

Numerical Weather Prediction at NIMH

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1. Operational Suite

Four canonical configurations based on cy43t2 are run at 00, 06, 12 and 18 UTC:

	ALADIN-BG	AROME-105	AROME-IFS	AROME-DA
Horizontal resolution	5 km (256x200)	2.5 km (320x240)	2.5 km (320x240)	2.5 km (320x240)
Vertical levels	105	90	105	105
LBCs, frequency	ARPEGE, 3h	ARPEGE, 1h	IFS, 1h	ARPEGE, 1h
Forecast range	72h/48h	72h/48h	72h/48h	72h/48h
Data assimilation	No	No	No	Surface data assimilation

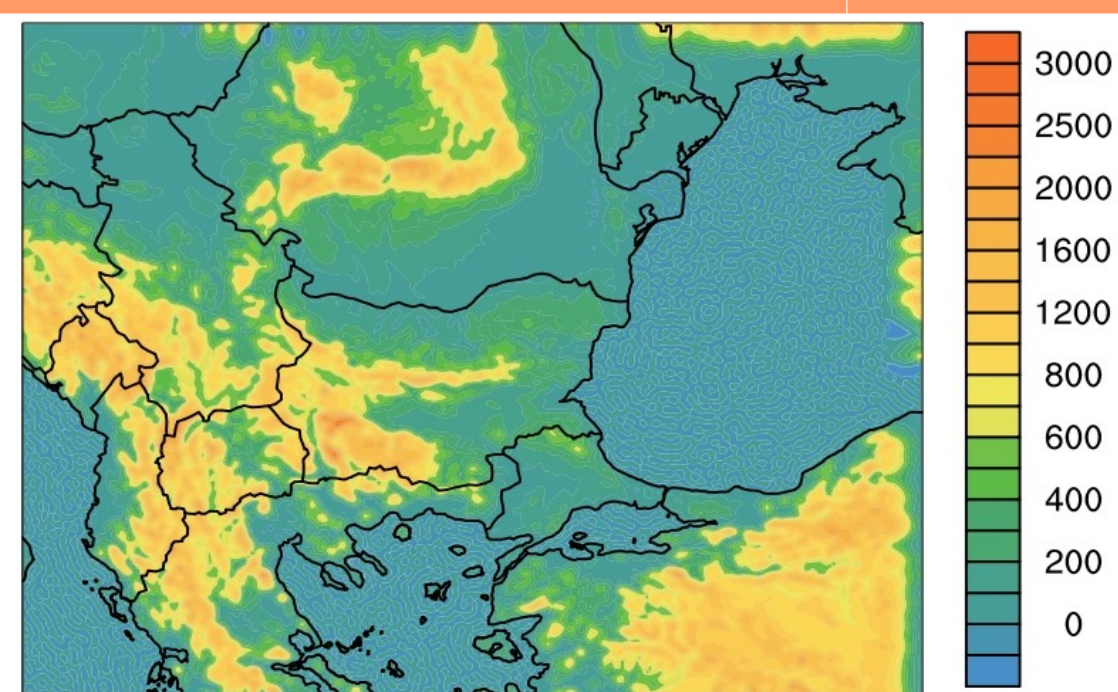


Fig.1. ALADIN-BG domain of integration with orography

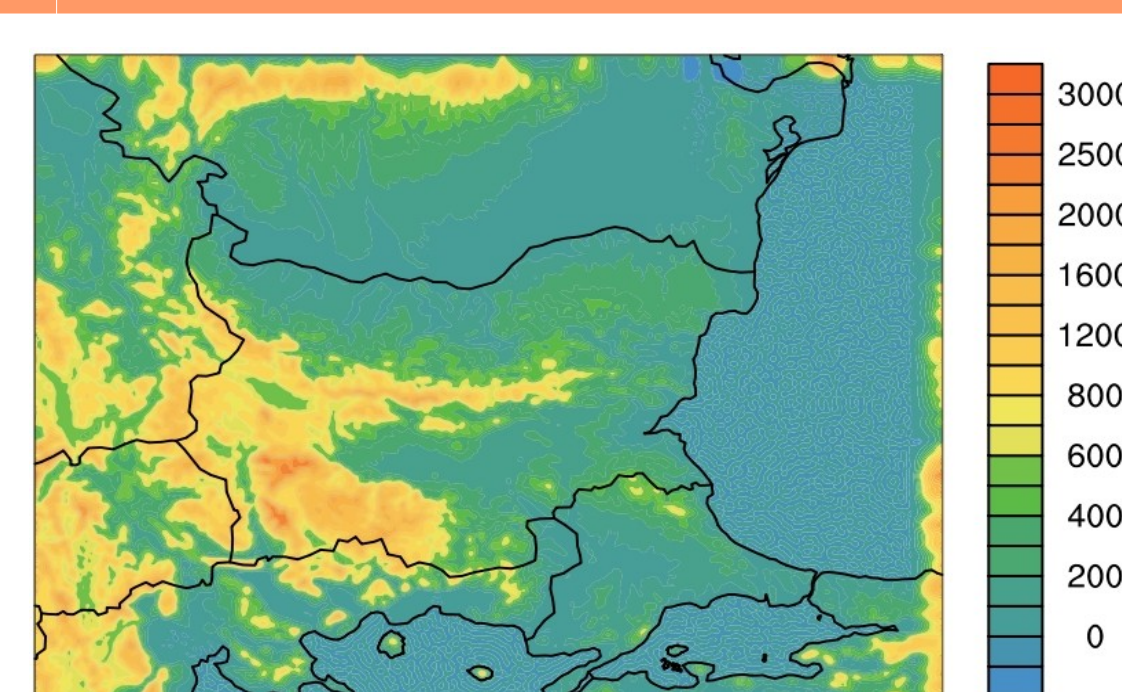


Fig.2. AROME domain of integration with orography

2. Operational Cluster

