

NATIONAL METEOROLOGICAL ADMINISTRATION

CENTRAL OFFICE OF FORECAST BUCHAREST, ROMANIA

USE OF ECMWF PRODUCTS IN SEVERE WEATHER FORECAST Teodora Cumpanasu, june 2005

The direct ECMWF model output was for many years the main model used in medium-range forecast at NMA. The synoptic studies carried out have shown a generally good accuracy of the ECMWF model available parameters for the 12 GMT RUN (MSPL, TA 500, T850, T500). A major change in improving forecast quality at Bucharest Central Office of Forecast has been made in the last half-year since we are using all ECMWF products that have been made available for the members state users (in Romania since 2004). on the ECMWF web site.

The NMA forecasters in COF (and now those from Regional Centers of Forecast in Romania) learned step by step how they can use the products from both deterministic and ensemble forecasts.

The prediction of severe weather is a challenging problem for all of us. There is strong scientific evidence of an increase in mean precipitation and extreme precipitation events which implies that weather hazards may become more frequent. In the middle of april 2005 heavy rainfalls occurred in Romania, causing severe flooding especially in the south-western part (in Banat - the most damaging since 1975), affecting thousands of people and destroying hundreds of houses. Unfortunately, it was not a singular event. In april, may and untill june 10 we confront with similar heavy precipitations and in this particular situation we had to foccus in improving the forecasts of intensity and timing and spatial distribution of the rainfalls so that the emergency agencies, the central and local administration, the water management agencies, Aid organizations could benefit from an increase in lead-time to efficiently implement their plans, to better prepare and coordinate their actions.

The question might be: why using a global model that usually runs at a relativeliy low horizontal resolution that could limit the usefulness when the forecast of severe and localised weather events is concerned. In the COF (Central Office of Forecast in

Bucharest) we used the outputs of high-resolution limited-area models (ALADIN, COSMO) in order to improve the short-range prediction for intense locally events. But there were two problems that occurred:

- in many situations the limited-area models couldn't estimate with accuracy the amount of precipitations and
- the difficulty of forecasting their space-time evolution for ranges longer than 48 h.

Following the encouraging predictability results of ECMWF model between 13 and 19 april 2005 COF began the operational use of those products in the medium-range forecast, especially in cases of extreme events. At the beginning we used the deterministic model fields (TA500, T850, T500, MSPL and wind at 700 and 500 hPa, Relative Humidity, 2m temperature), than the Ensemble Prediction System that allowed us to make a probabilistic approach in order to develop capability to estimate the uncertainty of the forecasts. The EPS forecasts for most of the cases had high skill scores for up to 7 days and even for up to 10 days ahead. Now, at met-ops room the forecasters are using the Cluster Analysis, the probabilities maps for different parameters (in particular 24h cumulated precipitations, precipitations rate probabilities, 10 m wind gusts probabilities) and thresholds. In order to evaluate the occurrence of weather events a very useful tool is now the EFI maps for parameters directly related to severe weather. Being a measure of the distance from the climate to the forecast distribution the EFI helps us to estimate the rainfall amount knowing that may and june are the most „rainy„ months in Romania.

