



NWP Related Activities in TURKEY



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Operational Configurations

ALARO-TURKEY

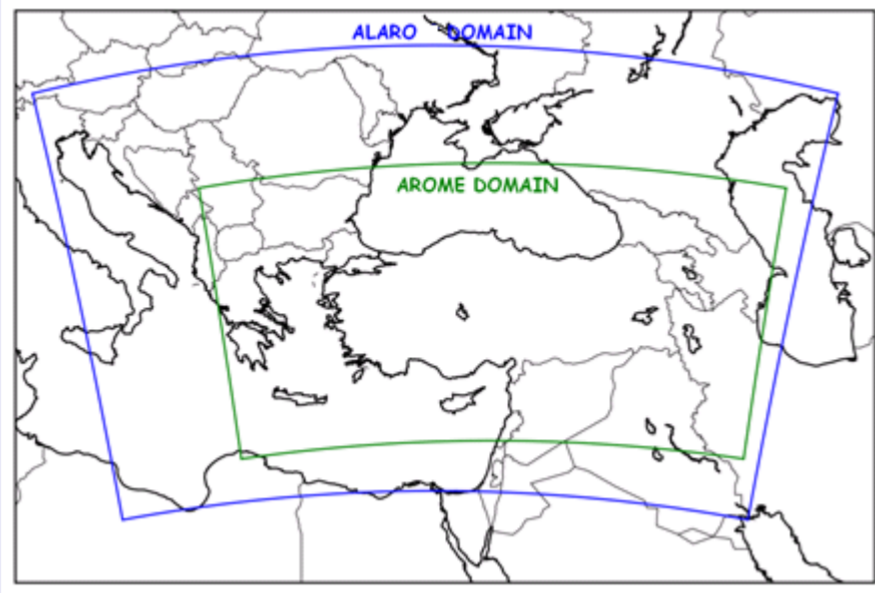
Current operational suite:
Model version: cy40T1bf5

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:
Model version: cy38t1

Model Geometry:

- 2.5 km horizontal resolution
- 512 X 1000 grid points
- 60 vertical model levels
- Linear spectral truncation
- Lambert projection

Forecast settings

- Digital filter initialization
- 60 sec time-step
- Hourly post-processing
- 1 run per day at 00 UTC up to 48 hourly forecast
- Coupling with ARPEGE LBC files at every 3 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