- Scientists from the "Numerical Modeling" section administrate and maintain the WOLF (Weather Operational Numerical Forecast) cluster. WOLF is made up of 17 nodes, QNAP and server that hosts virtual machines hosting computing access and monitoring services. This cluster of machines is managed by a central management module for all machines, including the management server. The seventeen "nodes" communicate during operation using means for multi-processor parallel communication between the nodes (Message Passing Interface - MPI), and the distribution of resources is carried out by SLURM system.

- Work is ongoing on model installation based on cy48t2 on the EWC.

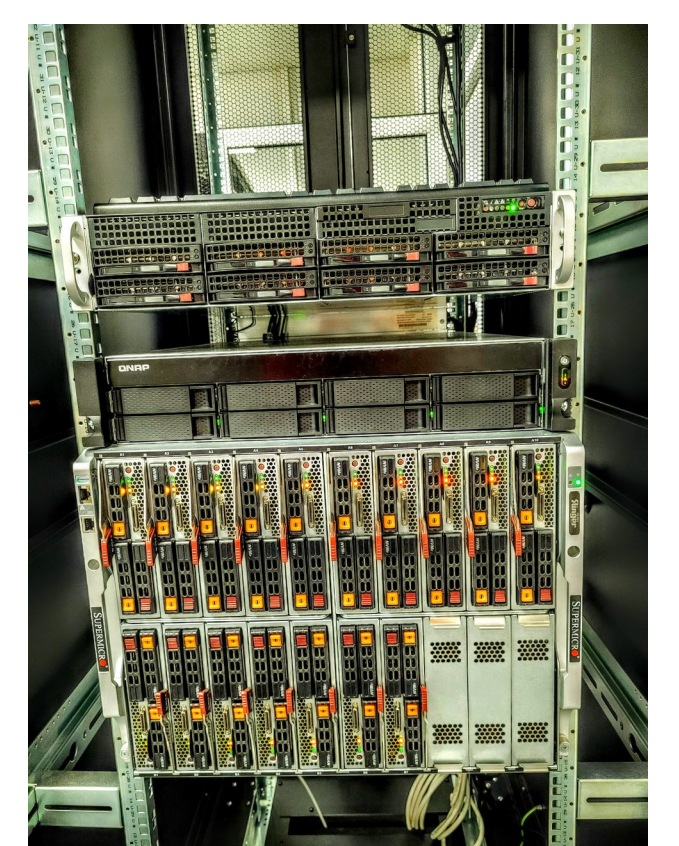


Fig.3. WOLF cluster at NIMH

3. Verification

We use our automated scheme for forecast verification of models forecast of temperature and relative humidity at 2m, wind speed and direction at 10 m, and 6h/12h precipitation based on synoptic measurements.

