

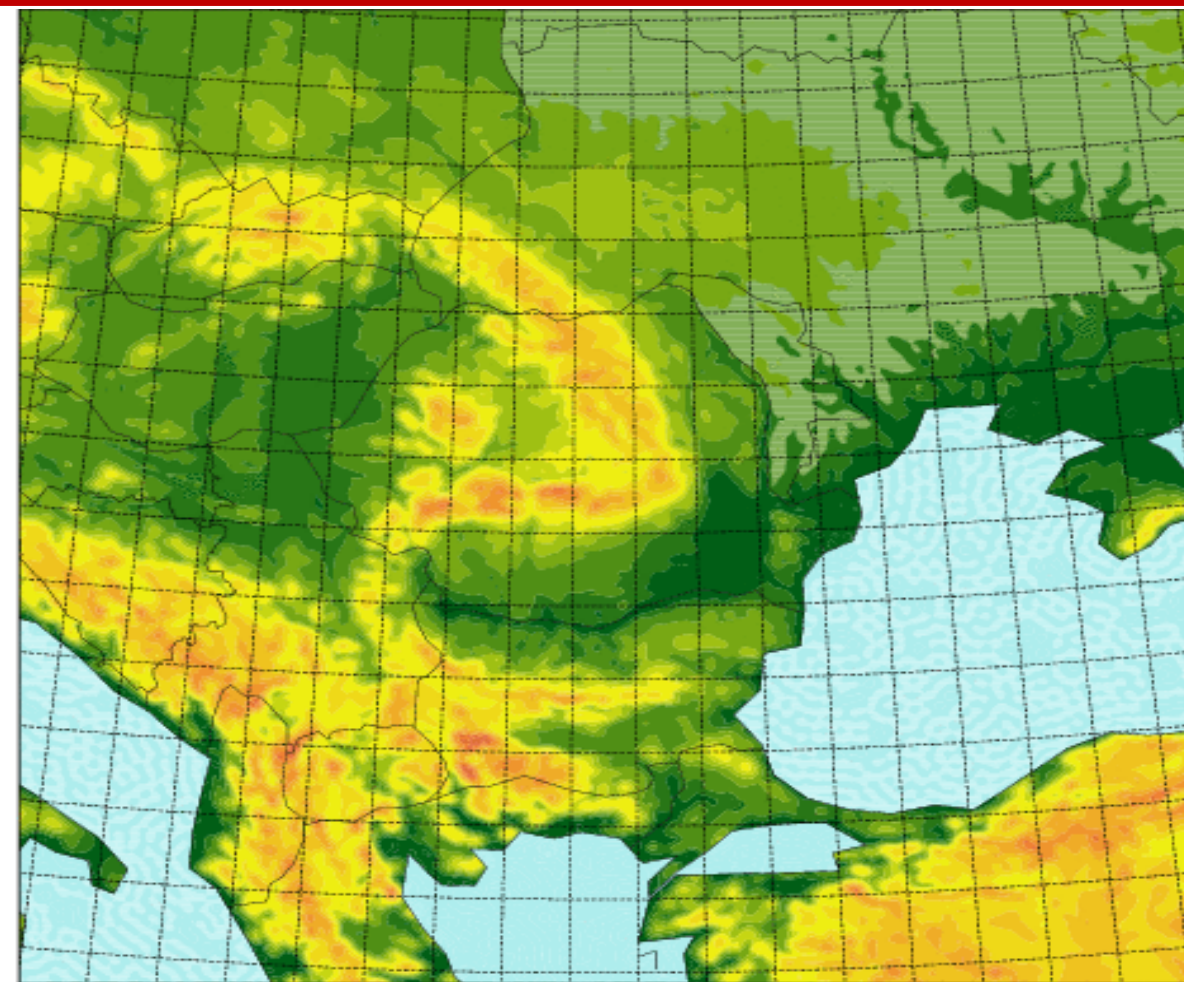
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## ALARO Operational Suite



### Characteristics

- cy40t1 - **ALARO-0** baseline;
- semi-implicit semi-Lagrangian 2TL,  $\Delta t=240$  s;
- $\Delta x=6.5$  km, 240 x 240 points, 60 vertical levels, linear grid, Lambert projection;
- LBC from ARPEGE (3h frequency), DFI Initialization;
- 4 runs /day 00, 06, 12, 18 UTC - no DA;
- forecast range: 78/54/66/54 hours;
- physical parameterizations : ALARO-0 including developments concerning thermodynamics adjustment, microphysics, moist deep convection.

### Downstream applications

- Atmospheric input from ALARO for:
  - hydrological model
  - wave model

### Post-processing

- FULLPOS in line - geographical grid (0.06° x 0.085°)

