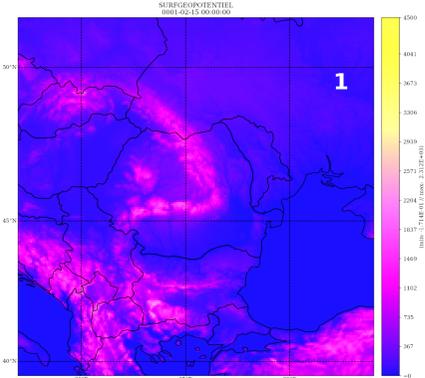


**Operational configurations**

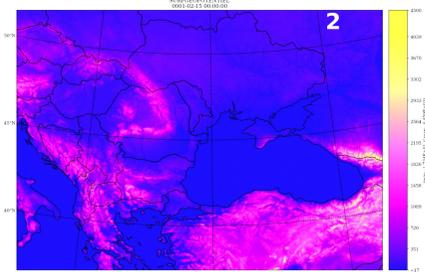
- **Cy43t2**
- semi-implicit semi-Lagrangian 2TL
- 60 vertical levels, linear grid
- Lambert projection
- LBC from ARPEGE (3h frequency)
- DFI Initialization
- 4 runs/day 00, 06, 12, 18 UTC
- forecast range: 78/54/78/54 hours

➤ **2 parallel configurations**

- 1) ALARO-0 baseline,  $\Delta x=6.5$  km, **L60**, 240 x 240 points,  $\Delta t=240$  s

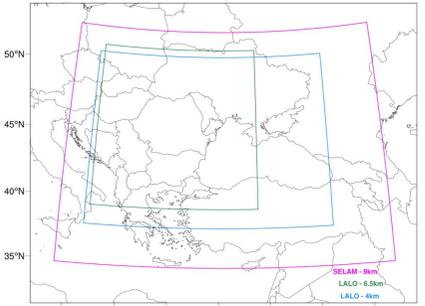


- 2) ALARO1 vB,  $\Delta x=4$  km, **L60**, 600 x 432 points,  $\Delta t=180$  s  
\* in parallel DA for 30 forecast range (runs 00, 06, 12, 18)



**Downstream applications**  
Atmospheric input from ALARO for hydrological model

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

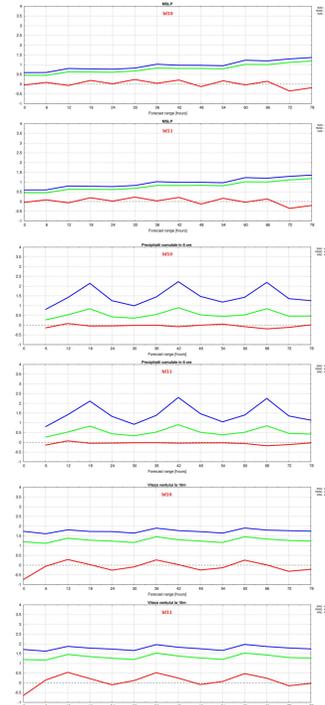


**Visualization**  
Graphics based on package developed within NMA and RC-LACE, based on grib\_api, perl and NCL-NCAR

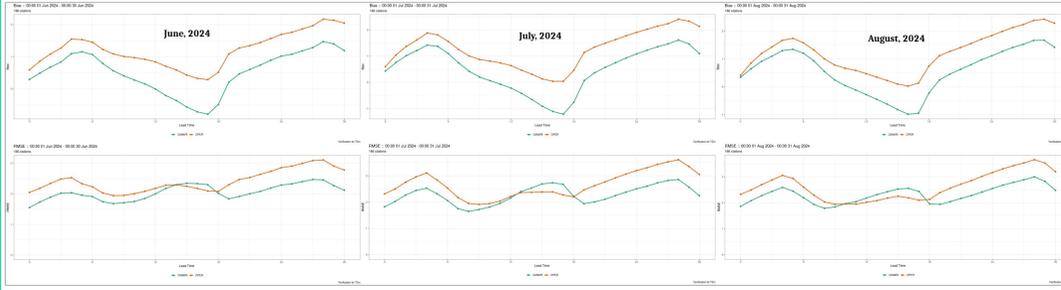
**Statistical Adaptation Verification**

**bf10 vs. bf11 results**

Verification was done for model version cy43bf11 in order to be used operationally. Scores are shown for May 2024. The results are very similar.



