Application and verification of ECMWF products 2012

National Meteorological Administration

1.   Summary of major highlights

No major changes in the statistical post-processing and forecast verification system.

No major changes in use of products

2.   Use and application of products

2.1   Post-processing of model output

2.1.1   Statistical adaptation

The MOS statistical models have been in operational use since 2004. No changes in basic models since that time. The models provide twice on a day, local forecasts up to 10 days, to 163 meteorological stations for the following main parameters: 2m temperatures, extreme temperatures, 10m wind speed and direction, total cloudiness(3 classes) and total precipitation. The results are plotted in map forms and displayed on the web site.

In 2008, the PseudoPP statistical model developed in cooperation with Meteo France, was implemented. The parameters are: 6h 2m spot temperatures and extremes temperatures, up to 15 days and up to 32 days.

In 2010, a MOS_MIXTE model was developed, using MOS_ECMWF RUN 12 UTC and MOS_ARPEGE RUN 00, for extreme temperatures.

No aditional statistical models in 2012.

Every two years these models are updated. One examples of the performance of the *new* MOS-2011 agains *old* MOS-2009 is shown in the Fig 1.
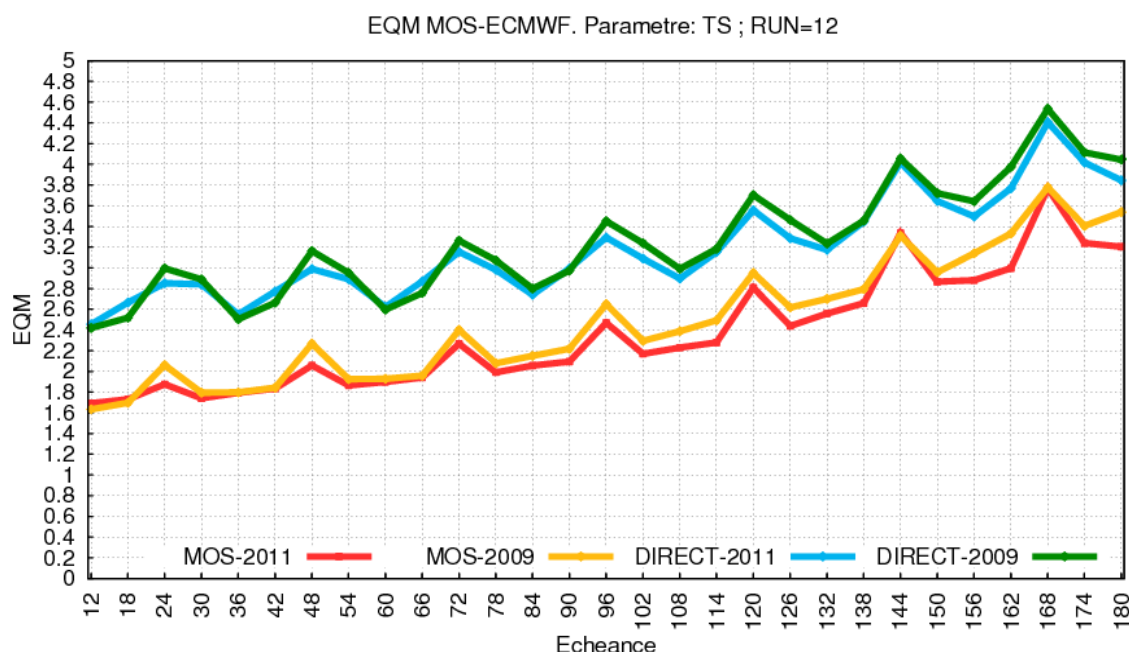