### Visualization

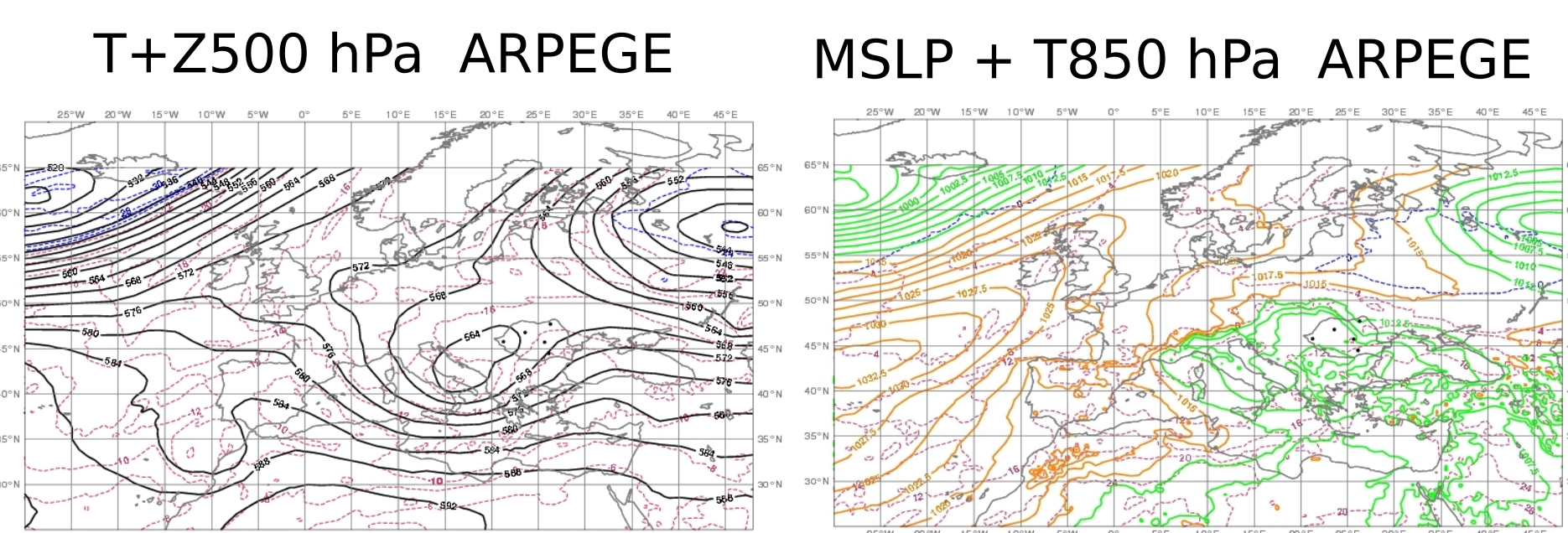
- Graphics based on package developed within NMA and RC-LACE, based on grib\_api, perl and NCL-NCAR

### Statistical Adaptation Verification

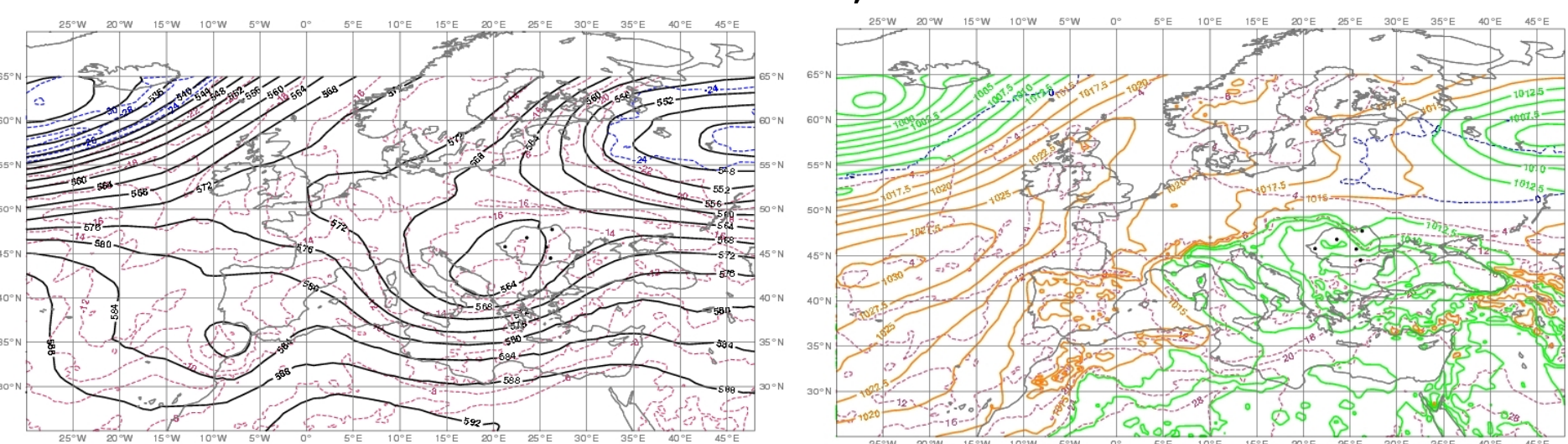
## Case study - 19.09.2016

Testing ALARO-1vA version

- the operational model:
  - led to much smaller amounts of precipitation in the southern part of the country with respect to the observations
  - simulated large, unrealistic amount of precipitation in the eastern part



