



ALADIN Related Activities in TURKEY



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Operational Configurations

ALARO-TURKEY

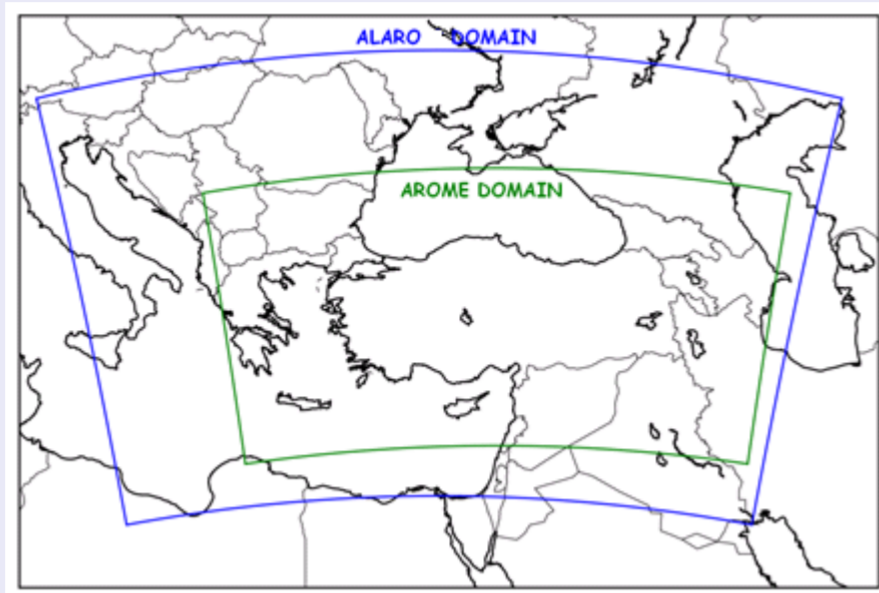
Current operational suite:
Model version: cy40T1bf7

Model geometry:

- 4.5 km horizontal resolution
- 450 X 720 grid points
- 60 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

Pre-operational suite (at New HPC)
Model version: cy41t1

Model Geometry:

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

Forecast settings

- Digital filter initialization
- 60 sec time-step
- Hourly post-processing
- 4 run per day at 00,06,12,18 UTC up to 48 hourly forecast
- Coupling with ALARO at every 1 hours

HPC Systems at TSMS

SGI Altix 4700

- 512 core based Intel Itanium2 each at 1.67 GHz.
- Total Peak performance 3.4 TFlops
- Total memory 1 TB
- 2 Login, 2 Services Nodes and 3 Xeon based postprocessing Nodes
- 30 TB Disk Storage



SGI UV 2000

- 256 core based Intel Xeon E5 each at 2.4 GHz.
- Total Peak performance 2.5 TFlops
- Total memory 1 TB
- 10TB SAS, 30TB SATA Disk



Calculation of New B matrix Using Ensemble Method for ALARO Turkey cy40t1

The B matrix was calculated by ensemble approach using 4 global ARPEGE analysis members. The calculation was done for the period of February 1-14 2018 and 4 runs (00, 06, 12, 18) a day were included. All members were downscaled to ALARO Turkey cy40t1_bf05 resolution (4.5 km). Since the length of the assimilation cycle is 6 hours, +6h forecasts were produced.

The namelist switch **LFEMARSD** was set .T. to obtain differences of prognostic variables in grib format and **LSPRT** was set .F. to calculate temperature differences.

Totally, 112 forecast differences (14 days and 4 runs a day) were obtained from 4 members (RUN2-RUN1, RUN4-RUN3) and used as inputs of B matrix calculation. The B matrix and related diagnostics were calculated by programs FESAT and FEDIACOV using cy40t1_bf05.

After having the new B matrix and its diagnostics, the results of ensemble method were compared to operational B matrix diagnostics, which were calculated by NMC method for cy38 (using period of August 1-October 29 2015, 90 days). The horizontal and the vertical resolutions in cycle 38 were same as in cycle 40 (4.5 km, 60 levels).

Vertical profiles of standard deviations of vorticity, temperature, specific humidity and divergence are shown in Figure 1 and 2. For temperature, vorticity and divergence vertical profile of ensemble standard deviation is greater. Only for specific humidity and vorticity in higher levels, the ensemble standard deviation is reduced. Vertical profiles of correlation length scales are plotted in Figure 3 and 4. For vorticity, temperature and divergence, ensemble length scale is shorter than NMC. However for specific humidity in the higher levels, ensemble length scale is longer.

