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NWP activities in Romania

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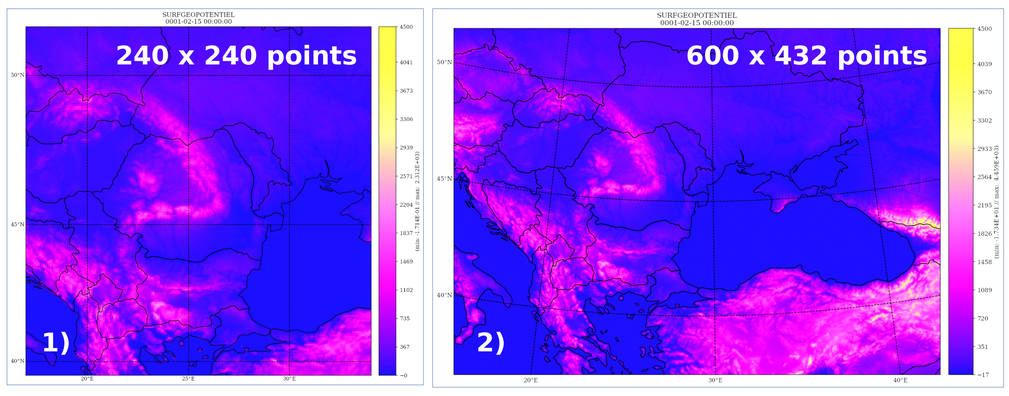
Operational configurations

1) ALARO 6.5: ALARO-0 baseline, Δx=6.5 km, L60, Δt=240 s

2) ALARO 4: ALARO1 vB, Δx=4 km, L60, Δt=180 s



- **cy43t2bf11**
- 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; no DA
- forecast range: 78/54/78/54 hours
- **2 parallel configurations**

- **Post-processing**

  FULLPOS in line – geographical grid

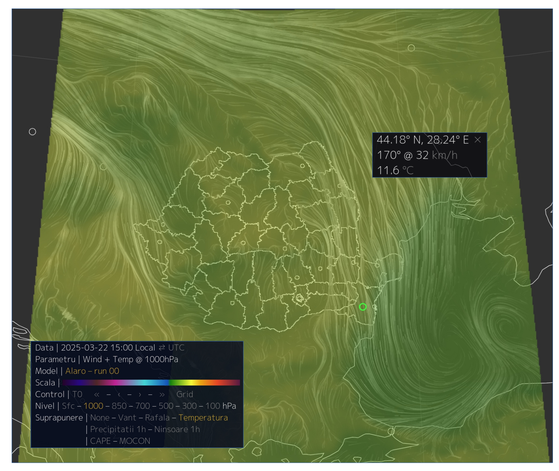
Downstream applications

Input for hydrological model

Visualization
Graphics based on package developed within NMA and RC-LACE, based on grib_api, perl and NCL-NCAR