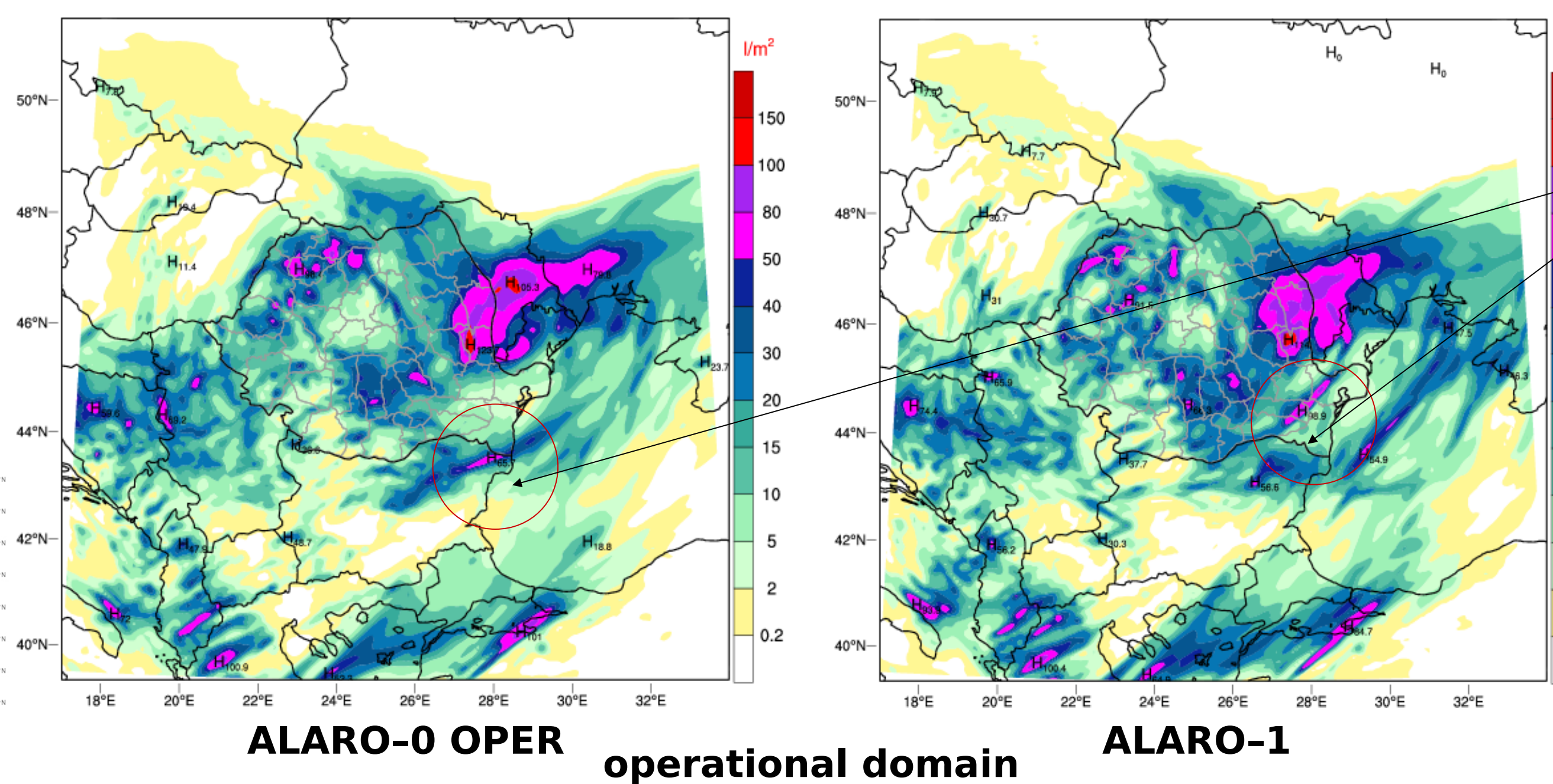
Base 19.09.2016 12 UTC, Valid 19.09 12 UTC



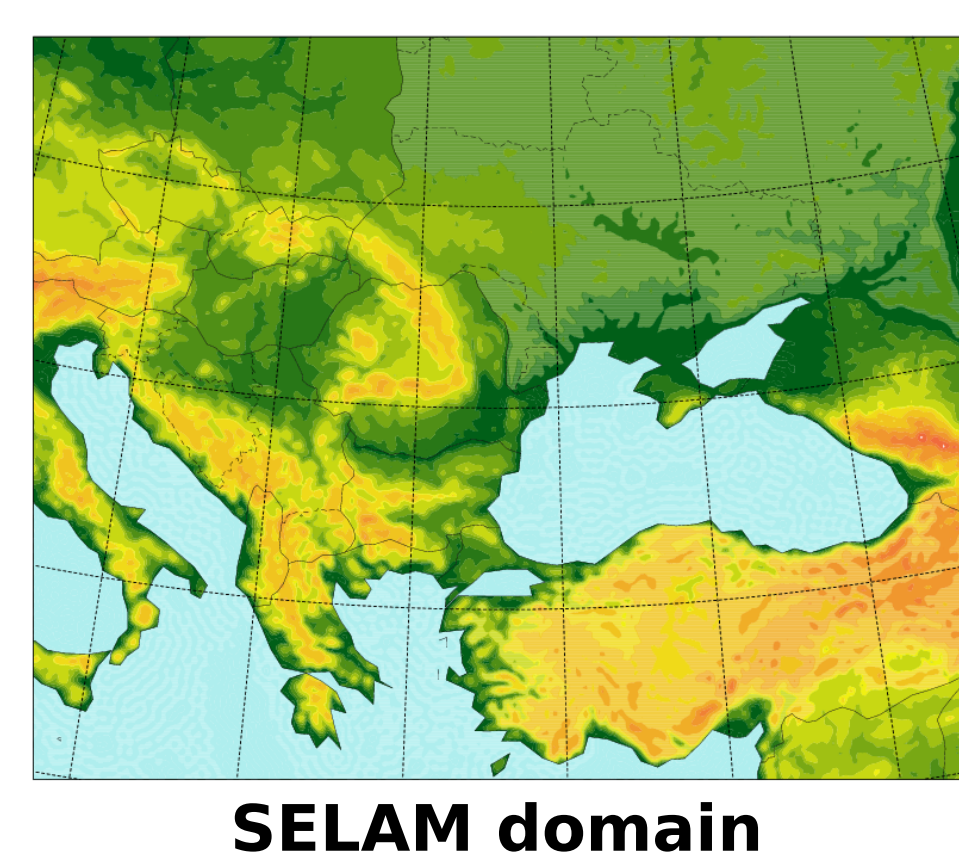
Base 19.09.2016 18 UTC, Valid 19.09 18 UTC