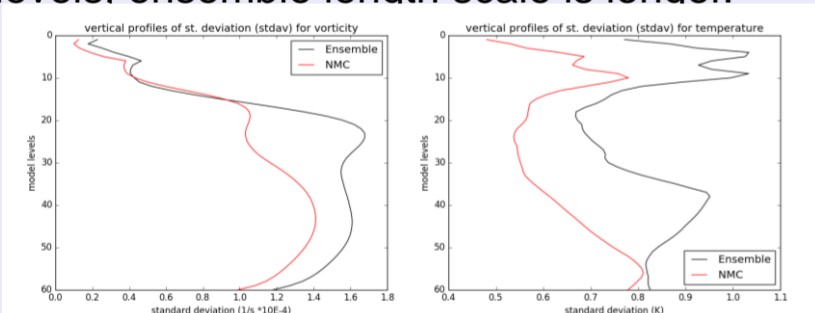


Figure 1: Vertical Profiles of St.Dev. for Vorticity and Temperature

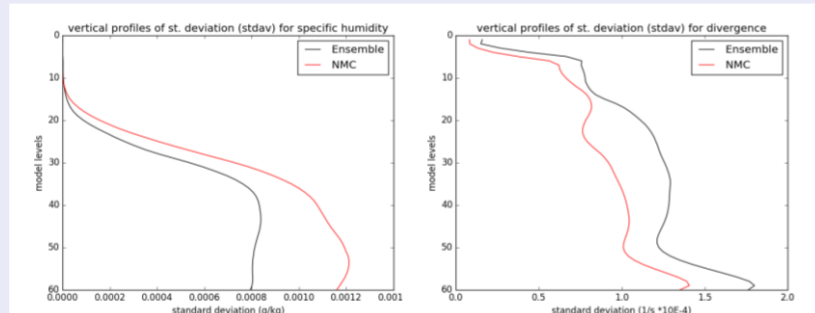


Figure 2: Vertical Profiles of St.Dev. for Spec.Humidity and Divergence

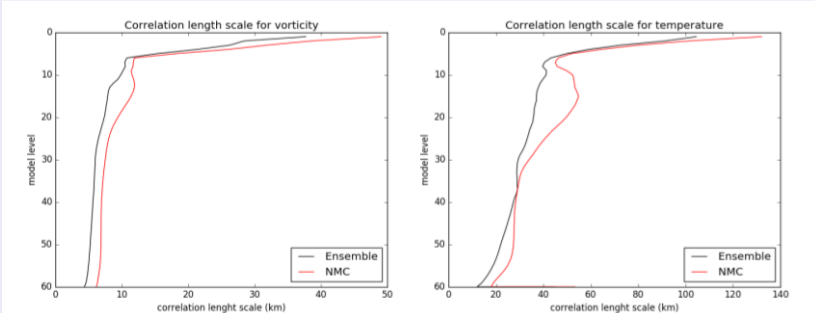


Figure 3: Correlation length scales for Vorticity and Temperature

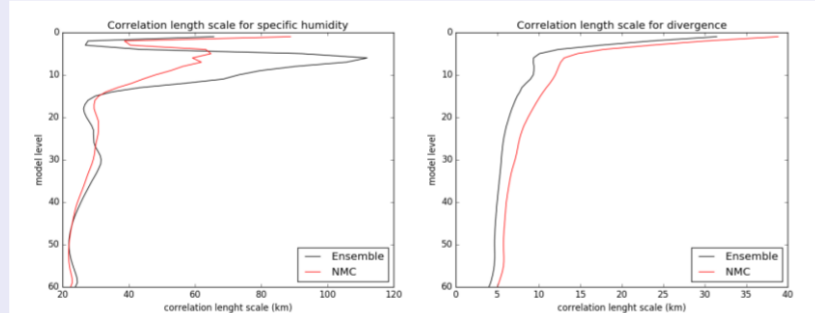


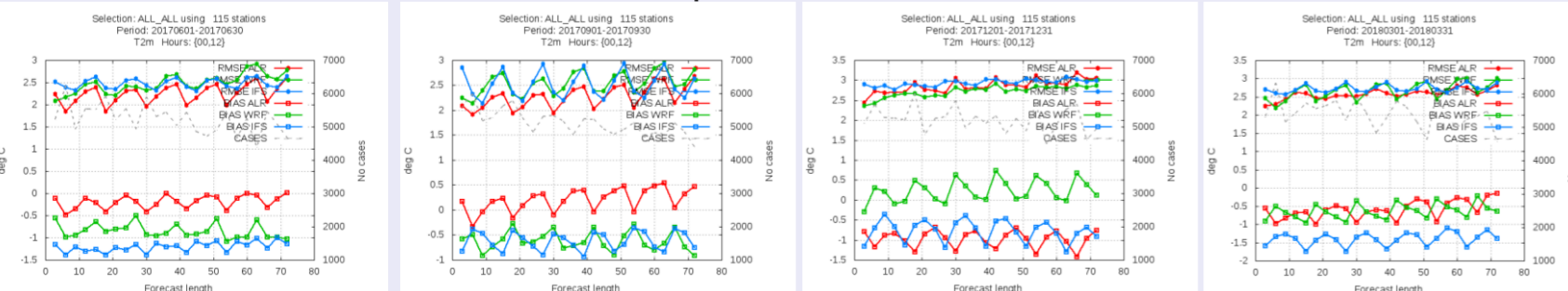
Figure 4: Correlation length scales for Spec.Humidity and Divergence