**Impact of CANARI data assimilation scheme on surface parameters forecast**

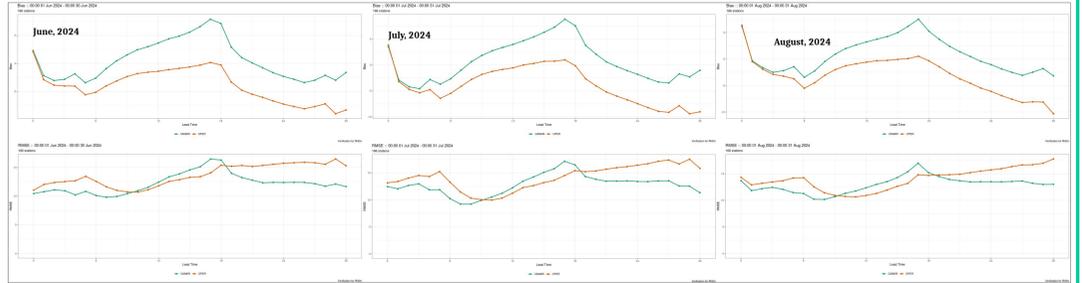


Monthly BIAS (upper panel) and RMSE (lower panel) scores for T2m for 00 UTC

Recent results regarding local data assimilation system are presented. They are based on the 4 km horizontal resolution model version, 60 vertical levels with a 6h assimilation window. They were run for the summer of 2024, for 00 run and for 30 hours forecast range. Using HARP, an evaluation was done with data from 166 meteorological stations, for operational and surface data assimilation configurations.

It was observed a highly increased impact of CANARI surface scheme on 2 m temperature with a cold BIAS during midday.

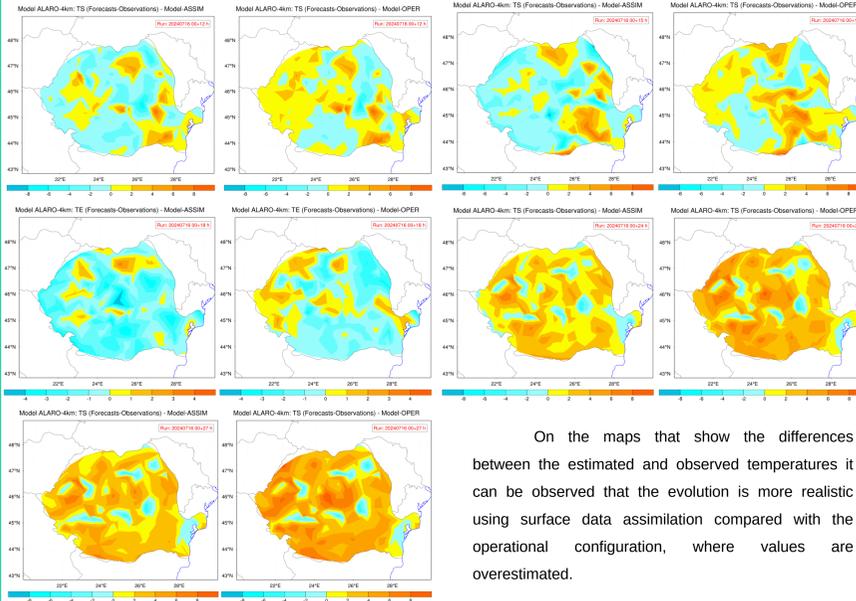
A major impact can be observed also for 2m relative humidity where the BIAS is overestimated.