- intense cyclonic activity over South-Eastern Europe, leading to increased atmospheric instability

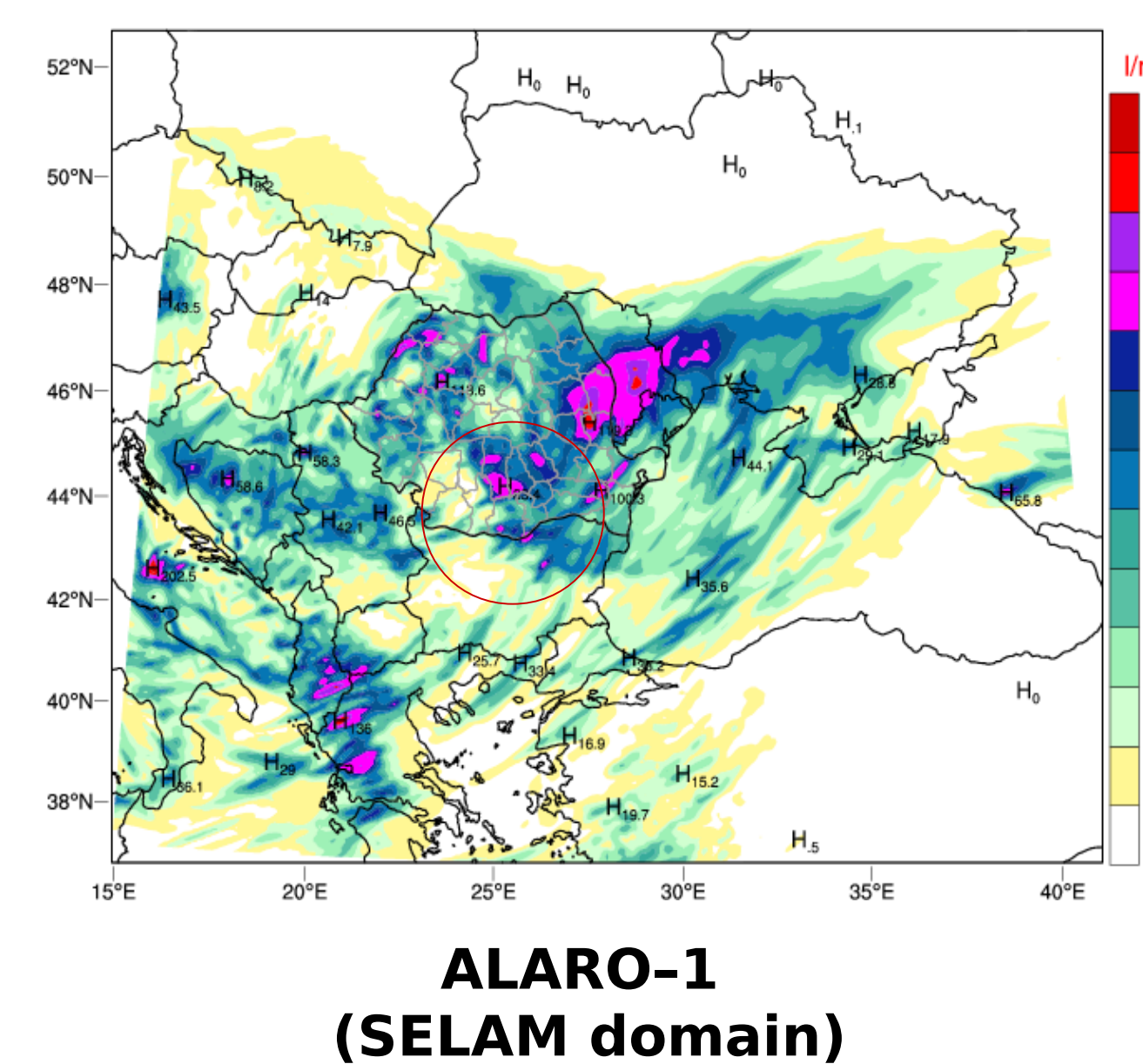
### 24h cumulated precipitation, 19.09.2016 - 20.09.2016, 06 UTC