Comparisons & Verification (ALARO-1 ECMWF WRF)

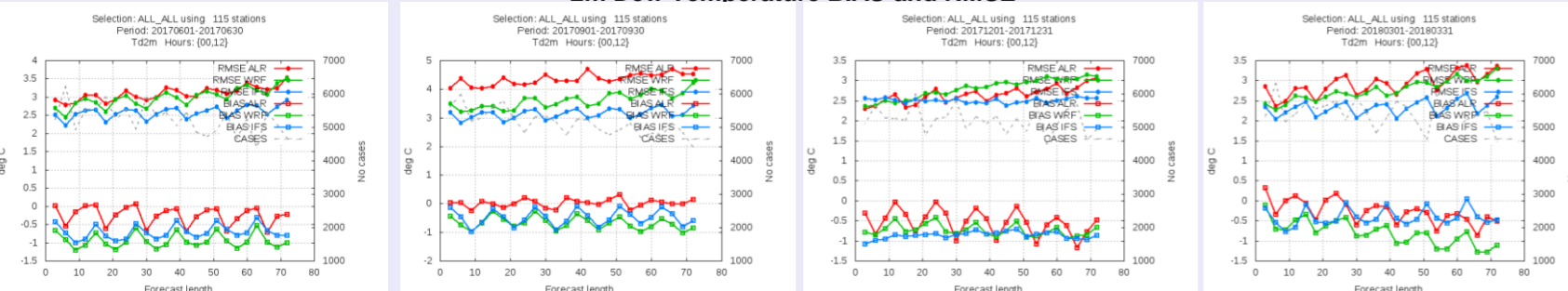
TSMS run both ALARO-1(cy40t1) and WRF model at local systems. WRF and ECMWF model outputs are also added to Harmonie Verification Tools at 00-12 GMT for monthly comparisons and verifications. 120 Turkish synoptic and 7 radio-sonde stations used for verifications.

June 2017 September 2017 December 2017 March 2018

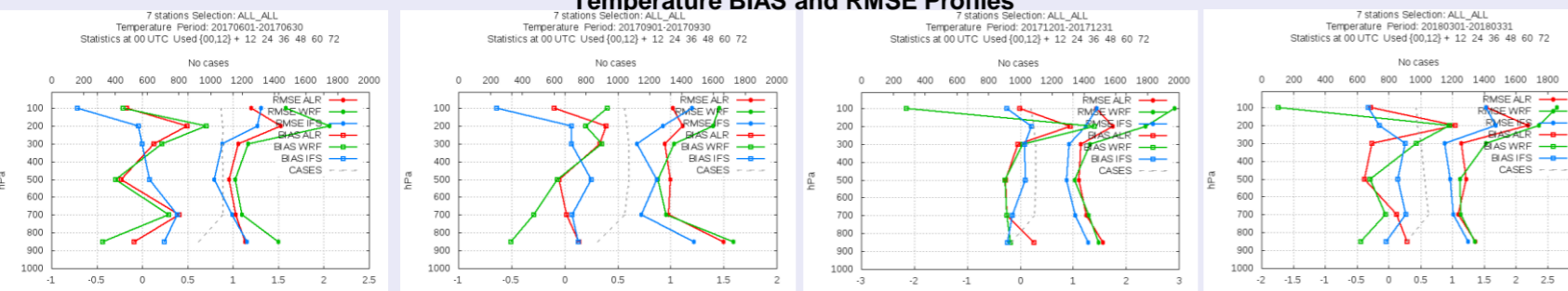
2m Temperature BIAS and RMSE



2m Dew Temperature BIAS and RMSE



Temperature BIAS and RMSE Profiles



New HPC at TSMS

TSMS has been completed a new HPC (SGI ICE XA) tender progress and installed at TURKSAT Headquarter. Models are running as parallel suite and old HPC will be switched off on May.



SGI ICE XA (Water cooled) System

- 288 nodes, E5-2690v4 Broadwell, 2.6GHz, 14 Cores (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

Case Study İstanbul Hail Storm

On July 27th 2017, İstanbul was hit by a severe summer storm with heavy rain, strong winds and golf ball size hail. The storm effected İstanbul between 15.15-15.45 GMT and caused widespread damage on vehicles and injured at least 10 people. Also several airplanes landing at İstanbul Atatürk Airport were damaged by the hailstorm.

TSMS run operationally Alaro-1, WRF and Arome without DA. It was observed that both operational models (Alaro-1,Wrf, Arome, ECMWF Hres) expected rain after 16.00GMT over İstanbul. Also TSMS run Alaro-1 with 3D-Var DA in test mode with different inputs such as only conv. obs., conv+Seviri 70km thinning distance and conv+Seviri 35km thinning. ALR+3DVar model outputs produced more realistic precipitation amounts and areal coverage for this case. Although Arome forecasts significant rain after 16.00 GMT, it didn't forecast hail over İstanbul.