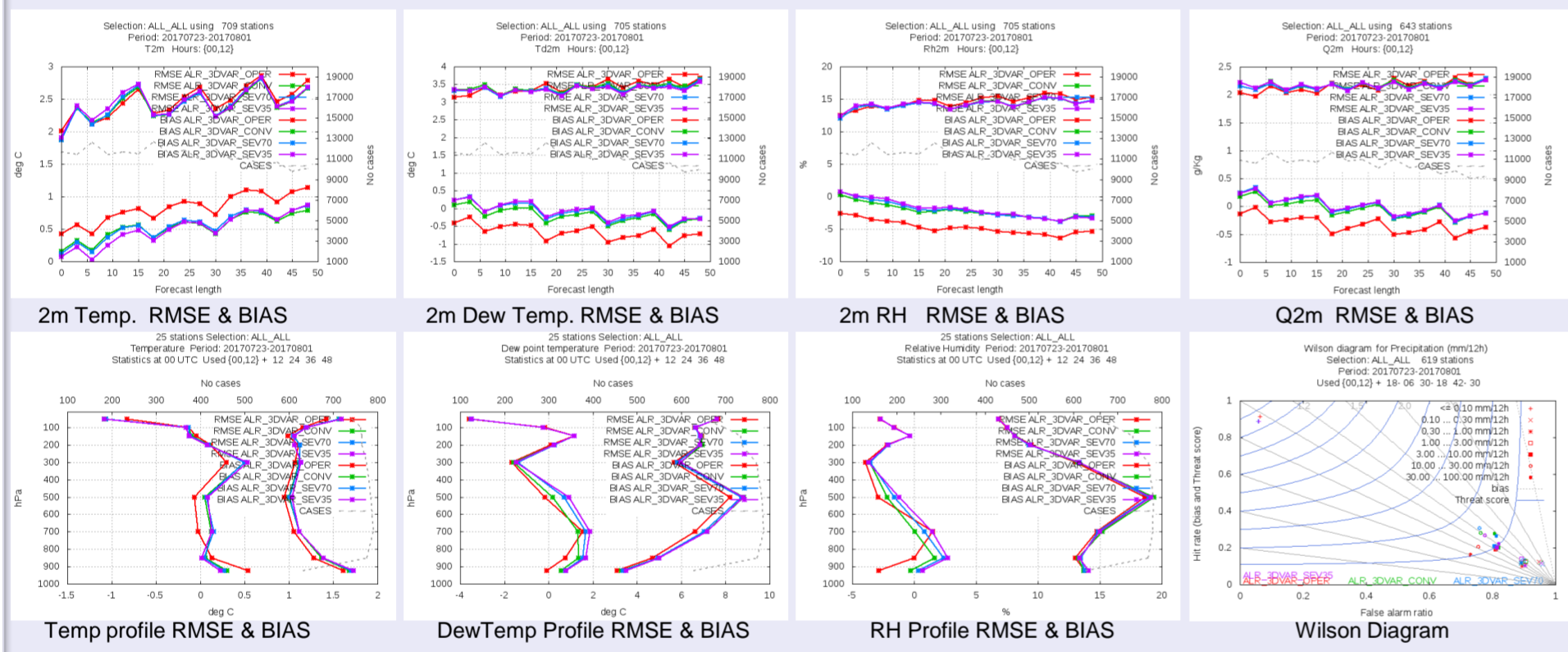
SGI UV 2000

- 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



Assimilation of SEVIRI Radiances into the ALARO Model

The ALADIN 3D-Var data assimilation system is being tested at TSMS since 2016. This work aims at adding MSG/SEVIRI radiances on the top of conventional observations which include synop, temp and mdgr observations. The measured radiances from two water vapour channels (the 6.25 μm and 7.35 μm) were used for assimilation. In this context, three experiments were prepared. In the first experiment only conventional observations were added to the operational ALARO model and assimilated. In the second experiment, SEVIRI radiances were added and assimilated on the top of conventional observations with 70 km thinning distance and in the last one SEVIRI radiances with 35 km thinning distance were used in the assimilation system together with conventional observations. After the minimization step, the biases of radiances were corrected iteratively using VarBC method, starting from zeroed bias coefficients. Primarily, the biggest improvement was found on near surface humidity. Moreover, the improvement in the humidity field leads to enhance the short-range precipitation forecast.



New HPC at TSMS

TSMS has been completed HPC tender on December 2016 to replace the old HPC system by the new one (SGI ICE XA). The installation started at TURKSAT Headquarter on April 2017 and acceptance tests have been finished on July 2017.



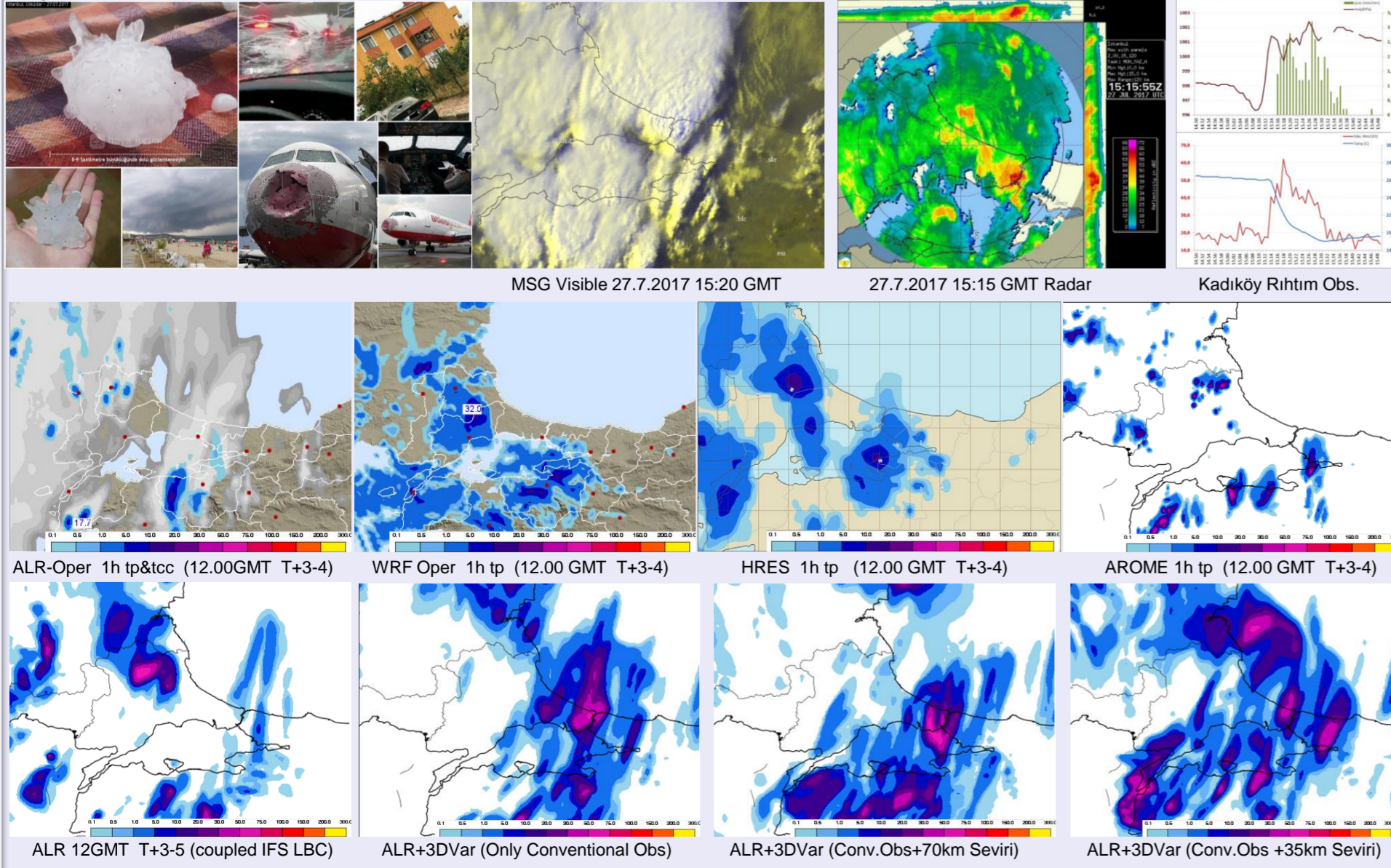
SGI ICE XA (Water cooled) System

- 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 expects significant rain after 16.00 GMT, it didn't forecast hail over İstanbul.



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.