Monthly BIAS (upper panel) and RMSE (lower panel) scores for RH2m for 00 UTC

**Case study:**

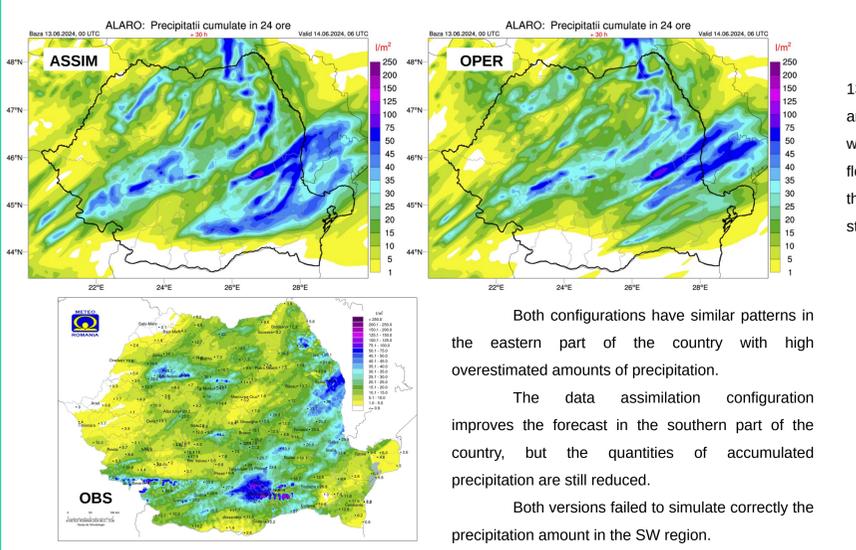
\* **2m temperature, 16 July 2024**



Forecast - Observation: ALARO with CANARI - left and ALARO OPER - right

On the maps that show the differences between the estimated and observed temperatures it can be observed that the evolution is more realistic using surface data assimilation compared with the operational configuration, where values are overestimated.

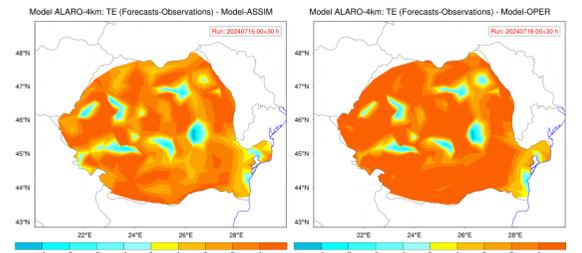
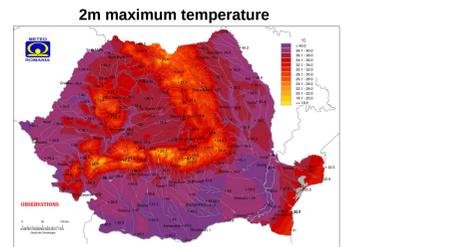
\* **24 hours cumulated precipitation, 13 June 2024**



Forecast - Observation: ALARO with CANARI (left) and F-O for ALARO OPER (right)

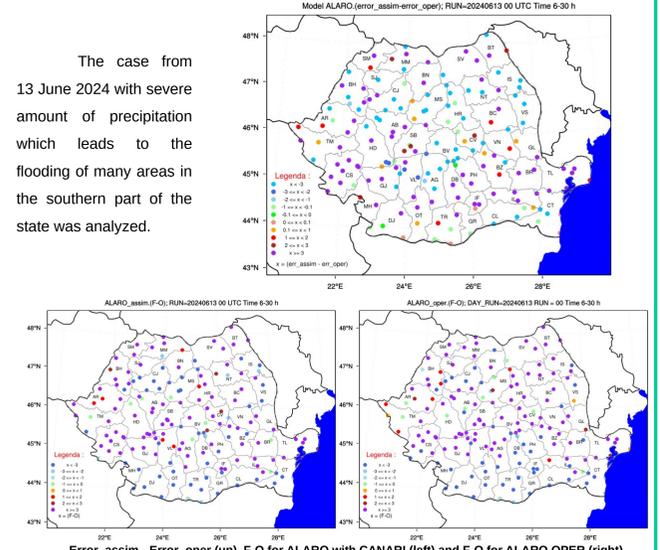
Both configurations have similar patterns in the eastern part of the country with high overestimated amounts of precipitation. The data assimilation configuration improves the forecast in the southern part of the country, but the quantities of accumulated precipitation are still reduced. Both versions failed to simulate correctly the precipitation amount in the SW region.

A heat wave from 8 - 20 July was analyzed. Results are shown for 16 July, when the maximum temperature reached 41.5° C at Bucharest-Filaret station, in the southern region.



