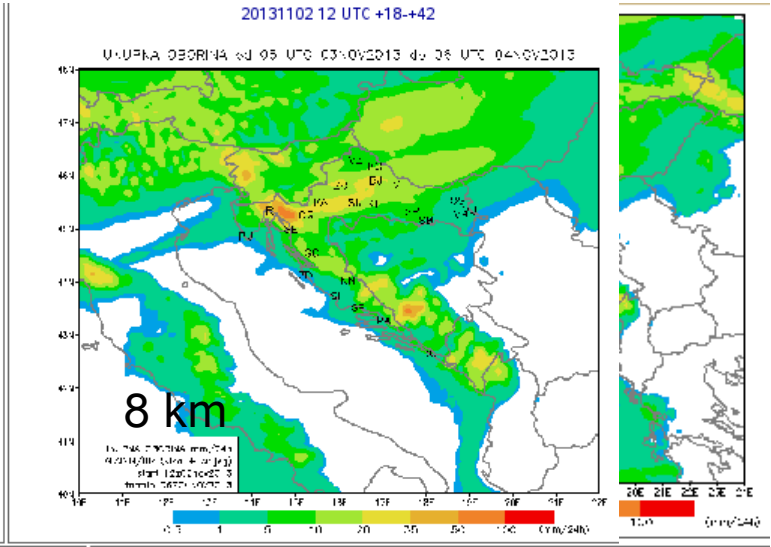


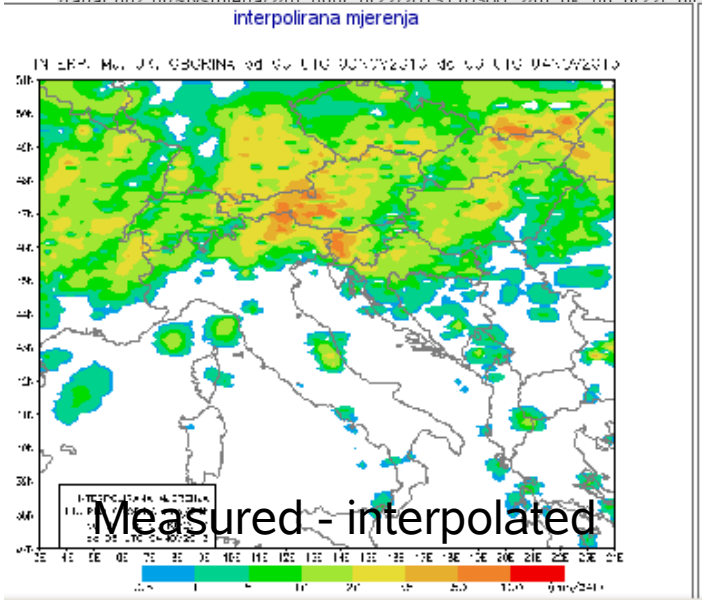


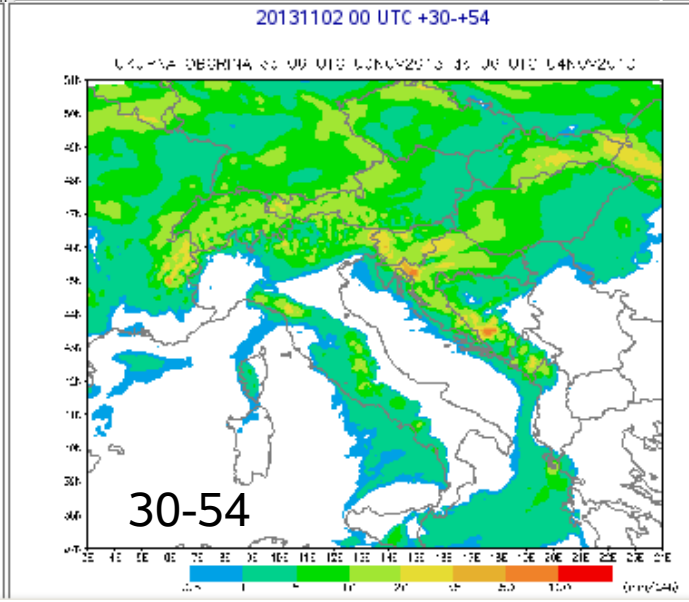
With TRMM data 03-04 Nov 2013