Fig. 1. **RMSE** for spot temperatures – MOS _ECMWF: version 2011 and version 2009   compared with DIRECT model output for one year independent data - 2012. Score calculated over 163 stations.
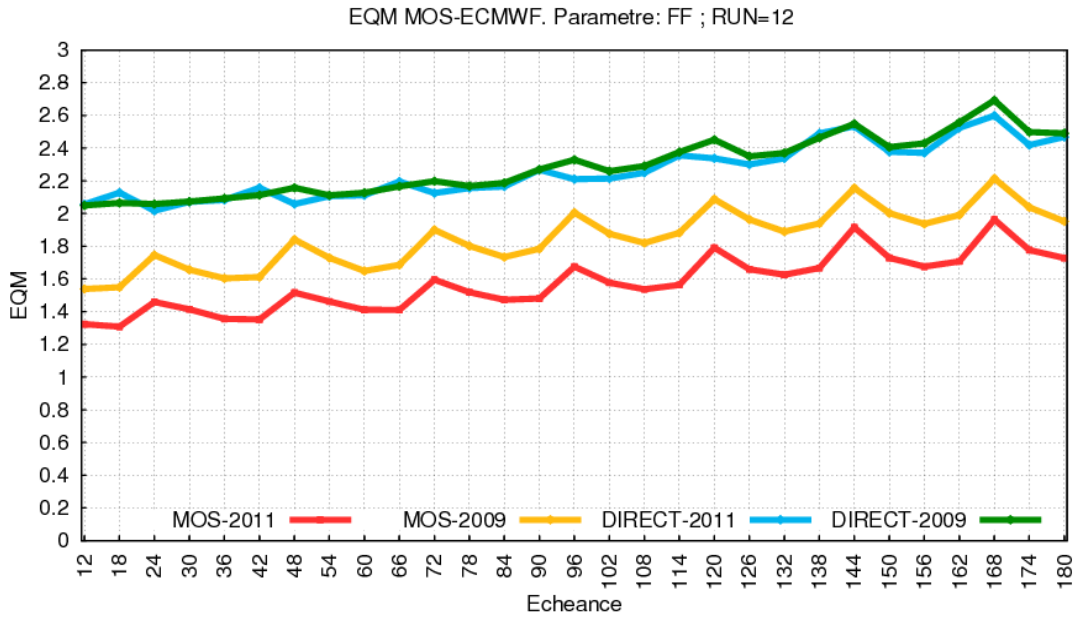
Fig. 2. **RMSE** for wind speed – MOS _ECMWF: version 2011 and version 2009 compared with DIRECT model output for one year independent data - 2012. Score calculated over 163 stations

There are a good reason to update the MOS, to take account of changes in both the numerical model and the observational data.

2.1.2   Physical adaptation

2.1.3   Derived fields

2.2   Use of products

The ECMWF products, available at NMA via RMDCN, are used for the short and medium range forecasts. These products are provided to forecasters (public, state authorities, national warning system) or to customers (more mass media) in different type format (graphical or grib data files).

The graphical products are available for the Forecasting Departament, in real time, which are obtained using graphical packages developed at ECMWF: Metview and Magics.
Some examples of graphical products, which are available on a specific web site, are shown in Fig.3, Fig.4, Fig.5 and Fig.6:
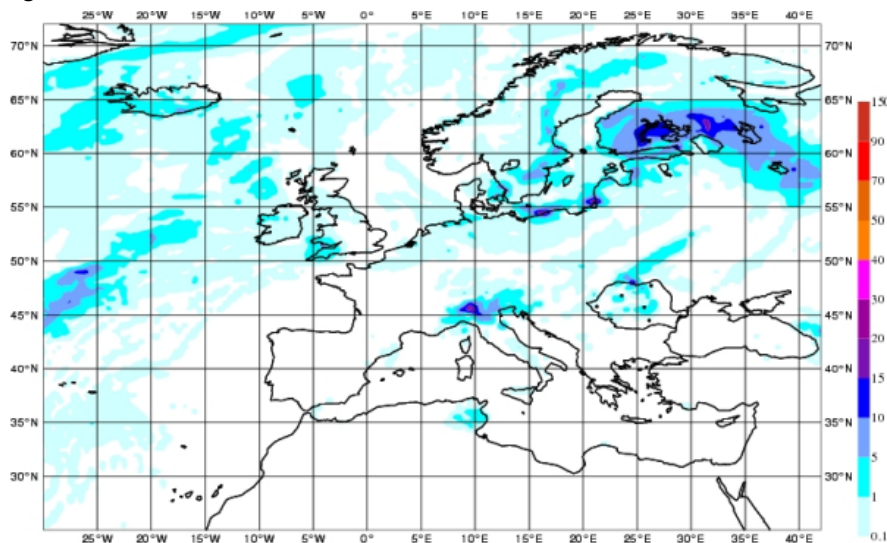

