

Operational Configurations

ALARO-TURKEY

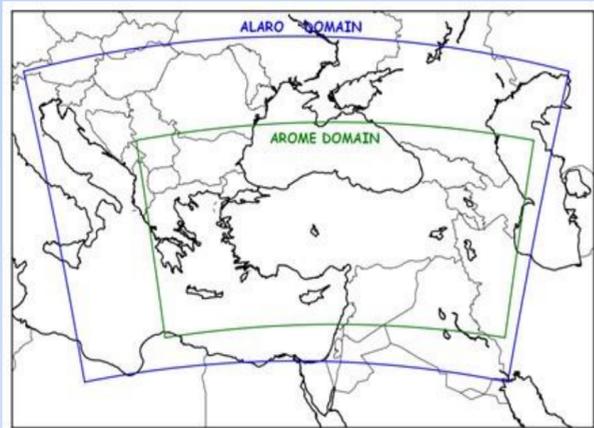
Current operational suite:
Model version: cy43t2_bf10

Model geometry

- 4.5 km horizontal resolution
- 450 X 720 grid points
- 72 vertical model levels
- Linear spectral truncation
- Lambert projection

Forecast settings

- Digital filter initialization
- 180 sec time-step
- Hourly post-processing
- 4 runs per day at 00, 06, 12 UTC (up to t+72) and 18 UTC (up to t+60).
- Coupling with ARPEGE LBC files at every 3 hours



AROME-TURKEY

Current operational suite:
Model version: cy43t2_bf10

Model geometry

- 1.7 km horizontal resolution
- 629 X 1589 grid points
- 72 vertical model levels
- Linear spectral truncation
- Lambert projection

Forecast settings

- 50 sec time-step
- Hourly post-processing
- 4 run per day at 00,06,12,18 UTC up to 48 hourly forecast
- Coupling with ALARO-TR hourly

Parallel Suite

AROME-RUC

(CANARI-OIMAIN & 3D-VAR)

Model version: cy43t2_bf10

Model geometry

Same as operational AROME

Forecast settings

Coupled to ECMWF-IFS, forecasts up to t+24

Assimilation settings

- 3 hour assimilation cycle
- Surface Assimilation- Canari OI Main
- Upper Air Assimilation – 3D-Var
- Ensemble B-Matrix calculated from ECMWF-EPS with Bxflow
- Coupling with ECMWF LBC files at every 3 hours

Observation usage

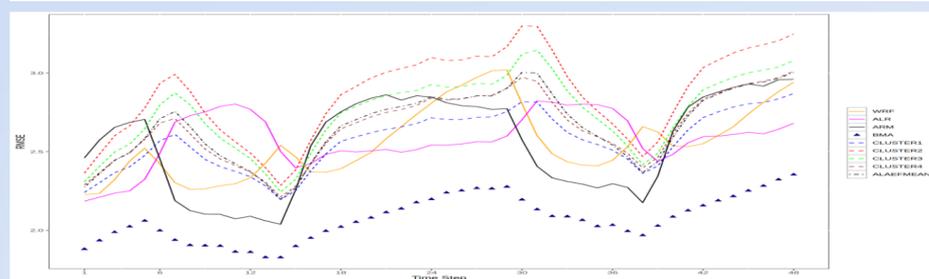
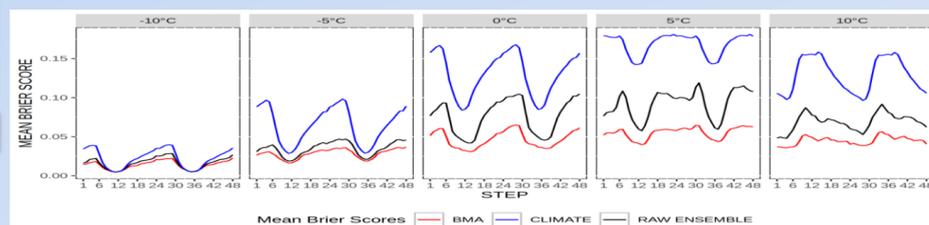
- SAPP Observations GTS Local – Synop & Temp & Amdar

Calibration Tests of Multi-Model 2-Metre Temperature Forecast EPS

Summary: Bayesian Model Averaging (BMA) method has been utilized to calibrate hourly 2-Metre Temperature raw forecasts up to 48 hours at 79 meteorological stations over Turkey. The operational NWP models (ALARO, AROME, A-LAEF and WRF) at TSMS are used to build multi-model ensembles. In the end, experimental BMA method is compared to operational Kalman Filter for daily maximum and minimum temperatures 79 stations over Turkey for the same testing period.

