NWP Related Activities in TURKEY

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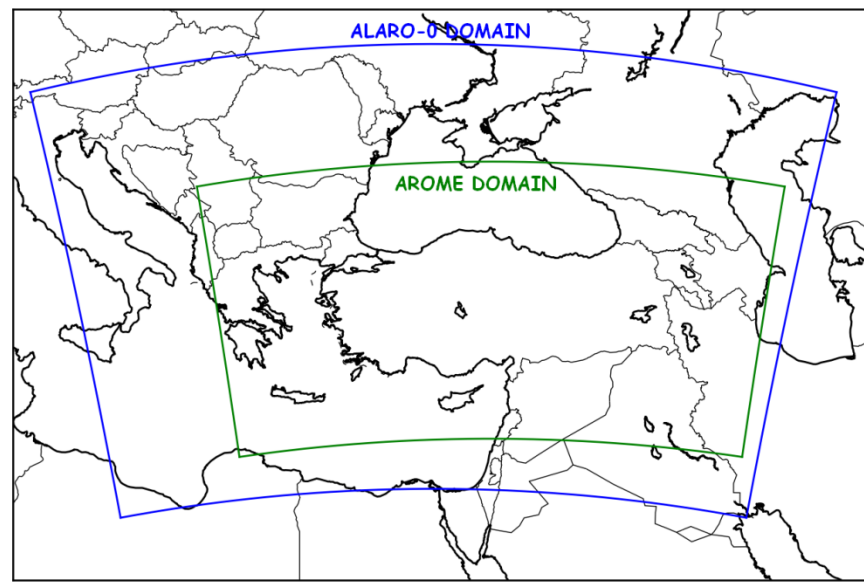## Operational Configurations

ALARO-0 TURKEY

Current operational suite:
Model version: cy38T1bf3

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

Current 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
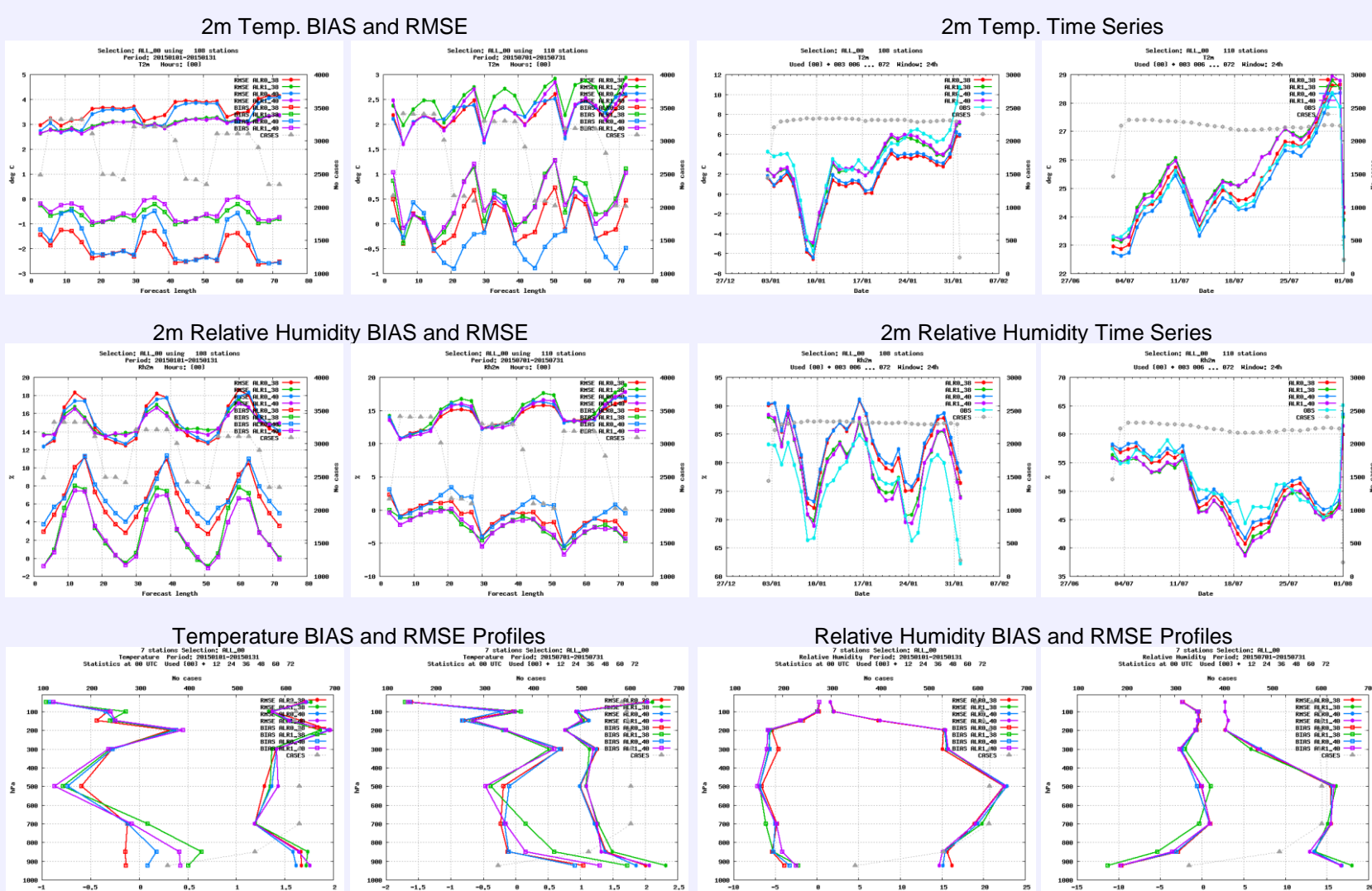
Interactive Web Page

