



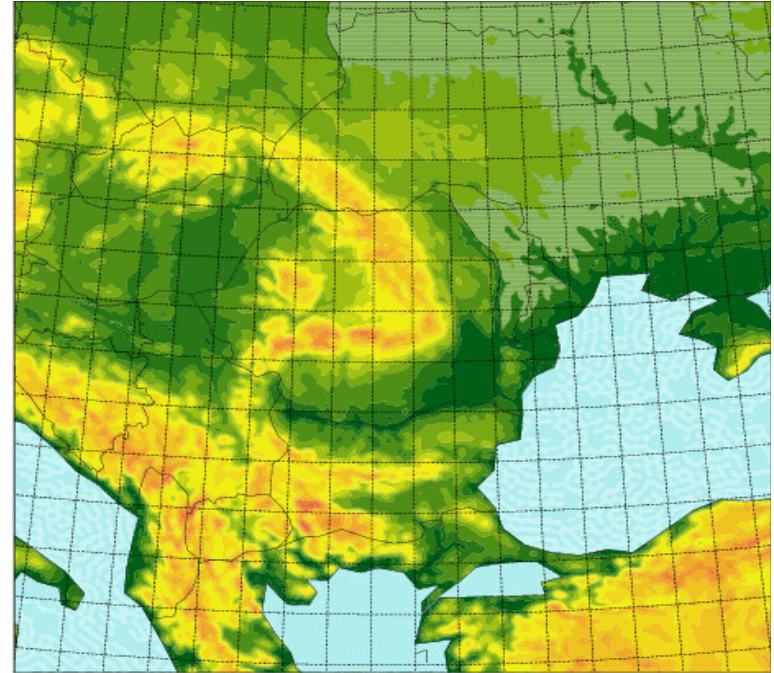
# ALARO experience in Romania

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## Operational model setup

- ALARO cy36t1: 1 January 2014 – 31 March 2016
- **ALARO cy40t1 after 1 April 2016**
- 00, 06, 12, 18 UTC, forecast range 78/54/66/54 hours
- dynamical adaptation mode, DFI initialization
- semi-implicit semi-Lagrangian 2TL advection,  $\Delta t=240$  s
- physical parameterizations : **ALARO-0 baseline**
- 240x240 grid points, 6.5 km horizontal resolution, Lambert projection
- 60 levels, vertical finite element
- LBCs from ARPEGE, 3h coupling frequency
- hourly output, in-line Fullpos post-processing in lat-lon grid



## Test configuration:

### **ALARO-1vA cy38t1:**

- Running on 16 processors on the old IBM platform, but the results differ (not significantly) when the same run is repeated
- On more than 16 processors, the integration is crashing in a Fullpos interpolation subroutine

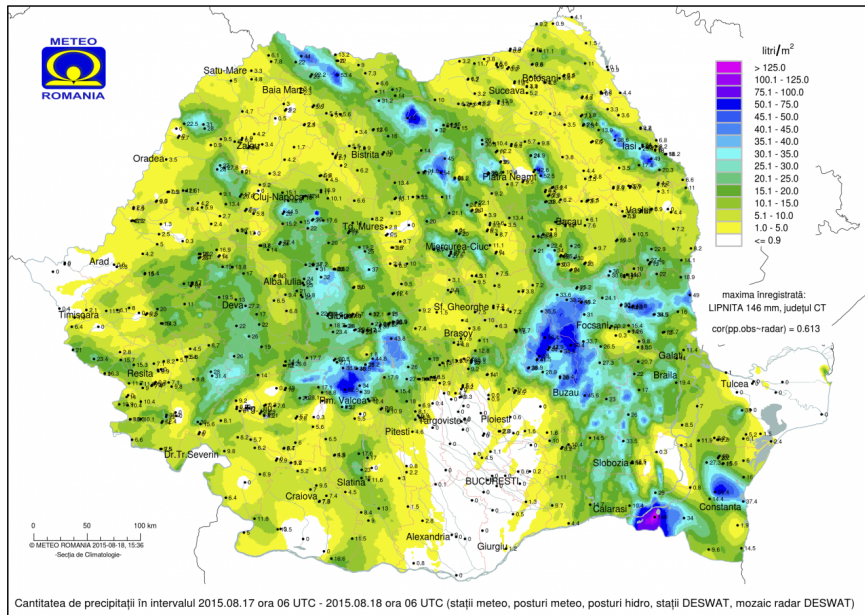
### **ALARO-1vA cy40t1:**

- Tested on the new IBM platform on 3 nodes (36 processors) and 1 node (12 processors), but also crashing in a Fullpos interpolation subroutine

## Observations:

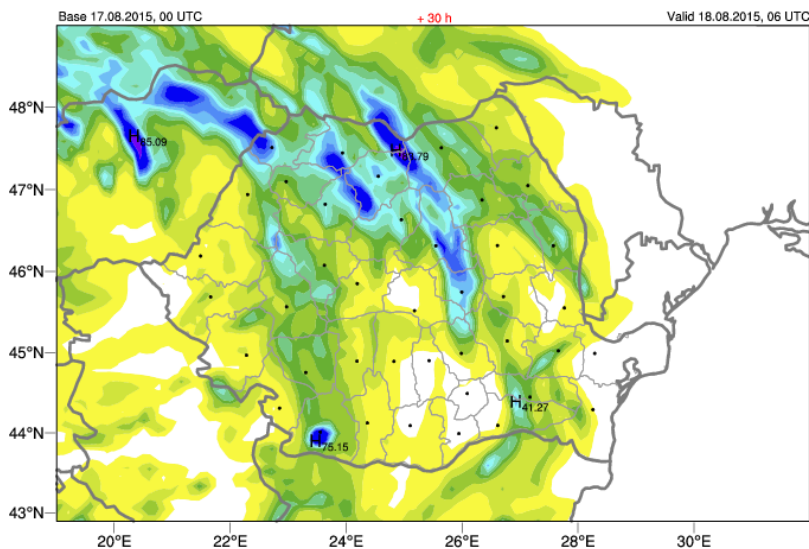
Data from synop and hydro stations, rain gauges and radar are used.