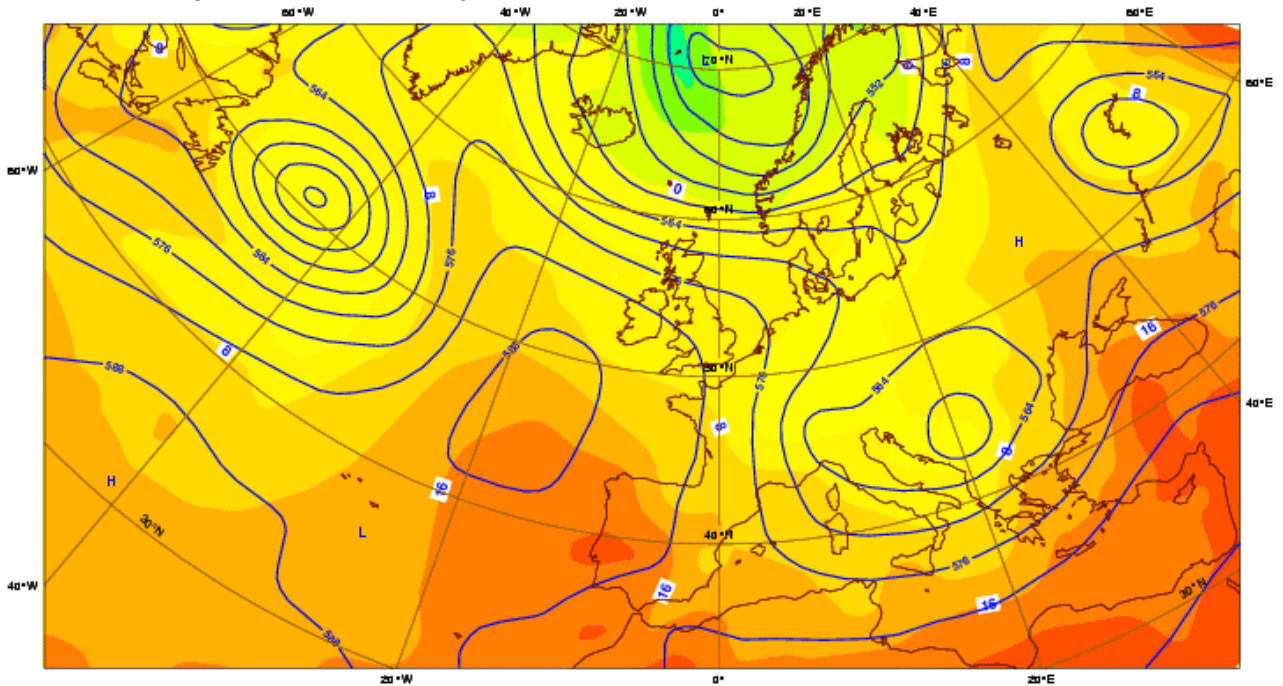
Also, for the last months COF specialists used the EPSgrams for the region which was indicated as the most likely to be affected by intense precipitations.

Unfortunately we are able to present only a subjective verification of ECMWF products based on synoptic studies of different cases (for the ECMWF MOS forecast was developed a new procedure of objective scores for the following parameters: 2m temperature, total cloud cover, 6h cumulated precipitations, 10 m wind speed, 10m wind direction.)

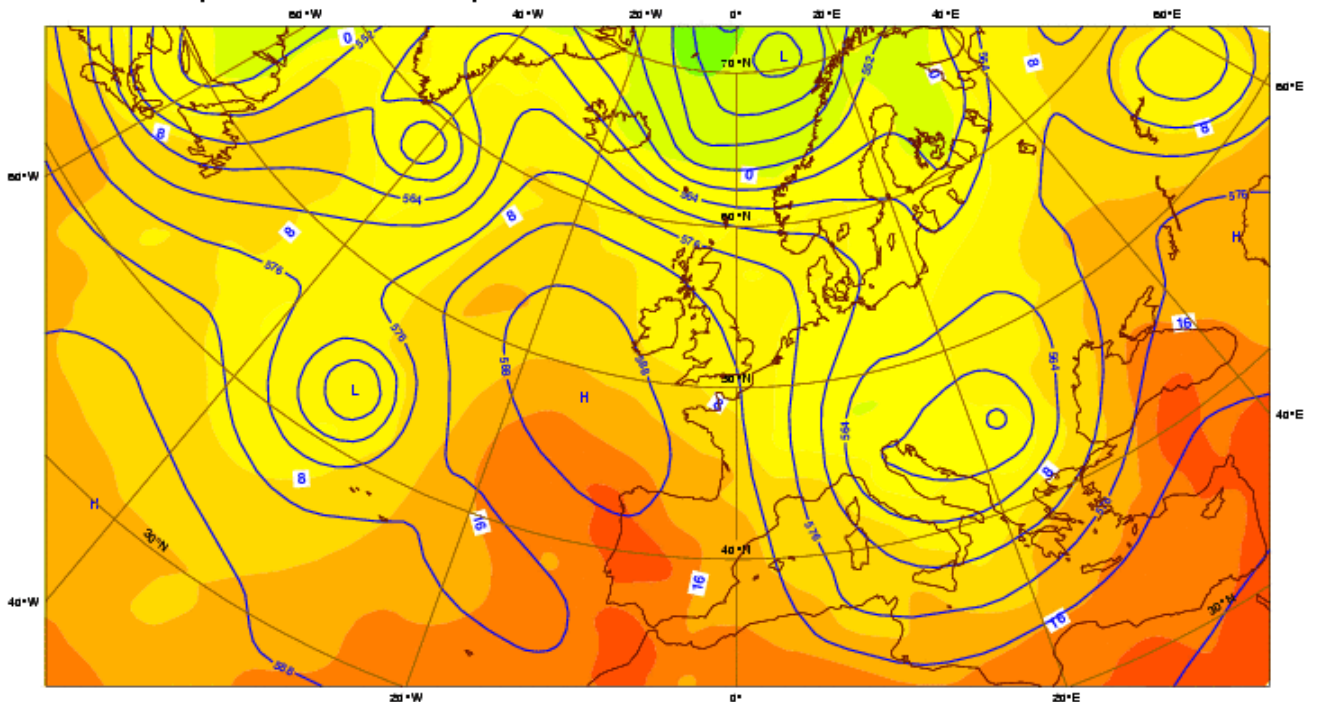
I choose to present the last case of heavy rainfalls in Romania, between 7 and 9 june 2005, estimated by ECMWF model compared with the precipitations structure that was actually observed. For this particular case we also found very useful the EFI map for 2m temperature that estimated with high accuracy the cold weather for the western and south-