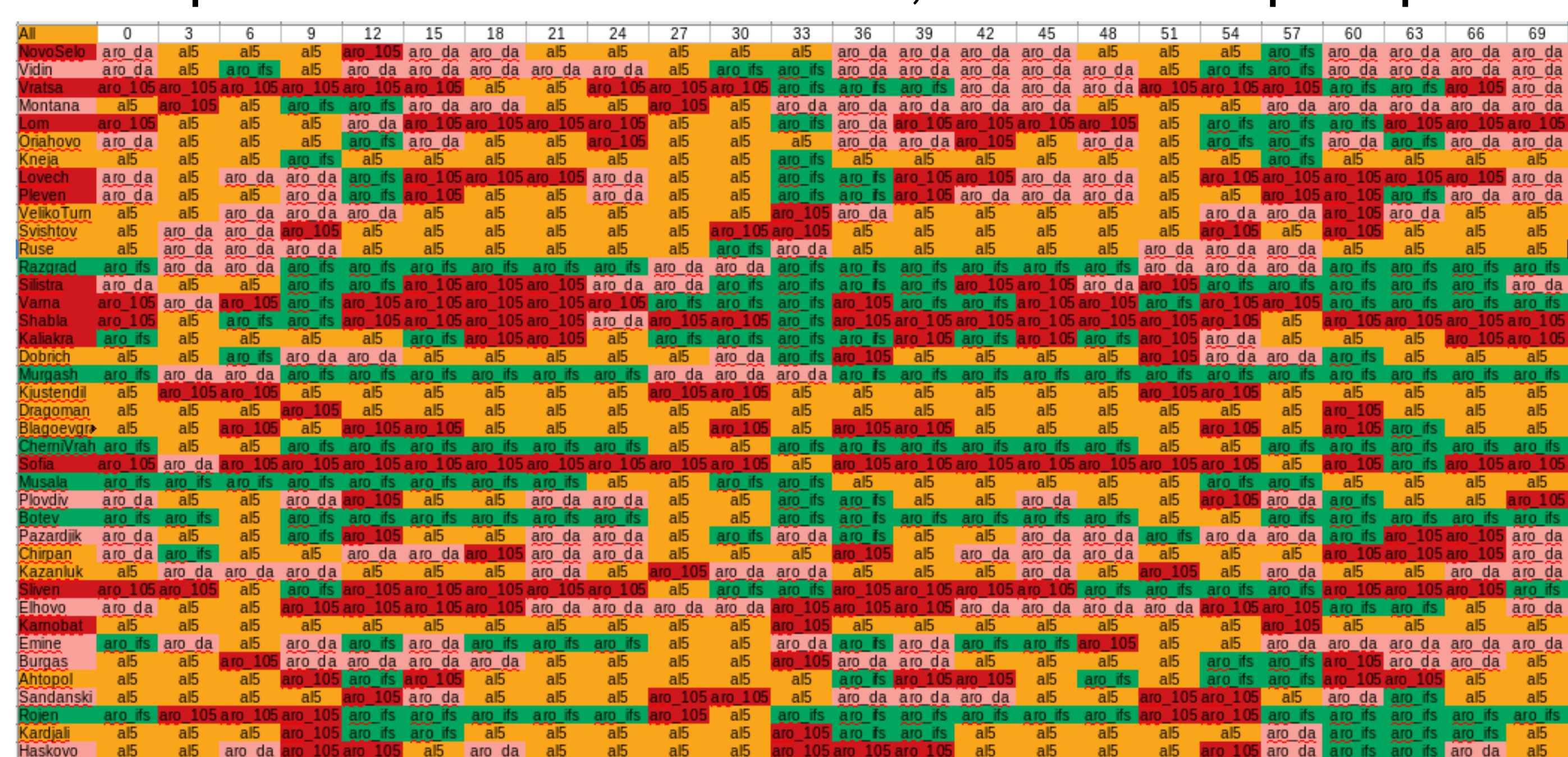


Fig.4. January 2025: Model with best performance (lowest RMSE) for 2m Temperature for each station at each forecast lead time