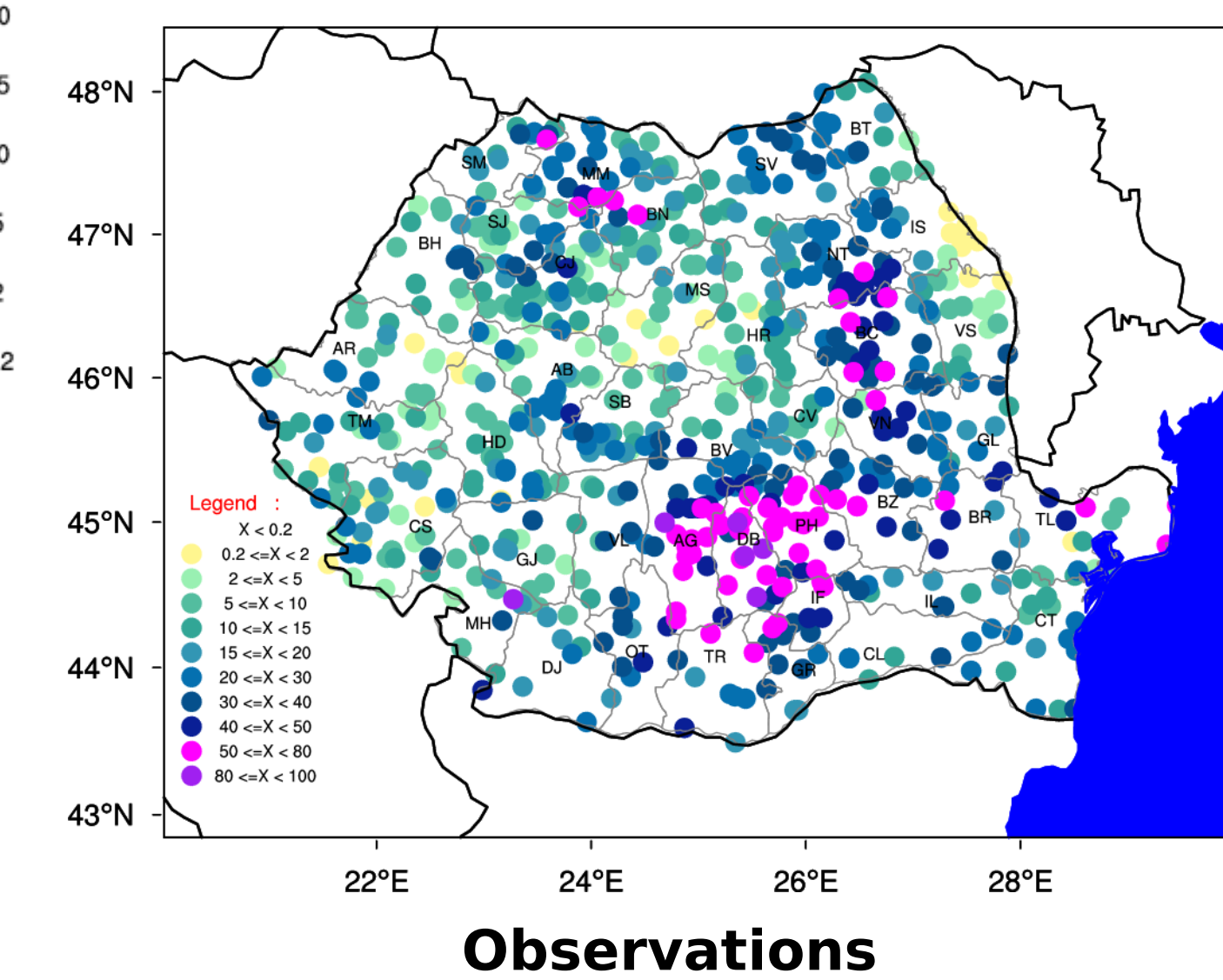
- ALARO-1 led to a shift of the precipitation belt which can be seen in the ALARO- operational forecast outside the southern border of the country → better forecast for heavy precipitation