Fig.3 The cumulated precipitation in 6 hours
Base: 14.08.2013, 00 UTC
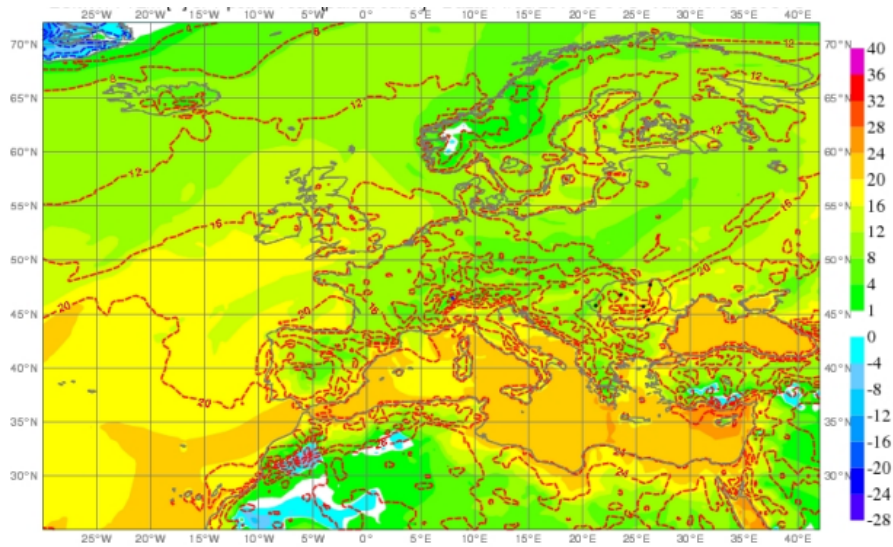Valid: 14.08.2013, 06 UTC – 14.08.2013, 12 UTC

Fig. 4 Temperature at 2m and dew point
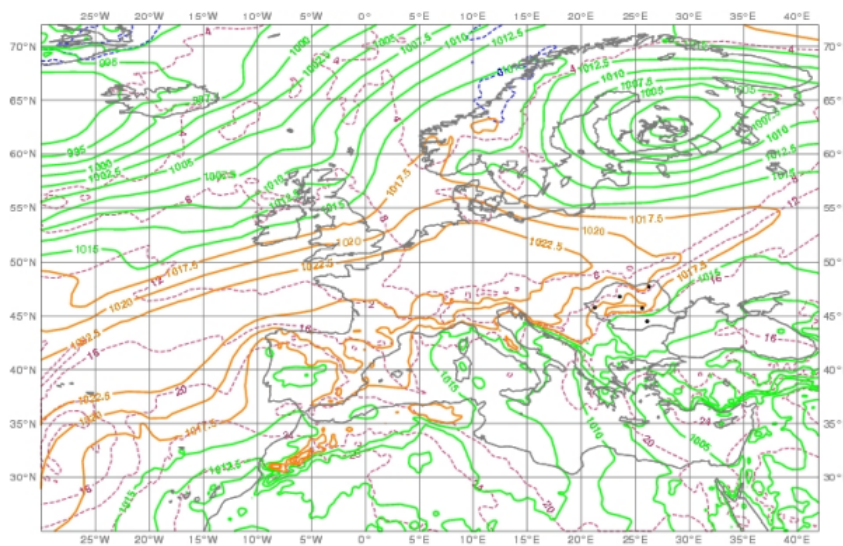Base: 14.08.2013, 00 UTC
Valid: 15.08.2013, 00 UTC