TSMS is using a web-based visualization tool which aims to give interactive services that provide parameterized graphical products to authorized users. The framework is designed to use Magics++ with python and Fortran for generating products. Also Java, php and ajax used for interface

ALARO-0 vs ALARO-1

ALARO-1 with new radiation scheme ACRENEB2 and turbulence scheme TOUCANS announced at the beginning of February 2015. Also cy40t1_bf.05 export version released in September. TSMS run 4 different version of model, ALARO-0 &1 both in cy38t1 and cy40t1 at 00 GMT for 2 months (January 2015 and July 2015) to compare the results at different seasons.

Harmonie Verification Tools used for obtaining monthly verification results.

FLASH FLOOD GUIDANCE SYSTEM (FFGS)

The guidance system installed at TSMS systems cooperation with WMO,US-AID/OFDA, HRC and NOAA. The system provides information on rainfall and hydrologic response, the two important factors in determining the potential for a flash flood.

Figure 1. FFGS Technical Components

Figure 2. FFGS Forecaster Interface Console

Threshold Runoff Model (drainage network characteristics) that is computed once for each sub-basin. Estimated precipitation from several sources like satellites, radar as available, and gauges as available are input into a snow model (Snow-17) which estimates snow water equivalent (SWE) and MELT that is inputted into soil moisture accounting model (SAC-SMA) to estimate upper level soil moisture (soil water deficit). Then, the Flash Flood Guidance model is used to estimate the amount of rainfall that is required to cause bankfull flow for a given at the outlet of each sub-basin taking into account of current soil moisture conditions. The Flash Flood Threat is the amount of rainfall of a given duration that is greater than the Flash Flood Guidance value for a basin; meaning that it is the difference between the Flash Flood Guidance value for a given duration and over a basin and the corresponding estimated or forecast precipitation for the same duration and basin.

Precipitation Products
- RADAR Precipitation- TSMS Radar Network,
- MWGHE Precipitation- Satellite based Microwave adjusted Global HydroEstimator Precipitation(NOAA/NESDIS)
- GHE Precipitation-Satellite based Global Hydro Estimator Precipitation (NOAA/NESDIS)
- Gauge MAP-Mean Areal Precipitation based on available gauge data only,
- Merged MAP-Mean Areal Precipitation based on radar, MWGHE or GHE precipitation and gauges
- ALADIN Forecast-ALADIN (ALARO-0) LAM forecast precipitation,
- FMAP-Forecast Mean Areal Precipitation based on ALARO-0 quantitative precipitation forecasts

Warning Products
- ASM- Average Soil Moisture,
- FFG - Flash Flood Guidance,
- IFFT- Imminent Flash Flood Threat,
- PFFT-Persistence Flash Flood Threat,
- FFFT-Forecast Flash Flood Threat.