## 17.08.2015 06 UTC – 18.08.2015 06 UTC

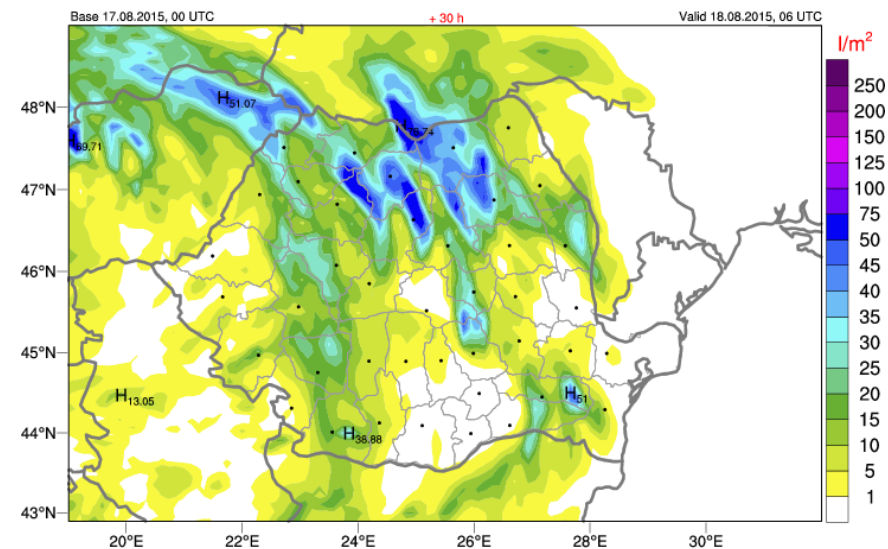


- The intense precipitation nucleus situated at the curvature of Carpathians was underestimated by both model versions (regarding both area and amount).
- The observations in the South-Eastern Romania show a value of 146 l/mp in 24 hours (measured by the rain gauges), but we question the validity of this value. The predicted value (41 l/mp – oper and 51 l/mp – ALARO1) was lower than obs.
- The model also simulates an intense nucleus (75 l/mp – oper and 39 l/mp – ALARO1) which is much lower in observations (16 l/mp).
- The area free of precipitation in the Southern part of Romania was well predicted by both models (slightly better by ALARO1)

ALARO: 24 hours accumulated precipitation



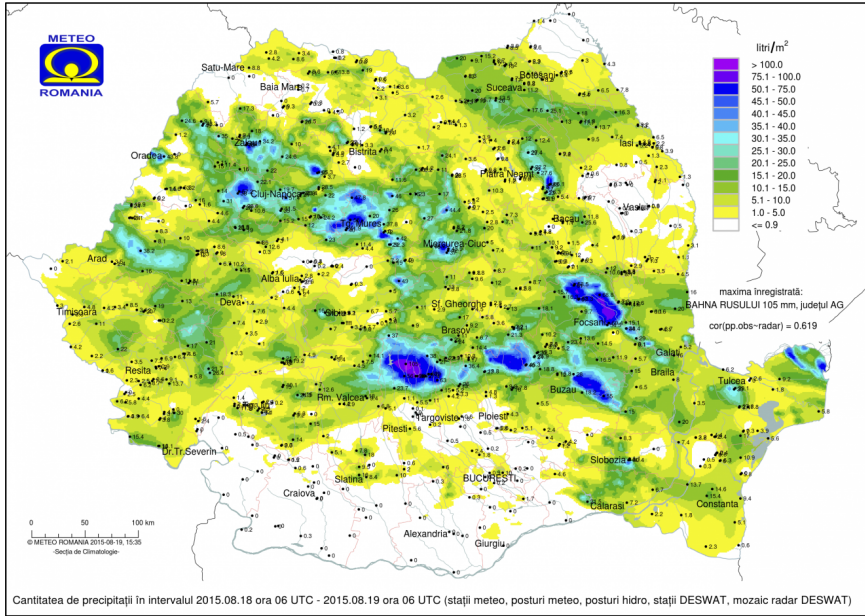
ALARO1: 24 hours accumulated precipitation