Input for IBL visualisation system and other products for the internal webpage →

Statistical Adaptation Verification

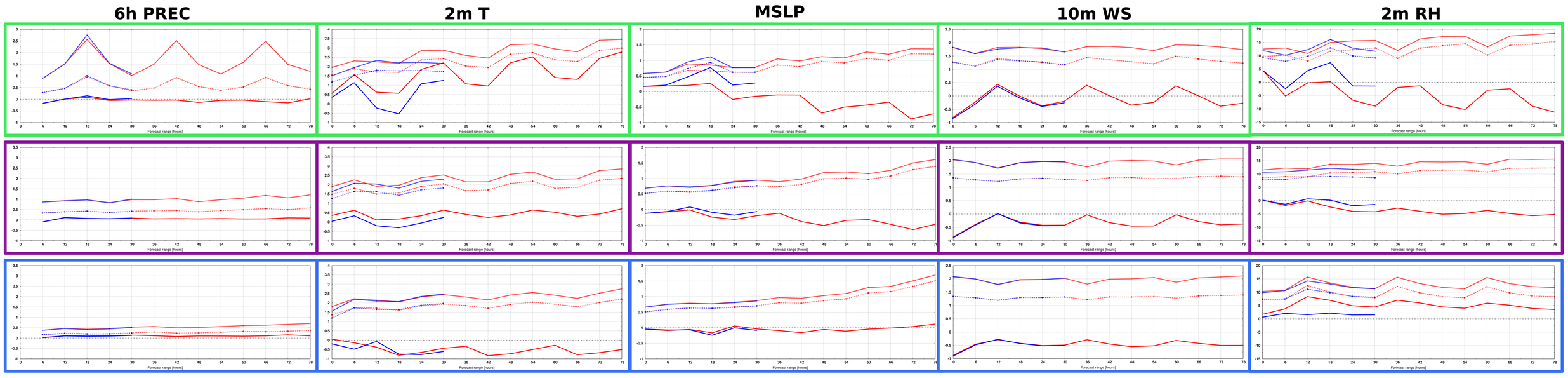


Verification results for preoperational DA

Since September last year the data assimilation system based on CANARI scheme runs in preoperational mode. The setup is based on cy43bf11, 4km horizontal resolution, 60 vertical levels and the forecast range is 30 hours, for 4 runs/day. Statistical scores were computed for a 9 month period: June 2024 – February 2025, to assess the impact it (DA – blue lines) has compared to the operational ALARO 4km configuration (OPER – red lines). Observations from 154 meteorological stations were used.

Summer 01.06.2024 – 31.08.2024
Autumn 01.09.2024 – 30.11.2024
Winter 01.12.2024 – 28.02.2025

BIAS - OPER
BIAS - DA
RMSE - OPER
RMSE - DA
MAE - OPER
MAE - DA



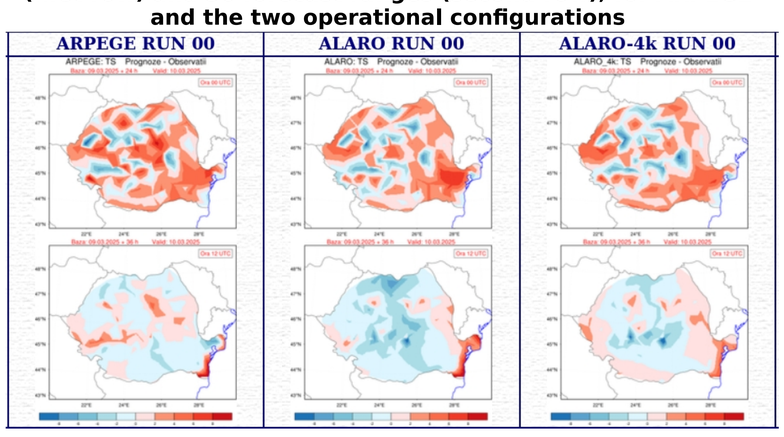
The results for 2 m temperature, mean sea level pressure, 10 m wind speed, 2 m relative humidity and 6 hours accumulated precipitation are presented here. The scores are computed for each season of the considered period: summer, autumn and winter. Most differences between the two forecasts appear in the summer season (first row). The data assimilation forecast seems neutral for the precipitation and wind speed scores. Concerning temperature, there is a visible reduction in the bias compared to the operational model that has a tendency to overestimate the real temperature in summer and autumn months. For relative humidity, the values are overestimated over daytime in the summer season, while in autumn and winter the DA forecast obtained better scores than the operational one. Similar pattern was found for mean sea level pressure, but to a lesser degree.

Some results related to the temperature forecast

In the evaluation of the statistical scores, it was observed that the temperature forecast of ALARO generally overestimated the real values over nighttime. Since the scores are computed as an average on all the meteorological stations over Romania, some information related to more local behaviour can be easily missed. Error maps showing the forecast – observation values over the whole territory reflect this.