Snow Products
- Gauge MAT-Gauge Mean Areal Temperature based on available temperature gauges,
- Latest IMS SCA-Fraction of area with snow cover,
- SWE-Snow Water Equivalent,
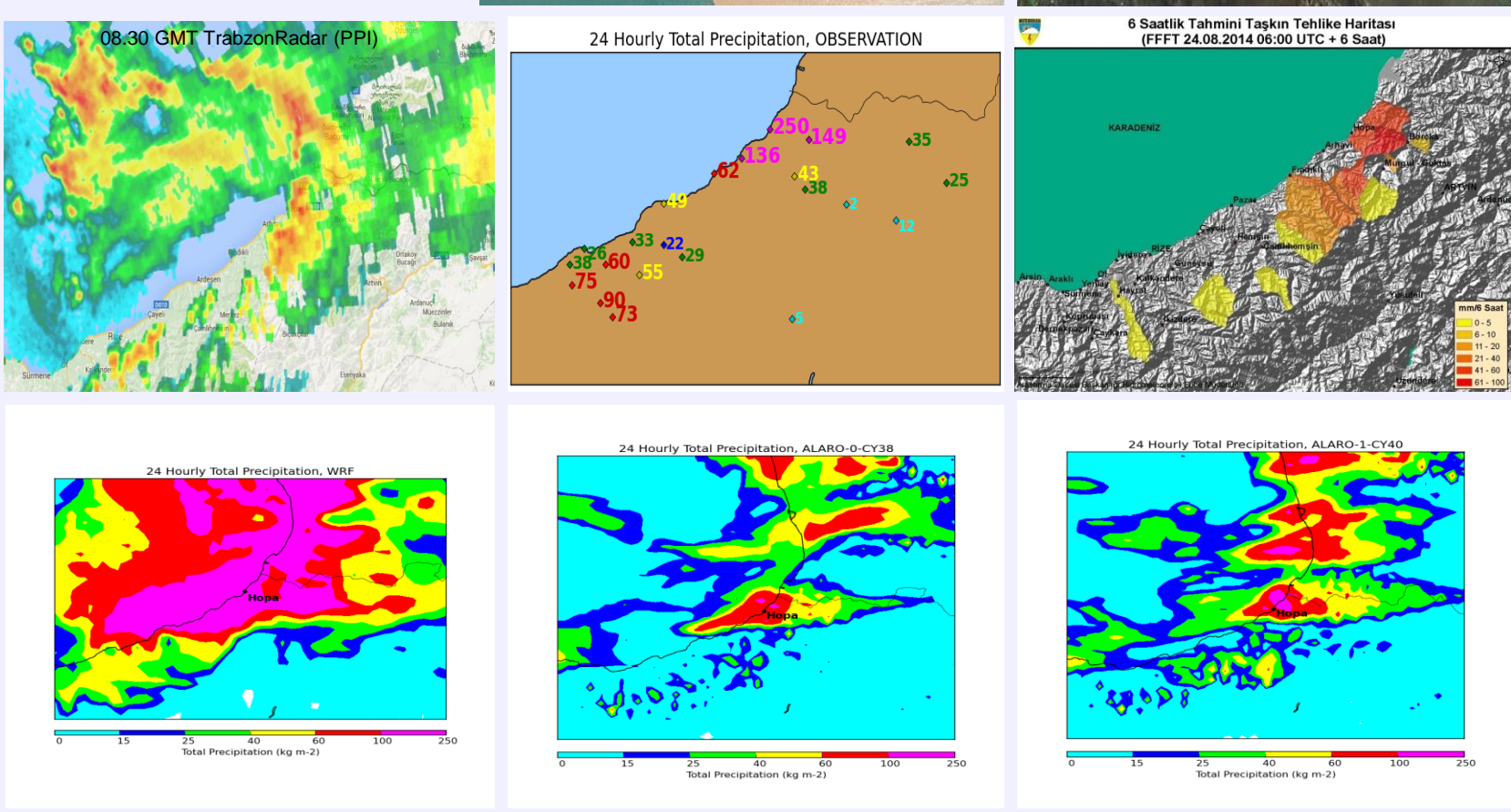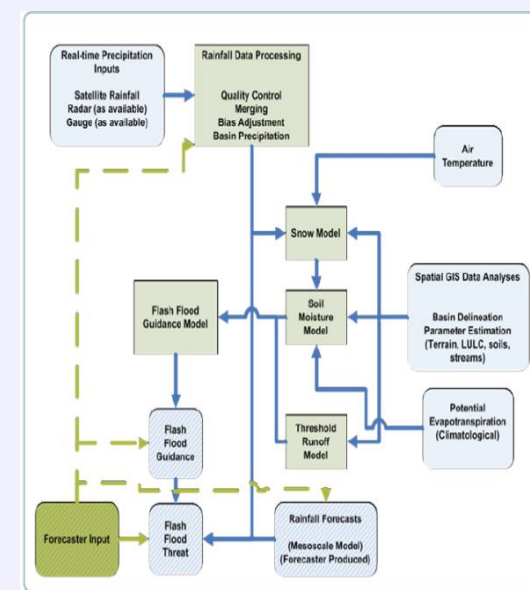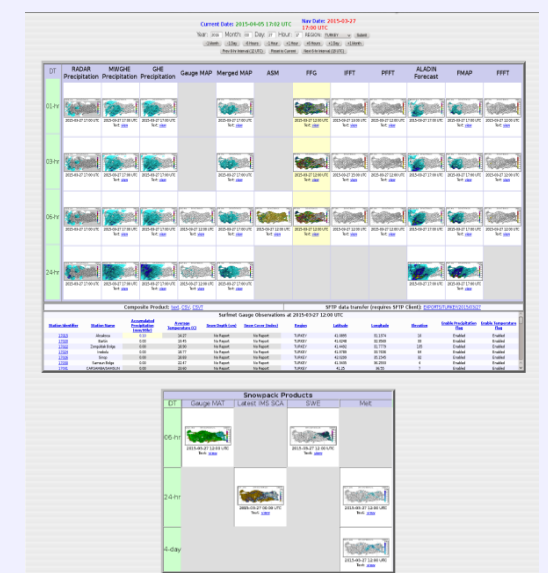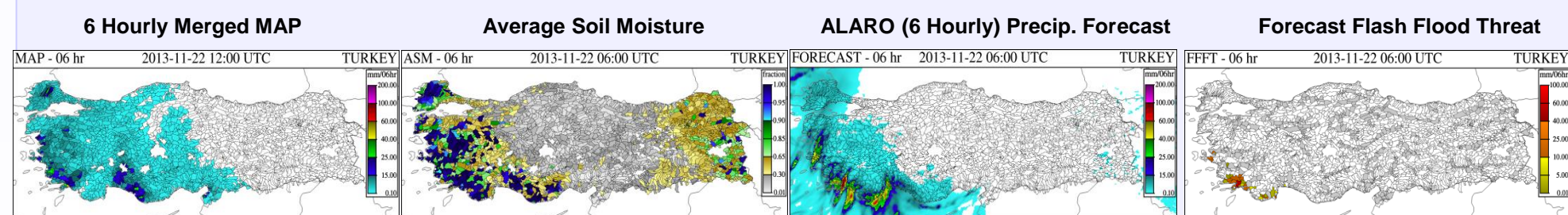- MELT-Snow Melt.

Flash Flood Event in HOPA

On 24th August 2015, flash flood event took place in North-Eastern part of Turkey and resulted with landslide, cataract and death. The rain started after midnight and reached its peak (159mm/3h) between 05:00-08.00 GMT in Hopa. 250 mm total precipitation observed for a period of 24 hours, while a major part of the precipitation was falling between 03:00 and 09:00 GMT.

24 hourly total precipitation in Hopa for three operational models (ECMWF, ALARO and WRF) are 88, 175 and 200 mm respectively. These 3 models are all relatively good at estimating the precipitation area. However, the time period that the models showed heavy rain was 2 hours earlier than its observed time. The WRF Model showed better performance on amount of precipitation but heavy rain coverage is overestimated. ALARO-0&1 hit the flash flood area with acceptable amount of precipitation.

Flash flood guidance system (FFGS) alarmed over than 50mm flash flood threat between 06.00-12.00GMT

22.11.2013 Marmaris Flash Flood Case Study

6 Hourly Merged MAP

Average Soil Moisture

ALARO (6 Hourly) Precip. Forecast

Forecast Flash Flood Threat

Marmaris, 22.11.2013