### Synoptic situation:

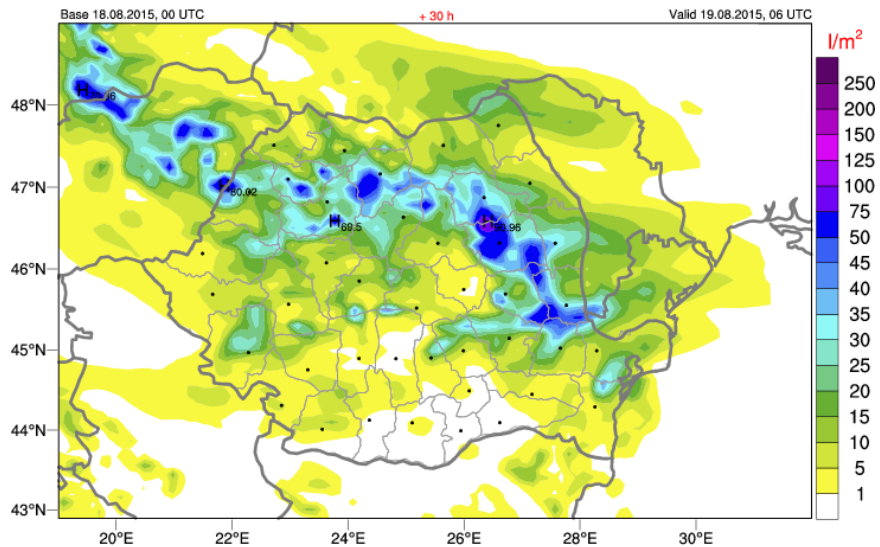
- Convection due to a warm and very humid air mass advection from South and South-West, sustained in the mid and upper troposphere by a through with a West-East axis.
- In the next hours, the through in the upper air deepens and extends towards the Western part of Romania. The PV anomaly coming from South-West triggers convection cell formation.

# 18.08.2015 06 UTC – 19.08.2015 06 UTC

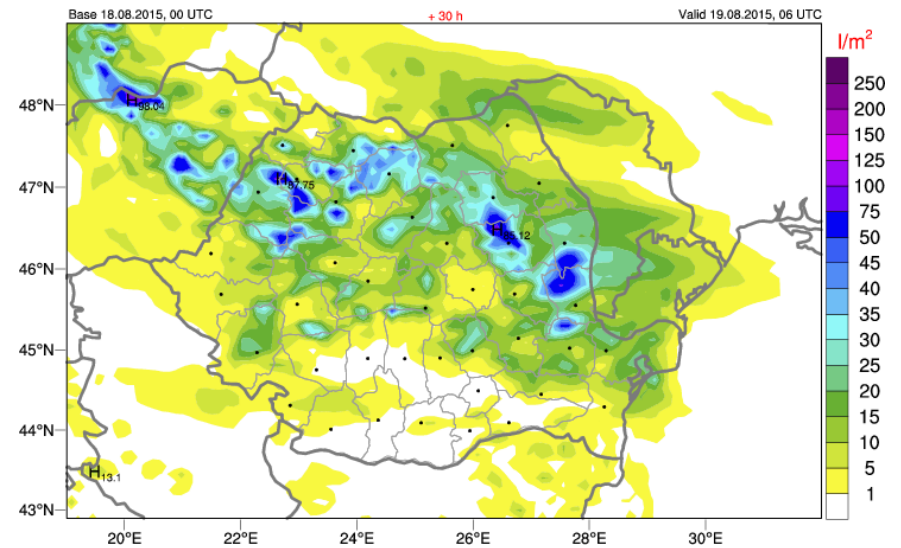


- Both models simulated well the precipitation field, but the operational version was slightly better in the Eastern half (at the curvature of Carpathians).
- The very intense observed precipitation nucleus in the Fagaras mountains (105 l/mp) was severely underestimated by the model (oper: 35 – 40 l/mp, ALARO1: 40 – 45 l/mp) regarding both the area and the amount.

ALARO: 24 hours accumulated precipitation



ALARO1: 24 hours accumulated precipitation

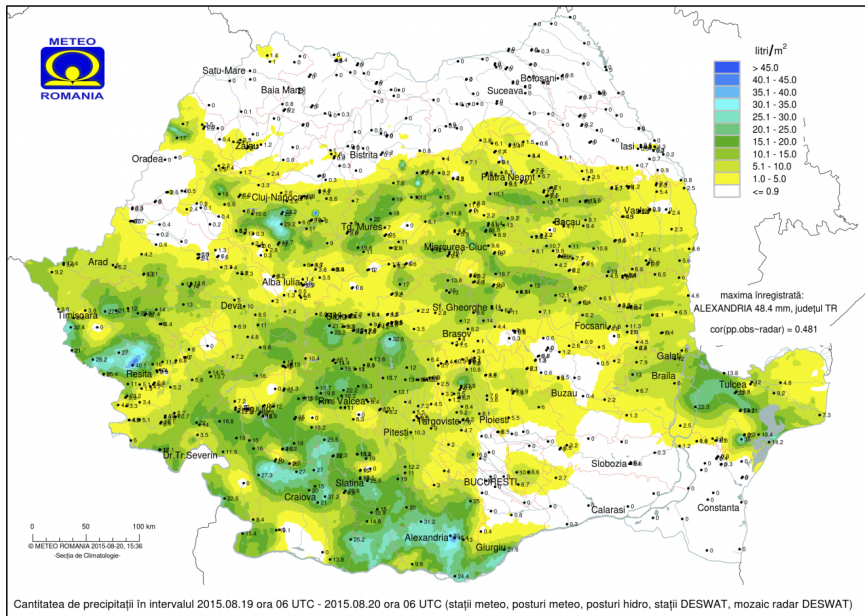


## Synoptic situation:

A cut-off separates from the through in the Western part of Romania, sustaining the development of new convective cells.