Fig. 5 MSLP and temperature at 850 hPa
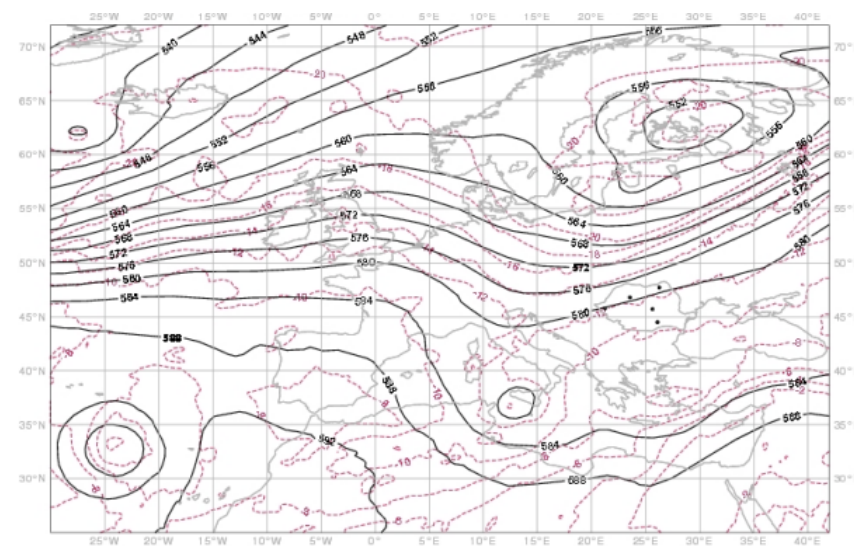Base: 14.08.2013, 00 UTC
Valid: 15.08.2013, 00 UTC

Fig. 6 Temperature and geopotential at 500 hPa
Base: 14.08.2013, 00 UTC
Valid: 15.08.2013, 00 UTC

The EUMETSAT Nowcasting SAF MSG application supports numerical models outputs in GRIB formats, and it is configured by default to use ECMWF products. The SAFNWC/MSG products are further processed and made available for the Forecasting Center in real time on a satellite data Intranet site.

Figure 7 represents an example of a SAFNWC/MSG Cloud Type product (date 14.08.2013, 10:15 UTC)
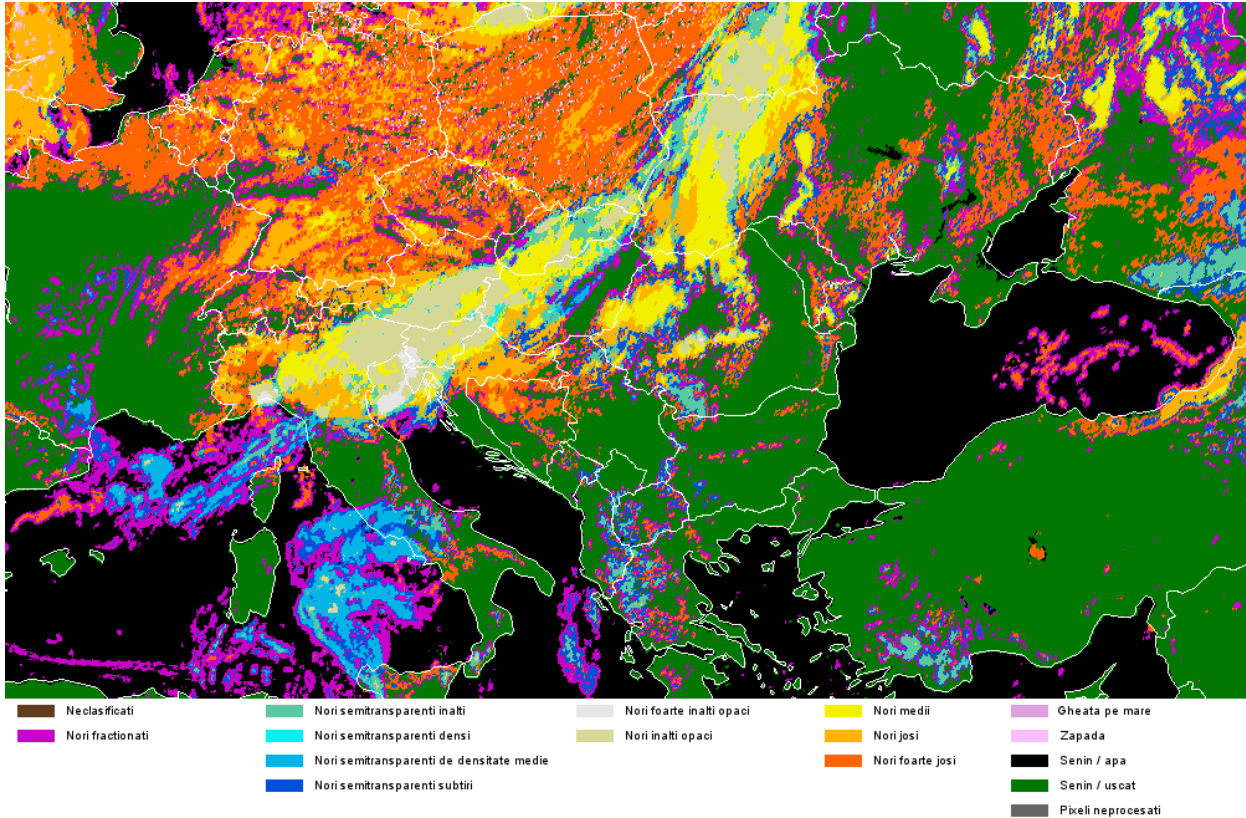