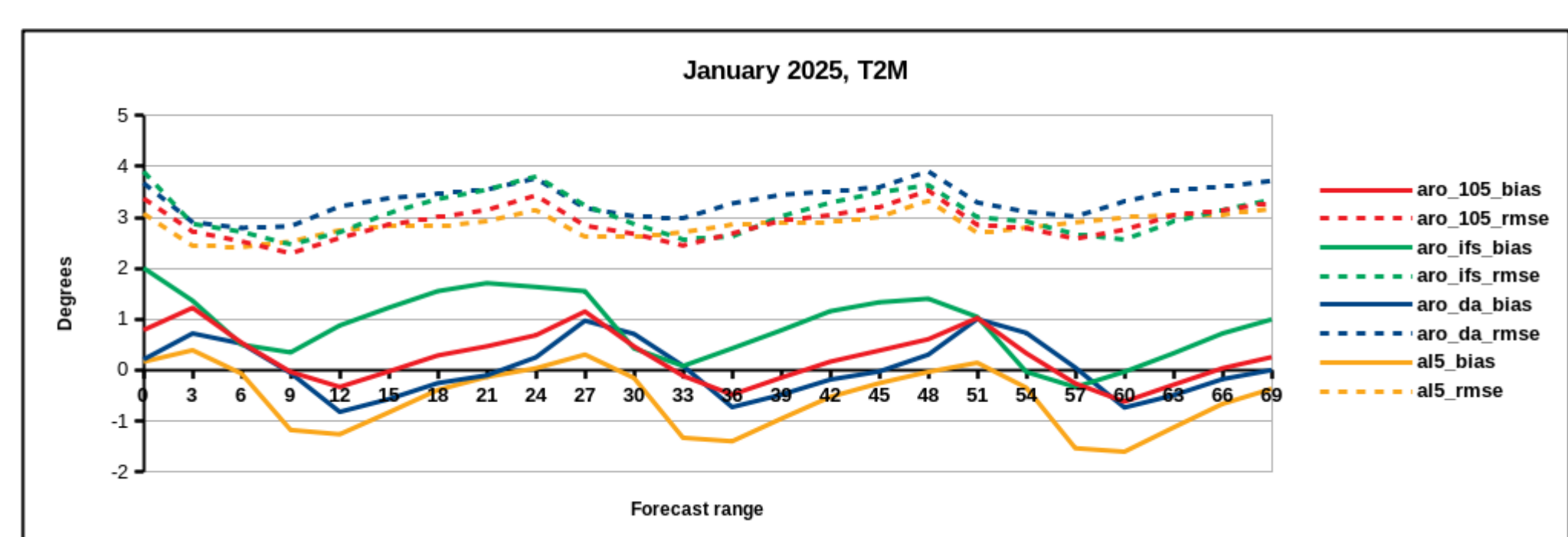


Fig.5. January 2025: Mean Monthly BIAS and RMSE for 2m Temperature for all synoptic stations for AROME-105, AROME-IFS, AROME-DA and ALADIN-BG as a function of the forecast range