## 19.08.2015 06 UTC – 20.08.2015 06 UTC

The precipitation area in the South – Central part of Romania (up to 48 l/mp in observations) was very well predicted by the coupling model ARPEGE (40 – 50 l/mp).

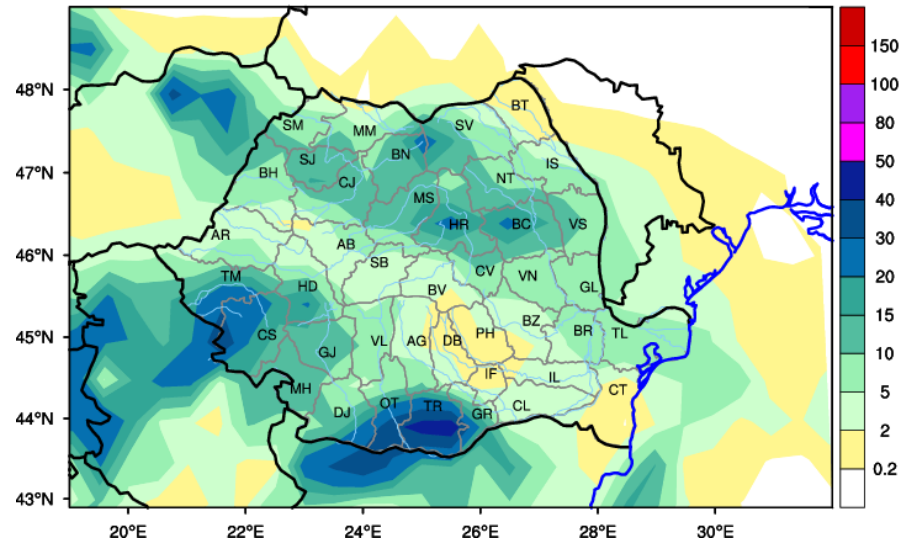


### Model: ARPEGE Cantitatea de precipitații prognozată în intervalul 19/08/2015-06 UTC - 20/08/2015-06 UTC

Baza: 08/19/2015 (00:00)

Anticipația: 6 - 30 h

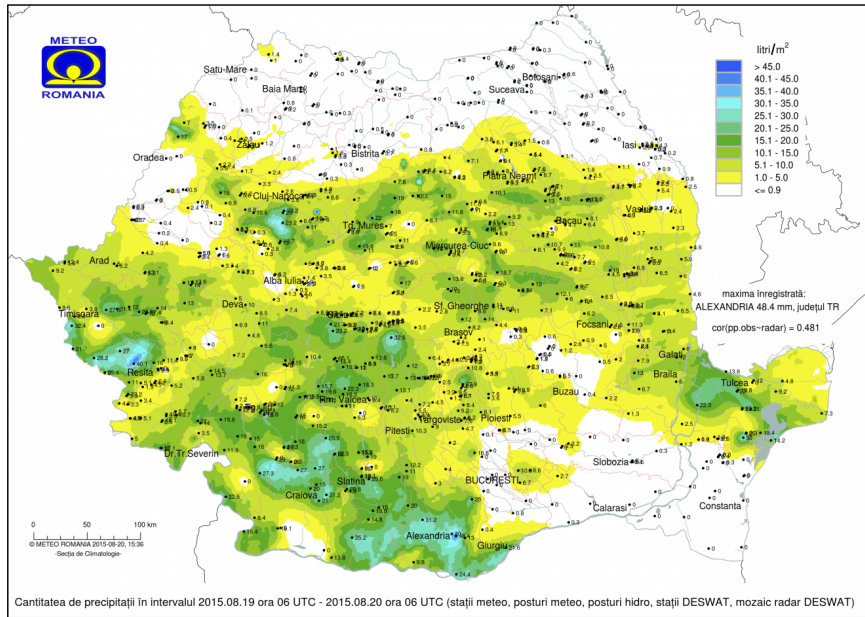
Unitati: l/m<sup>2</sup>



### Synoptic situation:

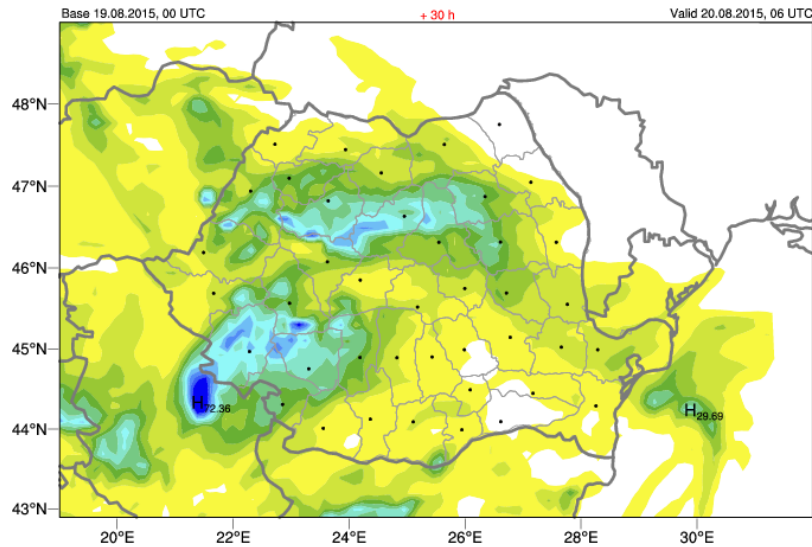
The Scandinavian blocking affects most of Europe. The North-European ridge brings rather cool and dry air over Northern and Eastern part of Romania, but the South-Western circulation continues in the rest of the country.