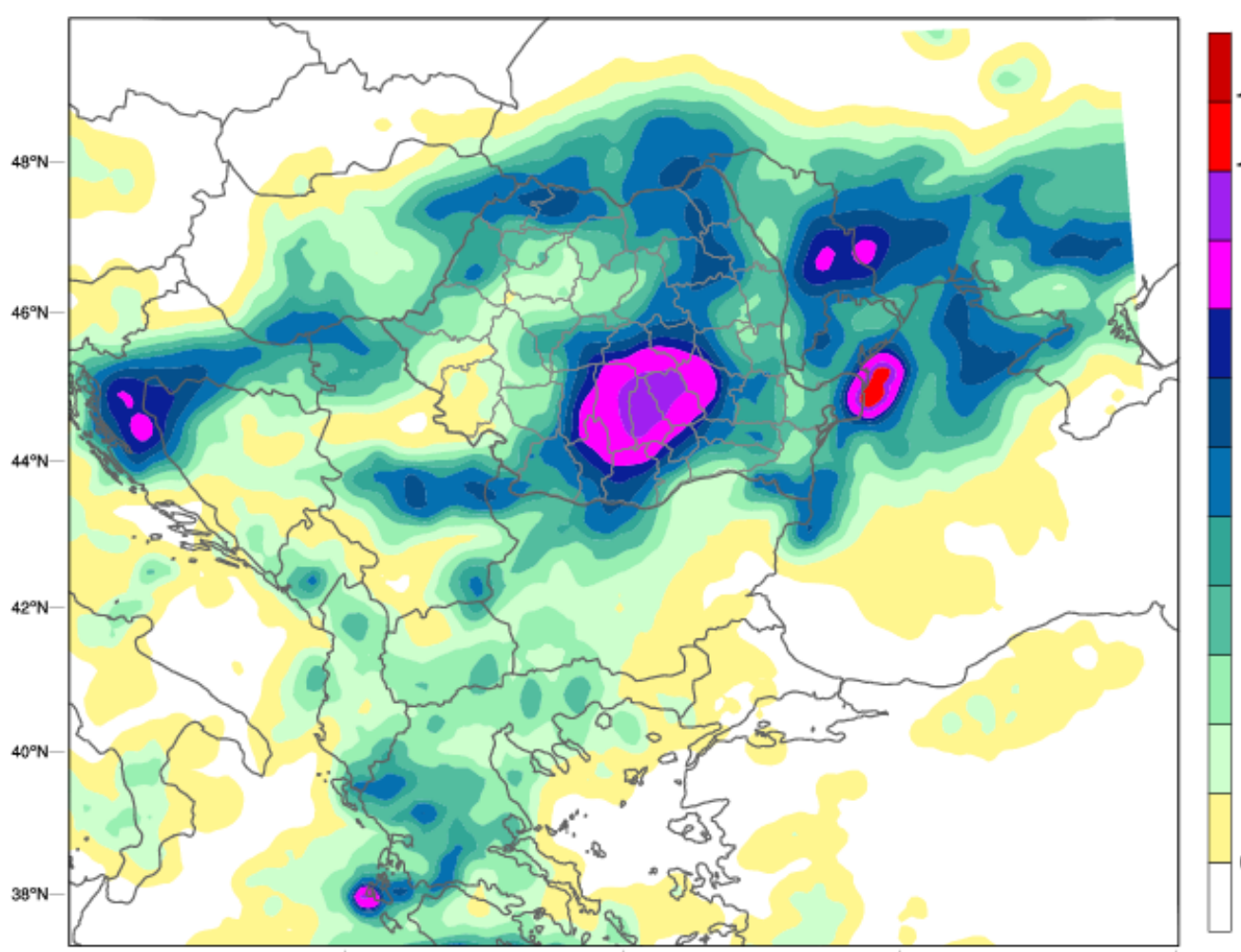
SELAM domain



ALARO-1 (SELAM domain)

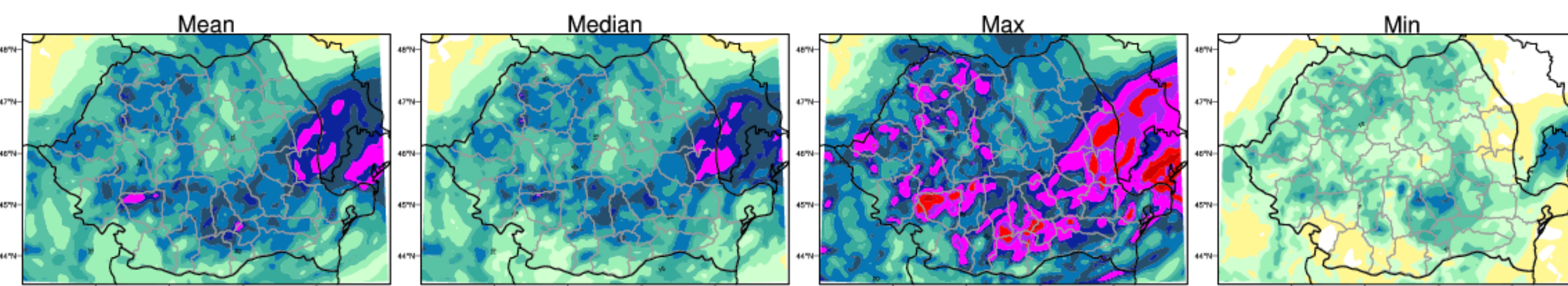
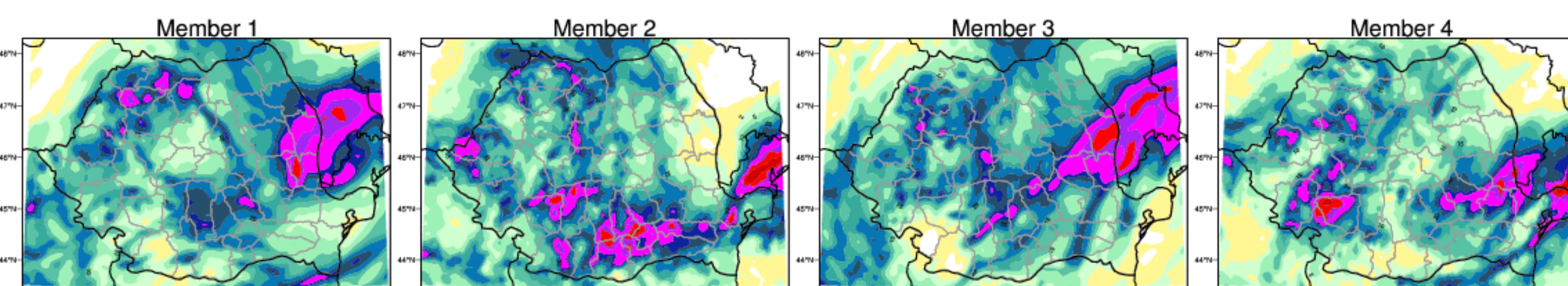


Observations



Global Satellite Mapping of Precipitation (JAXA)

- increasing the integration domain (including the Black Sea) generates a bigger amount of precipitation in the southern part → beneficial for precipitation forecast