4. Some specific NWP forecast postprocessing

Probability of lightning activity prediction based on AROME-105 microphysics

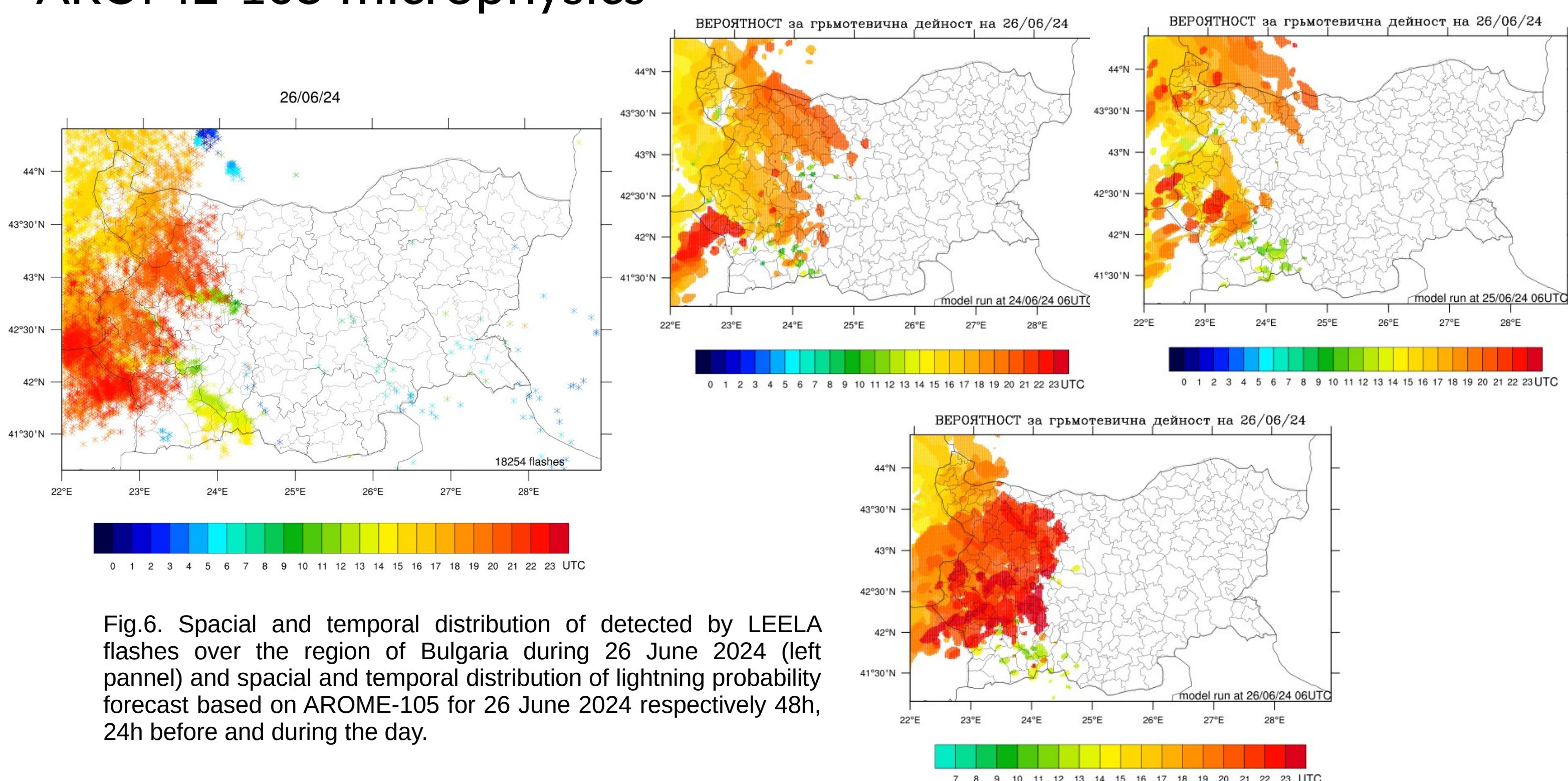


Fig.6. Spatial and temporal distribution of detected by LEELA flashes over the region of Bulgaria during 26 June 2024 (left panel) and spatial and temporal distribution of lightning probability forecast based on AROME-105 for 26 June 2024 respectively 48h, 24h before and during the day.

5. NWP Forecast End-users

The main end-users at NIMH: forecasters, Section "Specilized and maritime forecast", Section "Hydrological forecast, Section "Agrometeorology", Section "Atmospheric Pollution Modelling", We serve about 10 public and private enterprises as BULATSA, ELECTROHOLD, ...

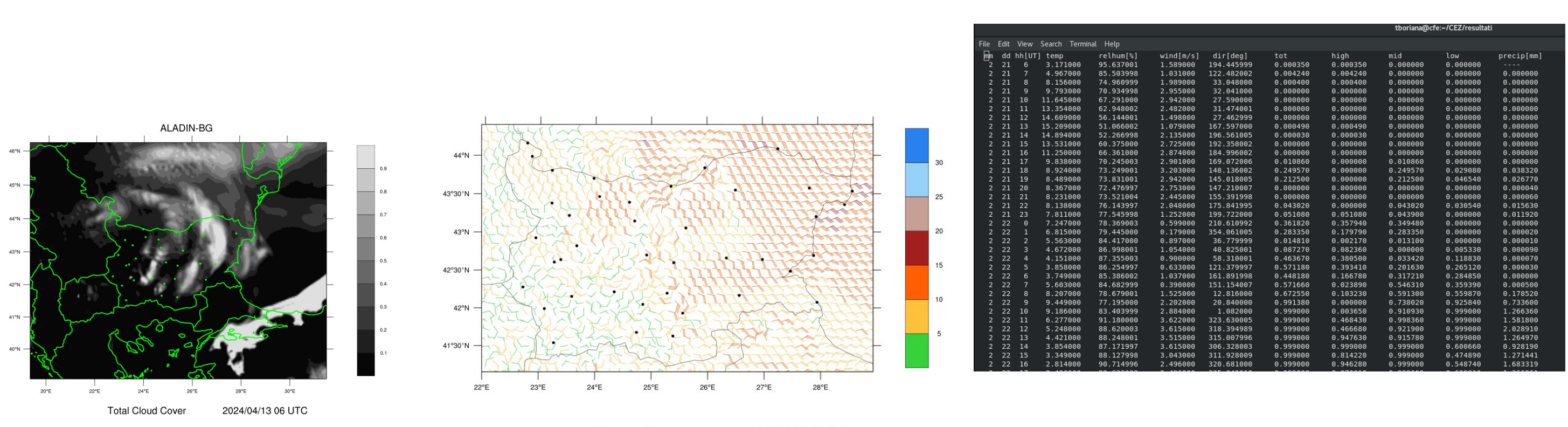


Fig.7. Some examples of operational post-processing depending of the needs of the end-users