# 19.08.2015 06 UTC – 20.08.2015 06 UTC

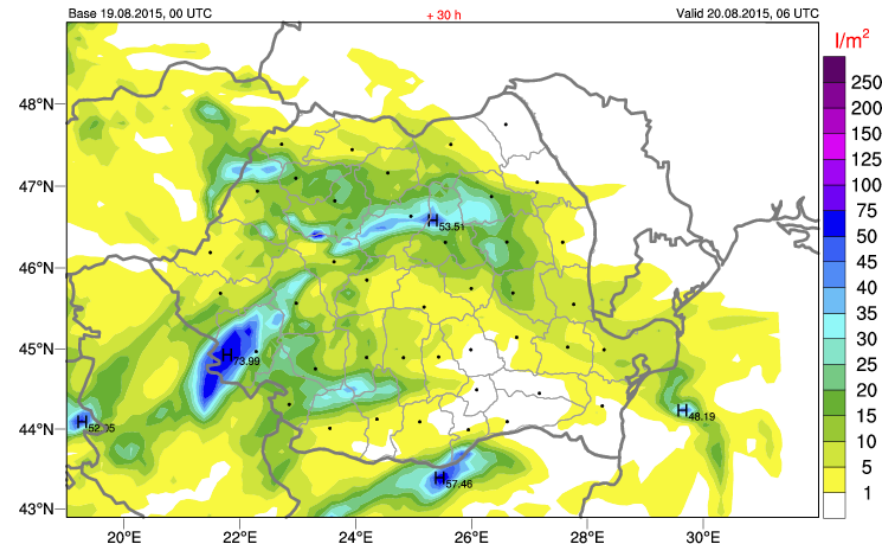


- The precipitation area in the South – Central part of Romania (up to 48 l/mp in observations) was missed by both model versions. Oper model positioned the nucleus too South, in Bulgaria. ALARO1 was better in positioning the nucleus (57 l/mp).
- The precipitation nucleus in the South-Western part of the country was too intense in ALARO1 (73 l/mp compared to 40 l/mp in oper and observations).

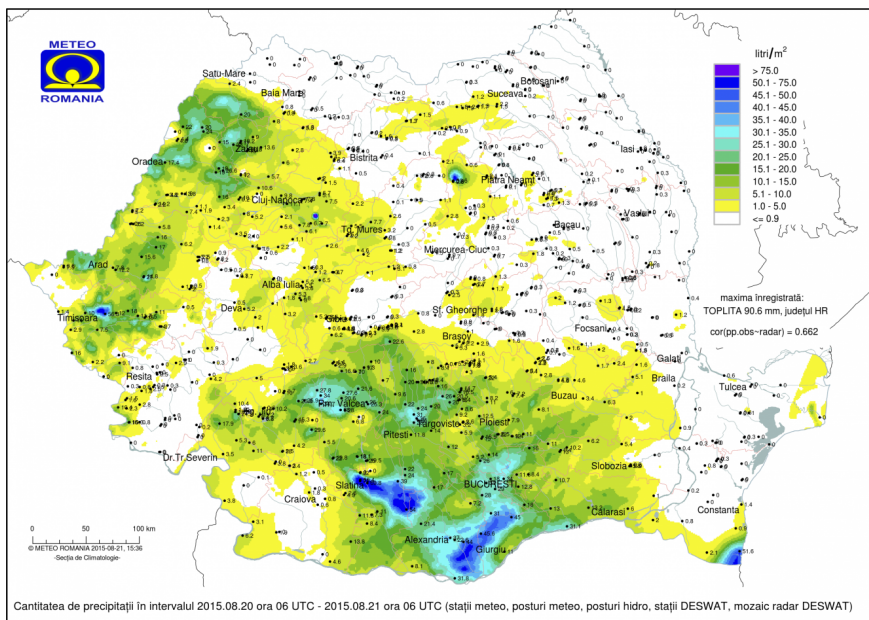
ALARO: 24 hours accumulated precipitation