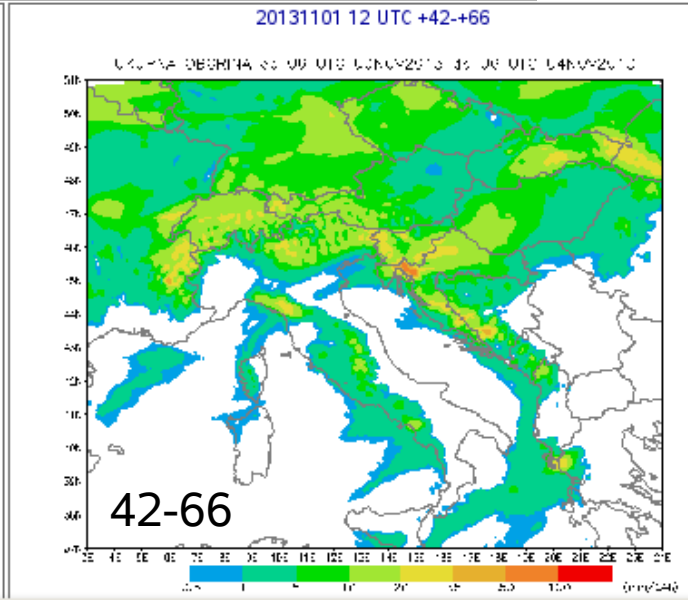




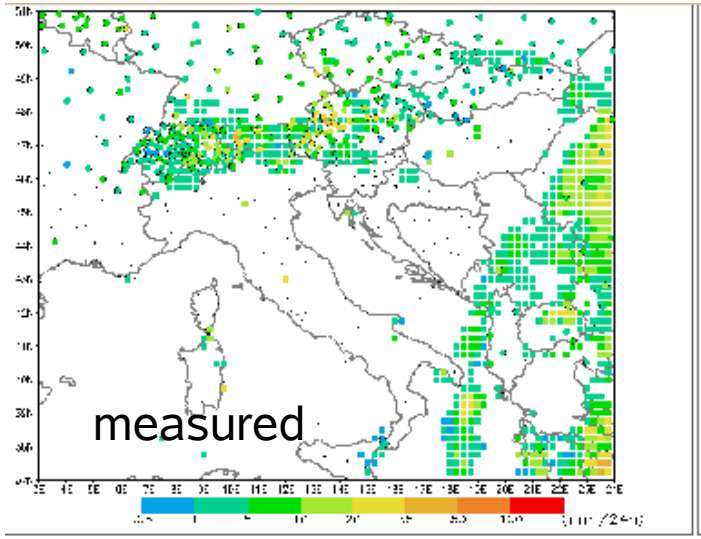


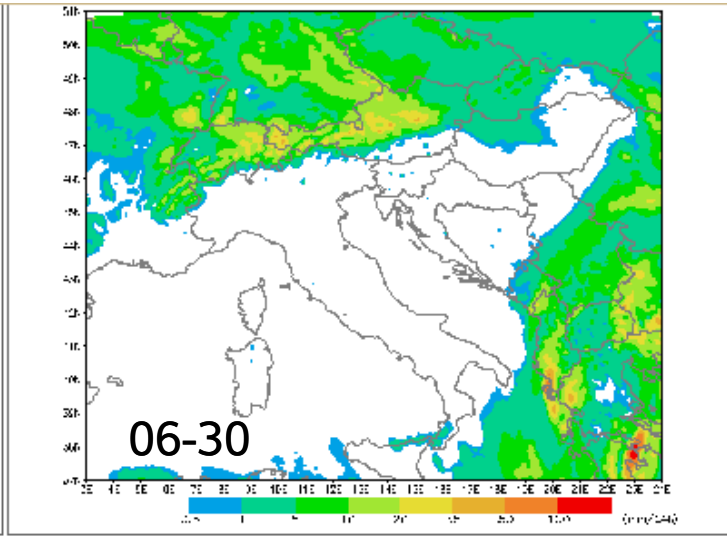


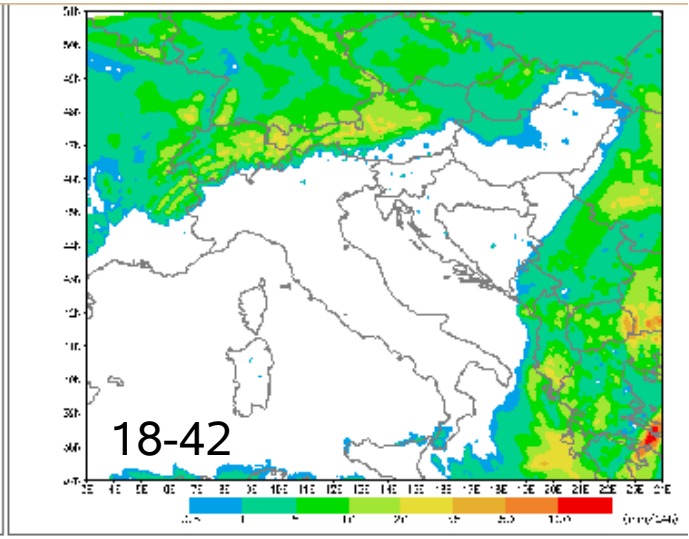