Neclasificati	Nori semitransparenti inalti	Nori foarte inalti opaci	Nori medii	Gheata pe mare
Nori fractionati	Nori semitransparenti densi	Nori inalti opaci	Nori josi	Zapada
Nori semitransparenti de densitate medie			Nori foarte josi	Senin / apa
Nori semitransparenti subtiri				Senin / uscat
				Pixeli neprocesati

Fig. 7

3.   Verification of products

3.1   Objective verification

3.1.1   Direct ECMWF model output (both deterministic and EPS)

The objective verification has been continued in 2012, using the **VERMOD** - an unitary system for objective verification of all models   used operationally by the National Meteorological Administration (NMA): ECMWF, ARPEGE, ALADIN, ALARO COSMO_RO.   A wide range of statistical verification measures are computed daily and monthly. The results are disseminated via dedicated *statistical and verification* web-site. The results are averaged over different selections of stations.

3.1.2   ECMWF model output compared to other NWP models

Comparison of performance of ECMWF model to other NWP models used by NMA is performed daily and monthly, for the most important surface weather parameters: 2m temperature, 10m wind speed, total cloudiness, mslp pressure and 24 h total amount of precipitation. Graphs of the main verification scores are available on the web-site and also an overview of the performances of the models for all year.

The daily errors for the main parametres(temperatures, wind, mslp, precipitation) and for all time ranges are displayed as in example Fig. 8. We can easily see the main differences between the various models.