ALARO1: 24 hours accumulated precipitation

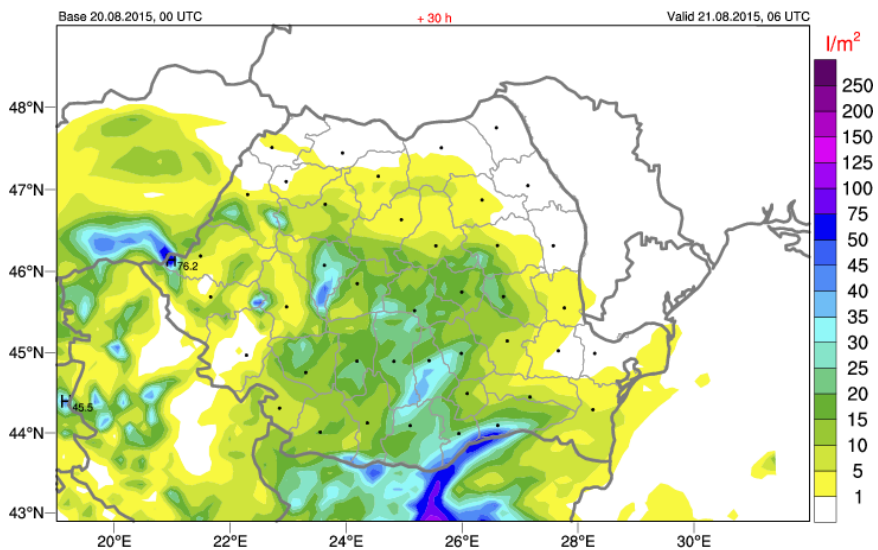


# 20.08.2015 06 UTC – 21.08.2015 06 UTC

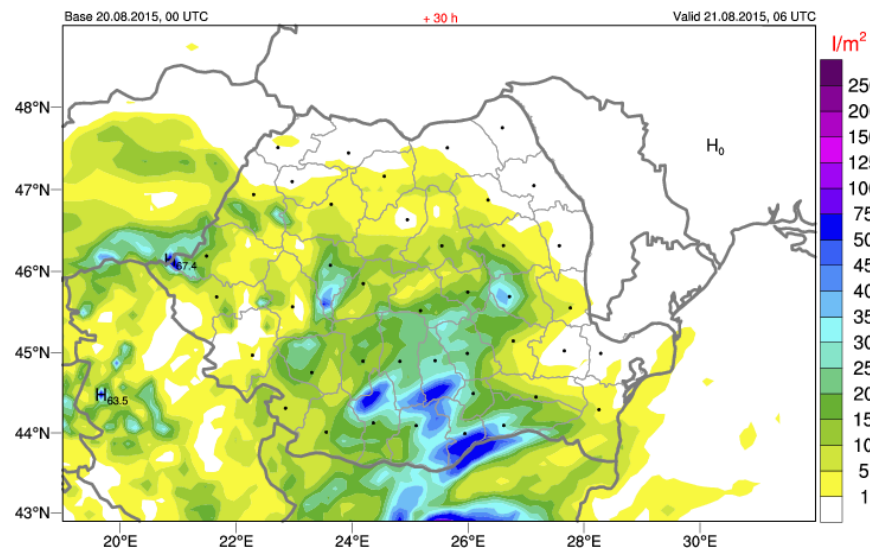


- The precipitation area in the South-Central part of the country was well positioned by both model versions, but the amount was underestimated by operational version; ALARO1 predicted better the position and the amount of the nuclei.
- The extreme South-Eastern nucleus (51 l/mp in observations) was underestimated by models .