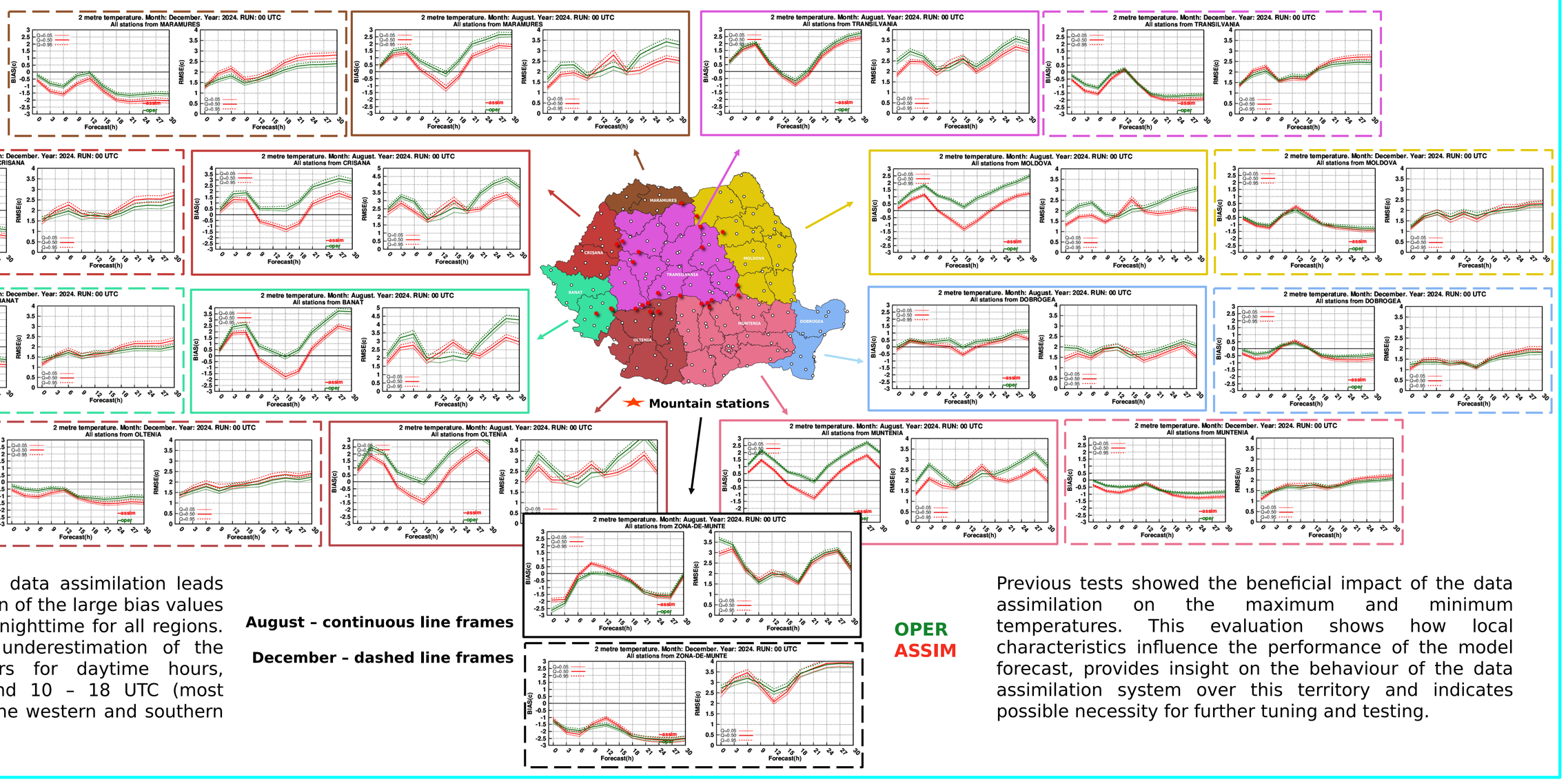
To go into more detail in this sense, monthly scores (bias and RMSE) were computed separately for each 8 regions of the country, to which an additional category was considered – the mountain stations (they are located over 800 m altitude). The results are presented here for August and December 2024, for the operational 4km version and ALARO with CANARI.

Forecast – observation from 09.03.2025, 00 UTC run, 24 (first row) and 36 forecast ranges (second row), for ARPEGE and the two operational configurations



As seen in the seasonal scores, the forecast for the winter period seems to determine most similarities between the two model versions performance. We can observe for the month of December that the results are consistent for all regions. In the western part of the country, the bias values are largest, going up to 4 degrees. The operational model seems to have a slight advantage in terms of bias, but the difference is usually around or less than 0.5 degrees.

For August, different pattern occurs, on multiple levels: the overall errors are more significant for both models, the differences between them are larger and the results present slightly more dissimilarities between the considered regions. In Transilvania (magenta) and Dobrogea (blue) the models perform similarly.



In August, the data assimilation leads to the reduction of the large bias values obtained over nighttime for all regions. However, an underestimation of the values appears for daytime hours, typically around 10 – 18 UTC (most significant in the western and southern regions).

August – continuous line frames

December – dashed line frames

OPER
ASSIM

Previous tests showed the beneficial impact of the data assimilation on the maximum and minimum temperatures. This evaluation shows how local characteristics influence the performance of the model forecast, provides insight on the behaviour of the data assimilation system over this territory and indicates possible necessity for further tuning and testing.