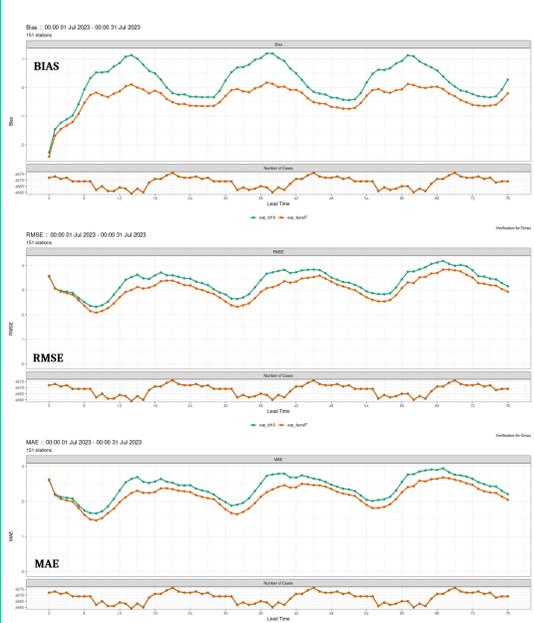
Forecast - Observation: ALARO with CANARI - left and ALARO OPER - right

The case from 13 June 2024 with severe amount of precipitation which leads to the flooding of many areas in the southern part of the state was analyzed.



Error\_assim - Error\_oper (up), F-O for ALARO with CANARI (left) and F-O for ALARO OPER (right)

**Evaluation of FACRAF's impact on 10m wind gust forecast**



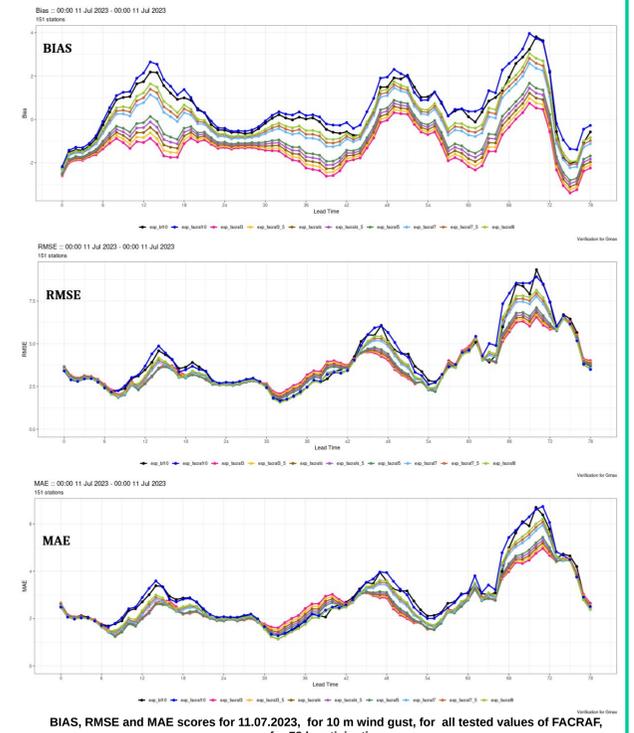
Monthly BIAS, RMSE and MAE scores for July 2023, run 00, for ALARO-oper version vs. ALARO\_facraf7 version

A series of experiments was done in order to tune the parameter FACRAF. Using HARP, a verification was performed to evaluate its impact on 10m wind gust forecast.

The experiments were obtained for the operational ALARO version at 4 km, cy43bf11, for several values for FACRAF. The evaluation was done using observation data from 151 stations, for July 2023. Several values for FACRAF were tested: 3, 3.5, 4, 4.5, 5, 7, 7.5, 8. The value of FACRAF in the operational configuration is 10. Several cases in July 2023 were selected because of the significant overestimation of the operational ALARO version.

Close values of FACRAF lead to similar results. It was observed that the overestimation of the wind gust is reduced, moreover, for some hours the bias is almost 0. There is an improvement in the scores over daytime, that is bigger than the underestimation introduced over nighttime. Overall in the monthly scores, the MAE score shows that the error is slightly smaller in all hours for FACRAF=7.

Also, the FACRAF's impact on other parameters forecast is unnoticeable.



BIAS, RMSE and MAE scores for 11.07.2023, for 10 m wind gust, for all tested values of FACRAF, for 78 h anticipation