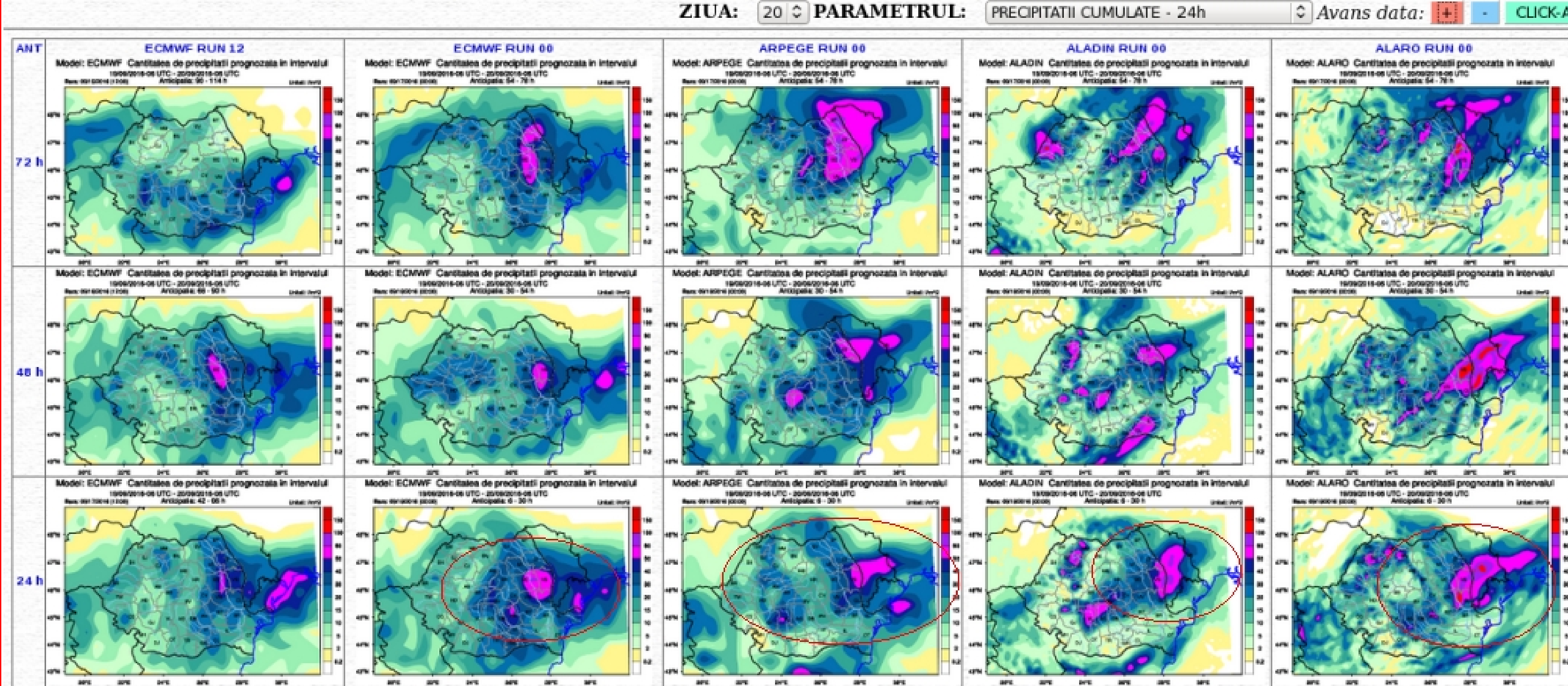


MULTI-MODEL forecast

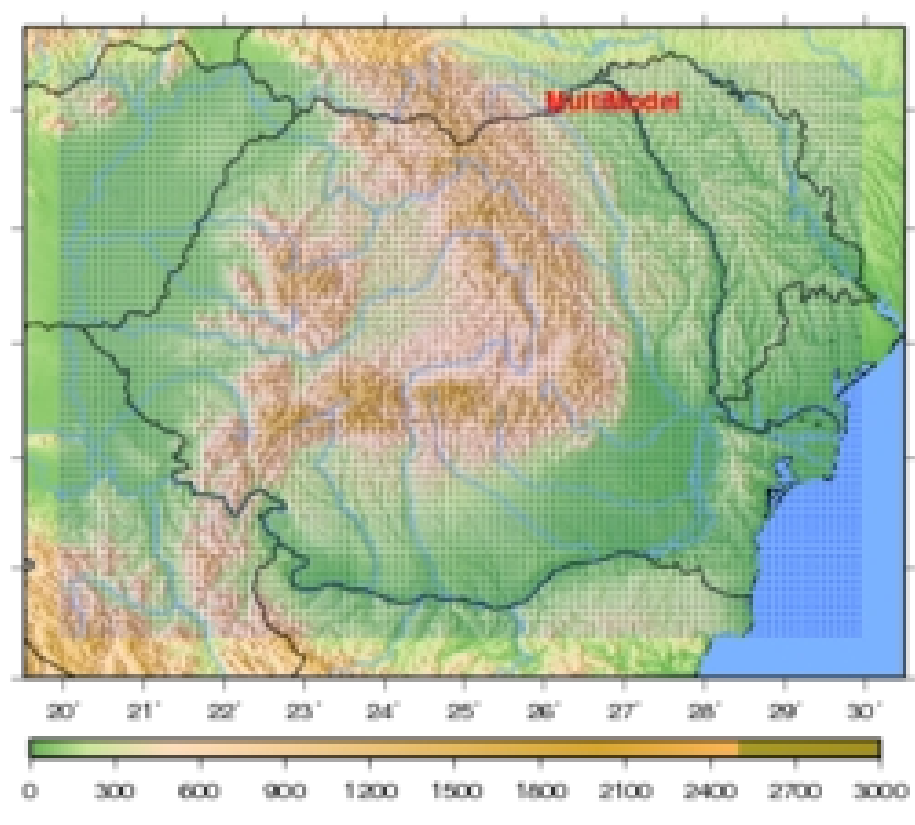
- the maximum values gave a signal of the intensity of the event