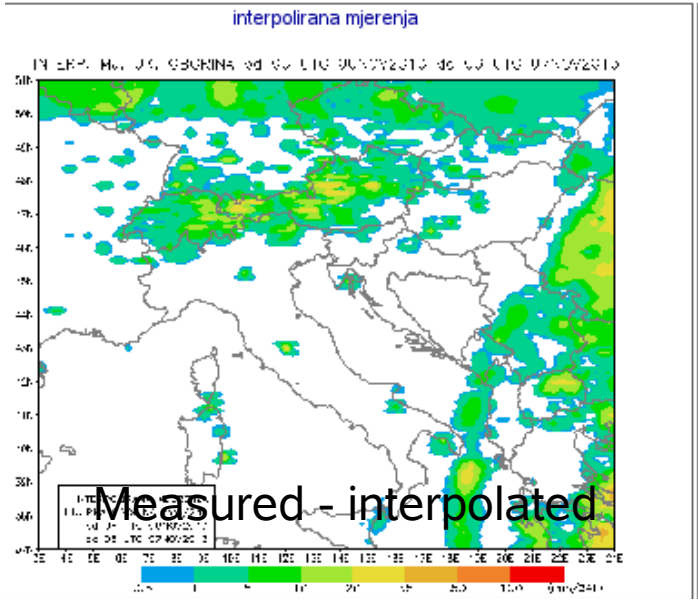


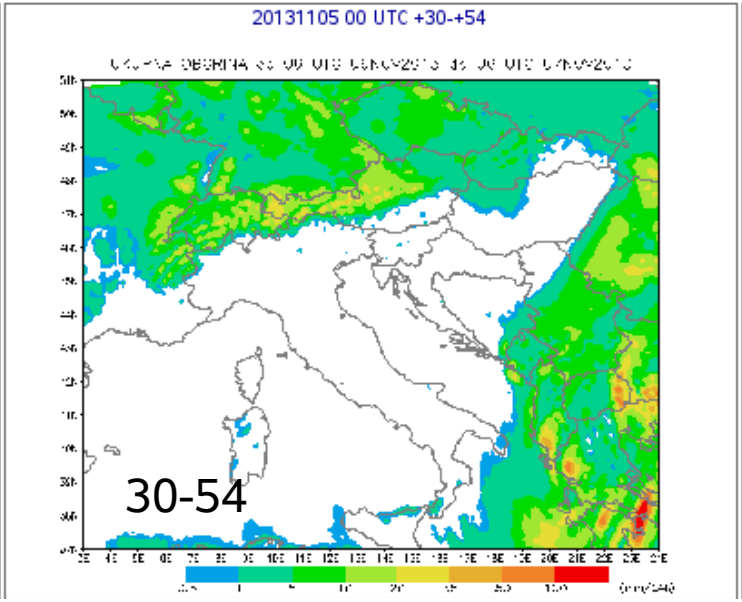
With TRMM data 06-07 Nov 2013

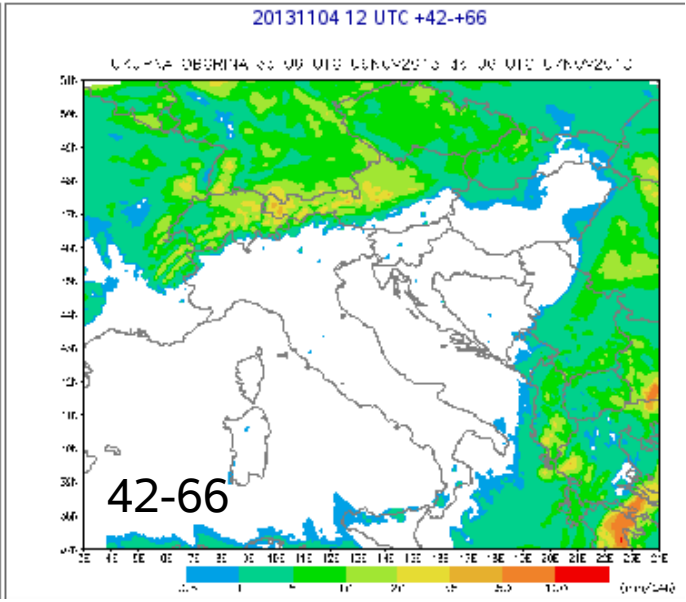












With TRMM data 08-09 Nov 2013