ALARO: 24 hours accumulated precipitation



ALARO1: 24 hours accumulated precipitation

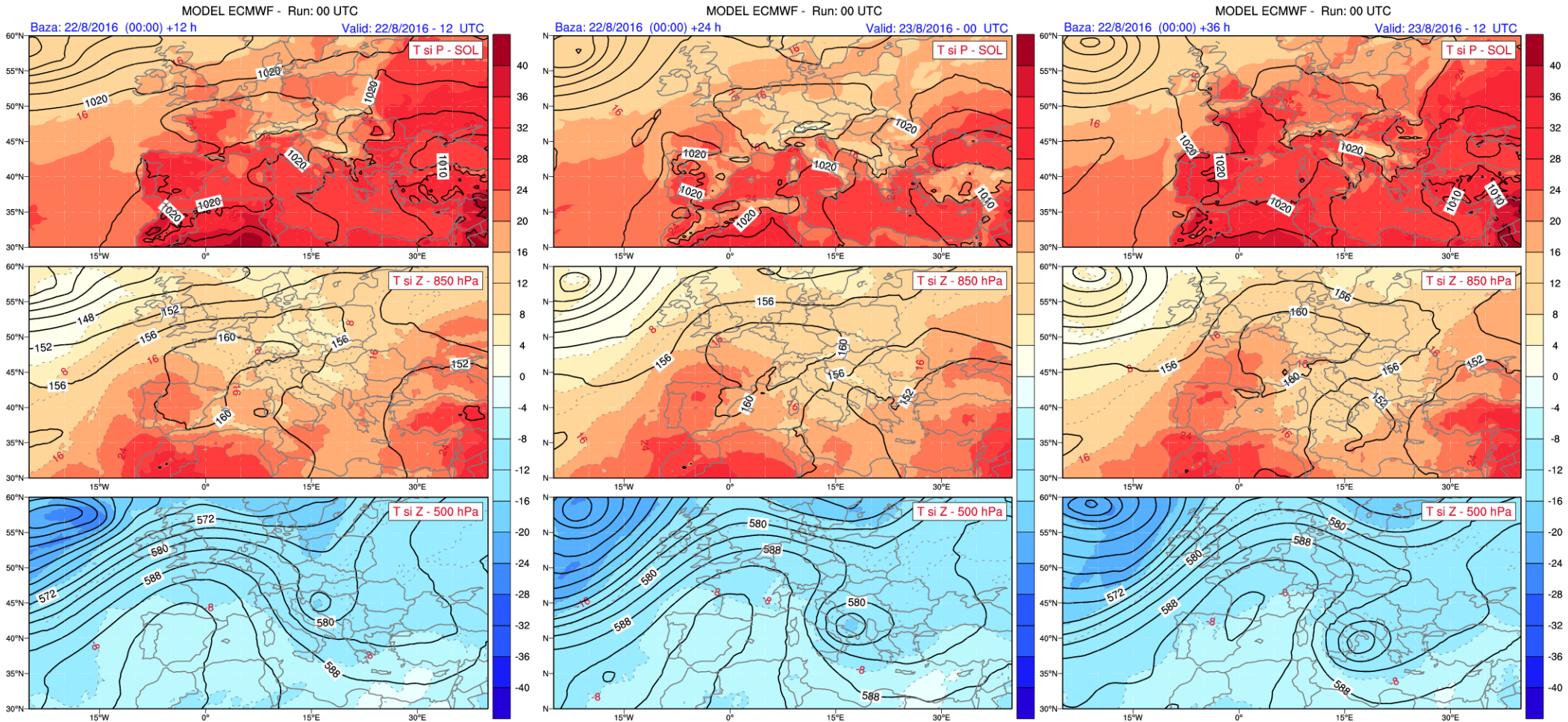


## Synoptic situation:

The through from the South-West Russia extends over Romania, maintaining the South-Western circulation.



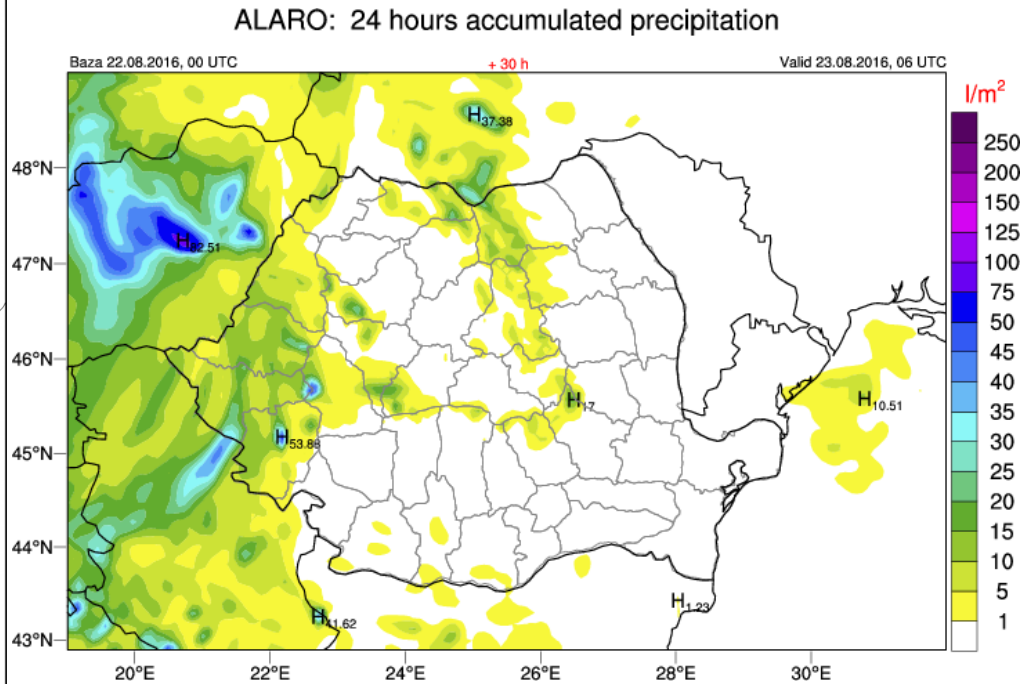
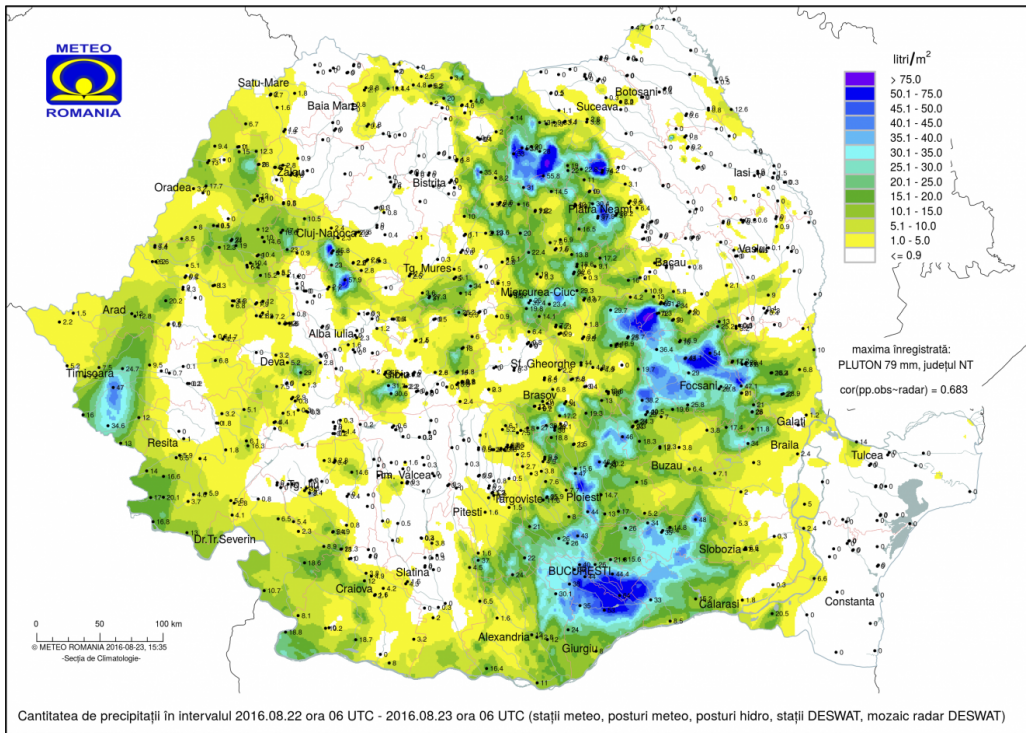
# Completely missed night convection in the Bucharest area: 22.08.2016 06 UTC – 23.08.2016 06 UTC