The monthly scores are presented on the web-site in the graphs form. The monthly comparative BIAS and RMSE distribution for 2012 – 2m temperature- is shown in Fig 9.
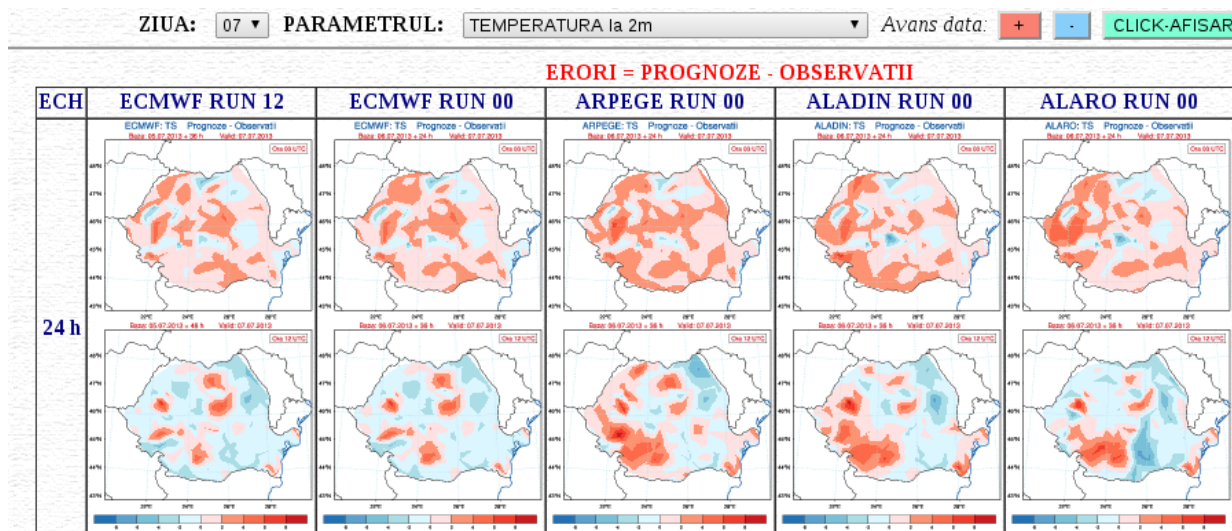
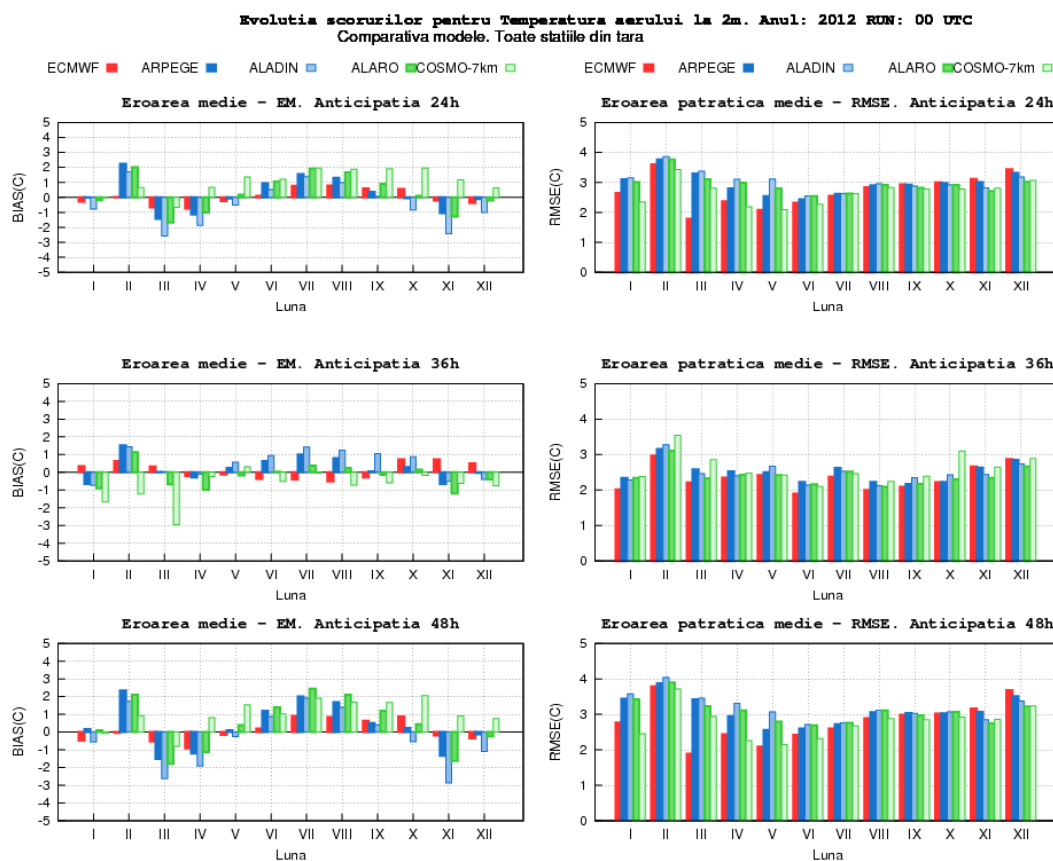**Fig. 8** Temperatures Direct Model spot errors : (Forecast – Observation) – comparaison between the models.

Fig. 9 2m Temperature. Mean monthly BIAS and RMSE scores distribution using all meteorological stations.
Year – **2012**

3.1.3 Post-processed products

All MOS forecasts have been verified every month since 2004, and the results have been displayed on the web site. A comparison between MOS and meteorologist forecasts, for extreme temperatures, total cloudiness and precipitation (Yes/No) is performed daily and monthly. There were no major changes during 2012

3.1.4   End products delivered to users

3.2   Subjective verification

3.2.1   Subjective scores (including evaluation of confidence indices when available)

3.2.2   Synoptic studies

Including evaluation of the behaviour of the model

4.   References to relevant publications

(Copies of relevant internal papers may be attached)

Smith, W. and **C. Jones**, 2005: Whatever the name of the article is called. *Mon. Wea. Rev.*, **20**, 134–148