- 2-metre temperature hourly forecast and measurement results were matched between 01/10/2021 and 12/02/2022 and used in the training and testing phase of the BMA method.
- Testing period covers 11/11/2021– 12/02/2022, that means training starts 40 days earlier for each training time step.
- BMA method assigns order of importance (weight) to each forecast, AROME model has the largest order of importance.
- A-LAEF members are grouped into four clusters by paying attention to use same physics configuration of ALARO for microphysics, radiation, convection and turbulence.
- Hourly 2-Metre temperature forecasts (T+1 to T+48) are used.
- All models used in BMA ensemble system are initialized at 00 UTC.
- Hourly 2-Metre temperature observations covering the period of 01/10/2021 - 12/02/2022 for 79 meteorological stations representing the country is used for validation.
- Model forecasts have been bi-linearly interpolated.
- It was seen that the new temperature prediction created by BMA was more successful than each of the model predictions in the system.
- BMA is clearly more successful in daily 2-Metre min temperature forecasts than KF, but in daily 2-Metre max temperature forecast values of KF and BMA are quite close in terms of calculated errors.

- ALARO
- AROME
- WRF
- ALAEF CTL
- ALAEF - CL 1
1, 5, 9, 13
- ALAEF - CL 2
2, 6, 10, 14
- ALAEF - CL 3
3, 7, 11, 15
- ALAEF - CL 4
4, 8, 12, 16



	Daily Max Temp (79 Station MAE Avg.)	Daily Min Temp (79 Station MAE Avg.)		Daily Max Temperature	Daily Min Temperature
BMA	1.642	1.640	BMA	32/79 (~%40)	43/79 (~%54)
KALMAN	1.639	1.771	KALMAN	29/79 (~%36)	20/79 (~%25)
AROME	1.765	1.977	AROME	17/79 (~%21)	13/79 (~%16)

HPC Systems at TSMS



SGI ICE XA (Water cooled) System

- 288 nodes, E5-2690v4 Broadwell, 2.6GHz, 14 Cores (Total 4032 Core), 192GB DDR4 RAM per node
- ~168 Tflops peak performance
- OmniPath (100 Gbps),
- Enhanced Hypercube Interconnect Topology
- Altair PBS Pro
- SLES 12
- Intel Parallel Studio XE Cluster Edition
- SGI Lustre System ; 350TB disk storage

(Installed at Turksat Headquarter)

Interactive Web Page for A-LAEF Outputs

- A-LAEF model outputs are shown on the interactive web page created by TSMS' NWP Division.

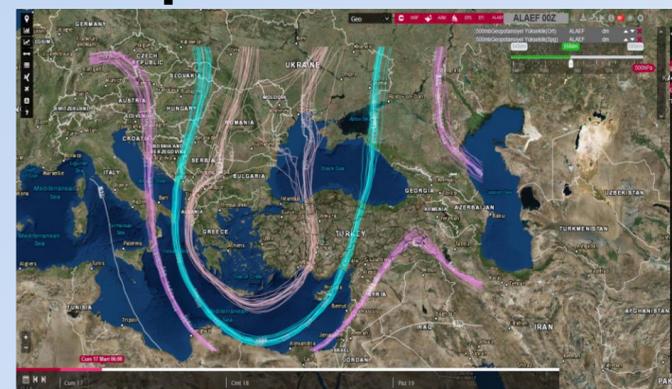


Figure 1. Spaghetti plot of 500 hPa geopotential height



Figure 2. Probability of total precipitation of 24-Hour at Surface Level

Available plotting options for internal users

- Spaghetti plots for upper air parameters
- Ensemble mean for surface parameters
- Probability for selected threshold

Future Plans

- Addition of new observation into DA System (Radar, GNSS, MODES Data)
- Operational usage of HARP (Adaptation tests continue on ECMWF-HPC)
- Adaptation of C-LAEF for Turkish domain (Planned stay in GeoSphere in 2023)
- Calibration studies for ALARO and AROME models