## Synoptic situation:

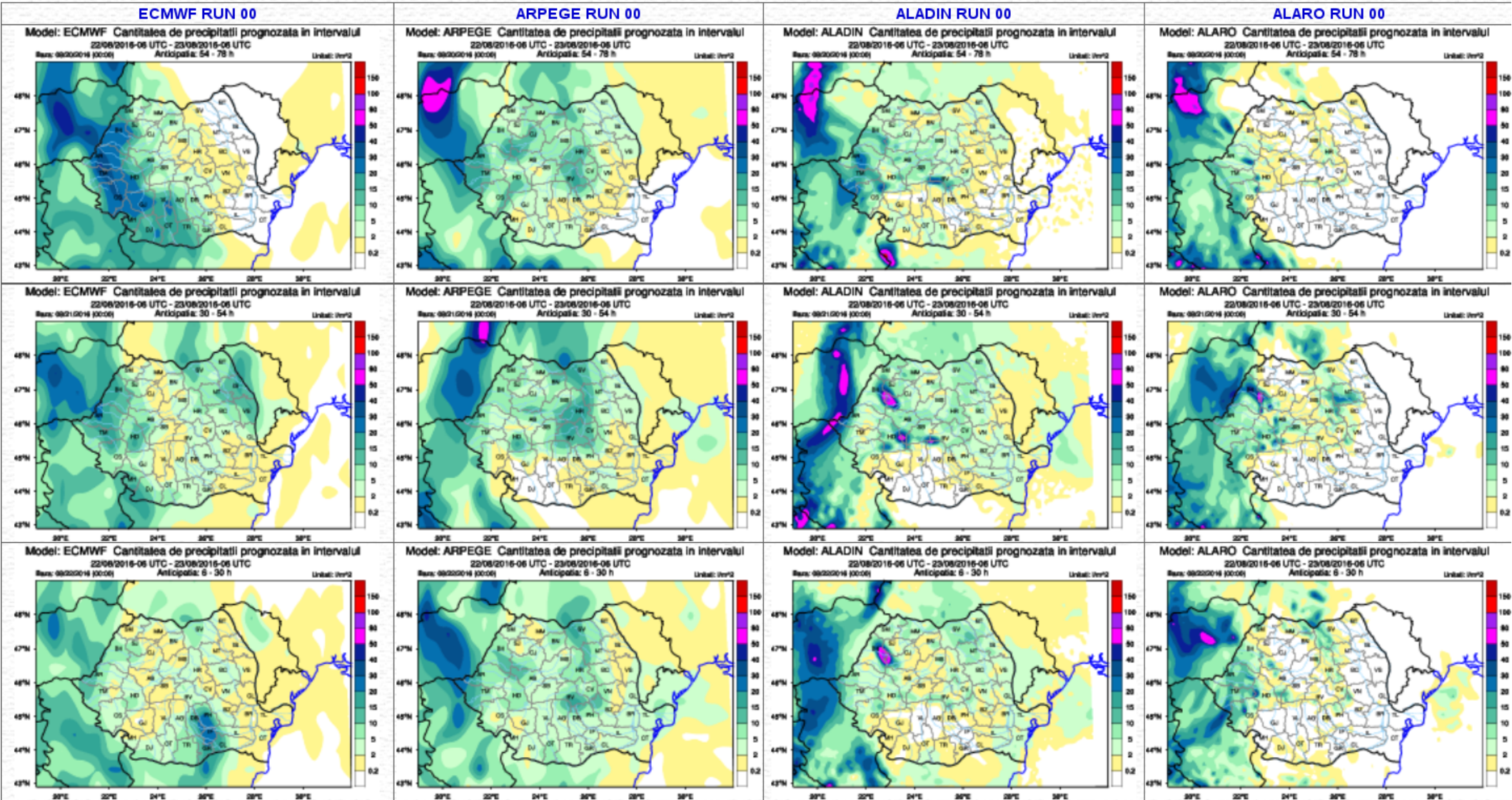
- A mid and upper troposphere trough from central Europe moves Eastwards. The Southern end of the trough develops a cut-off and becomes a cold pool. Advection of this cold air at upper levels, over a very warm air mass at surface in the extra-Carpathian regions triggered night convection.
- A slow cold front, mainly over Western Romania produced some precipitation in this area.

# Completely missed night convection in the Bucharest area: 22.08.2016 06 UTC – 23.08.2016 06 UTC



- The operational model completely missed the precipitation around Bucharest area (where the observed maximum reached  $64 \text{ l/m}^2$ ) and in the South of Moldavia ( $54 \text{ l/m}^2$ )
- All the convective cells developed in the Eastern Carpathians were underestimated (the maximum observed precipitations was  $79 \text{ l/m}^2$ )

# Completely missed night convection in the Bucharest area: 22.08.2016 06 UTC – 23.08.2016 06 UTC



The ALARO operational model is too dry in the extra-Carpathian region!

**Thank you for your attention !**