HOME HRES\_ECMWF MODELE NUMERICHE MODELE STATISTICE PRECIPITATI INDEX TERMIC EPS COSMO\_LEPS SNOW WAVE SEZON VERIFICARE DOCUMENTATIE

ZIUA: 20 PARAMETRUL: PRECIPITATI CUMULATE - 24h Avans data: CLICKA



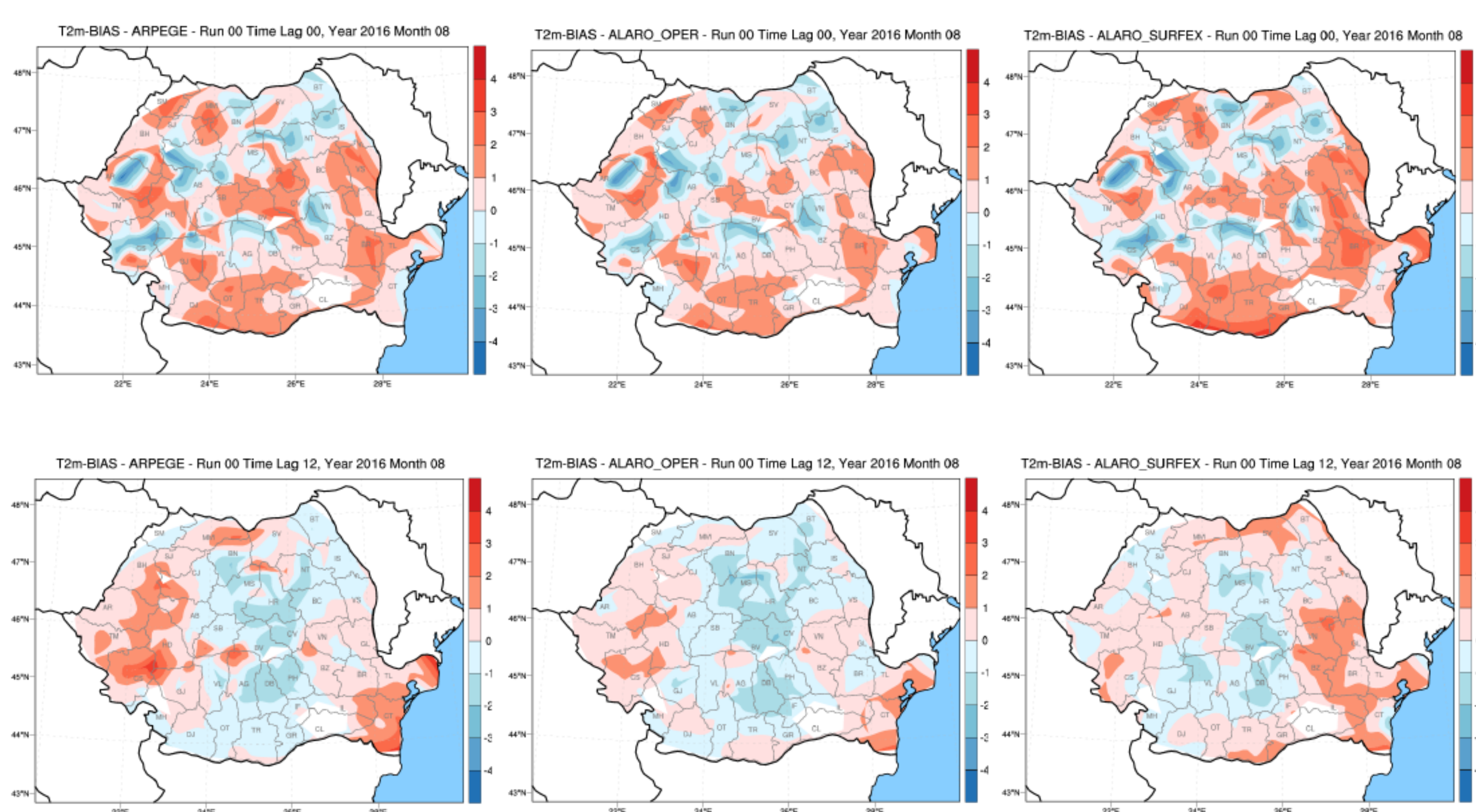
24h precipitation forecast from ECMWF (12 UTC and 00 UTC), ARPEGE, ALADIN and ALARO (00 UTC), with 72h anticipation (first row), 48h anticipation (second row) and 24h anticipation (last row)



MULTI-MODEL domain

COSMO - 00 UTC (previous day):	
member 4 -	00 06 12 18 24 30 36 42 48 54
ALARO - 00 UTC (previous day):	
member 3 -	00 06 12 18 24 30 36 42 48 54
COSMO - 00 UTC (current day):	
member 2 -	00 06 12 18 24 30
ALARO - 00 UTC (current day):	
member 1 -	00 06 12 18 24 30

## Testing ALARO coupled with ARPEGE+SURFEX



### Verification for 05-31.08.2016 period

- increased BIAS for 2m temperature, especially in the southern part of Romania
- negative BIAS over the Carpathians
- 157 synoptic stations from Romania