western part of Romania. The structure shows the cut off low (500hPa) centered near the western part of Romania AND a low pressure structure in retrograde motion centred in northern part. The system remains active for more than 48 h.

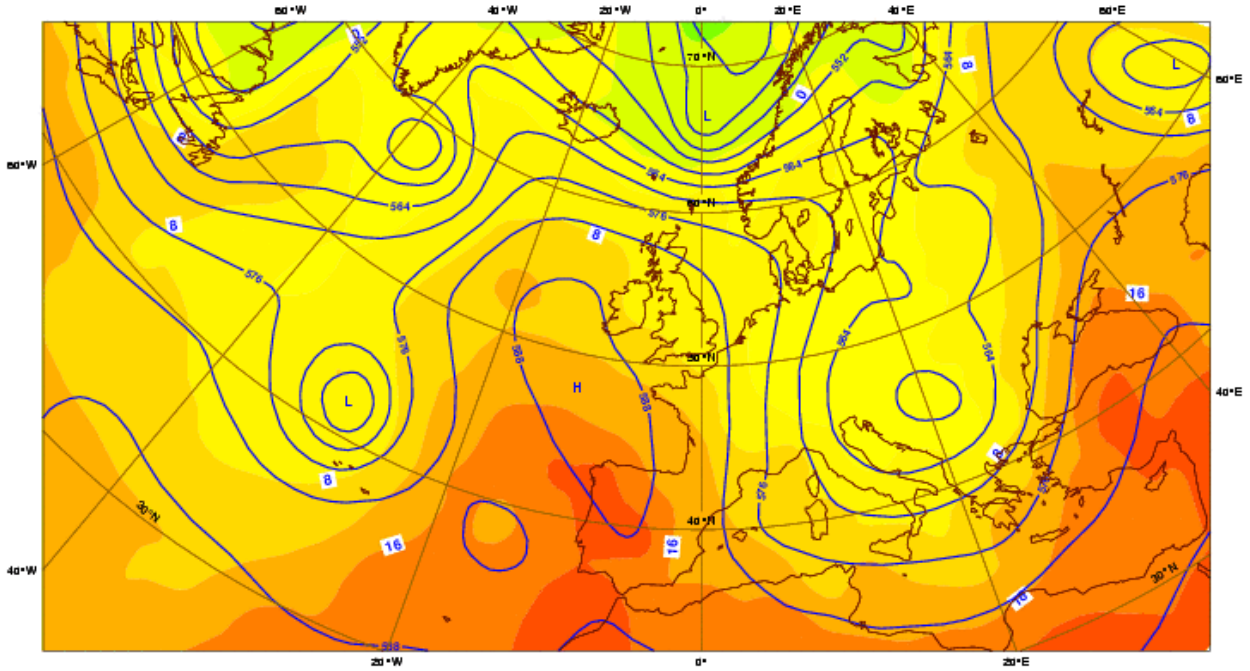
Friday 3 June 2005 00UTC ©ECMWF Forecast t+144 VT: Thursday 9 June 2005 00UTC
850 hPa Temperature / 500 hPa Geopotential



Saturday 4 June 2005 12UTC ©ECMWF Forecast t+108 VT: Thursday 9 June 2005 00UTC
850 hPa Temperature / 500 hPa Geopotential

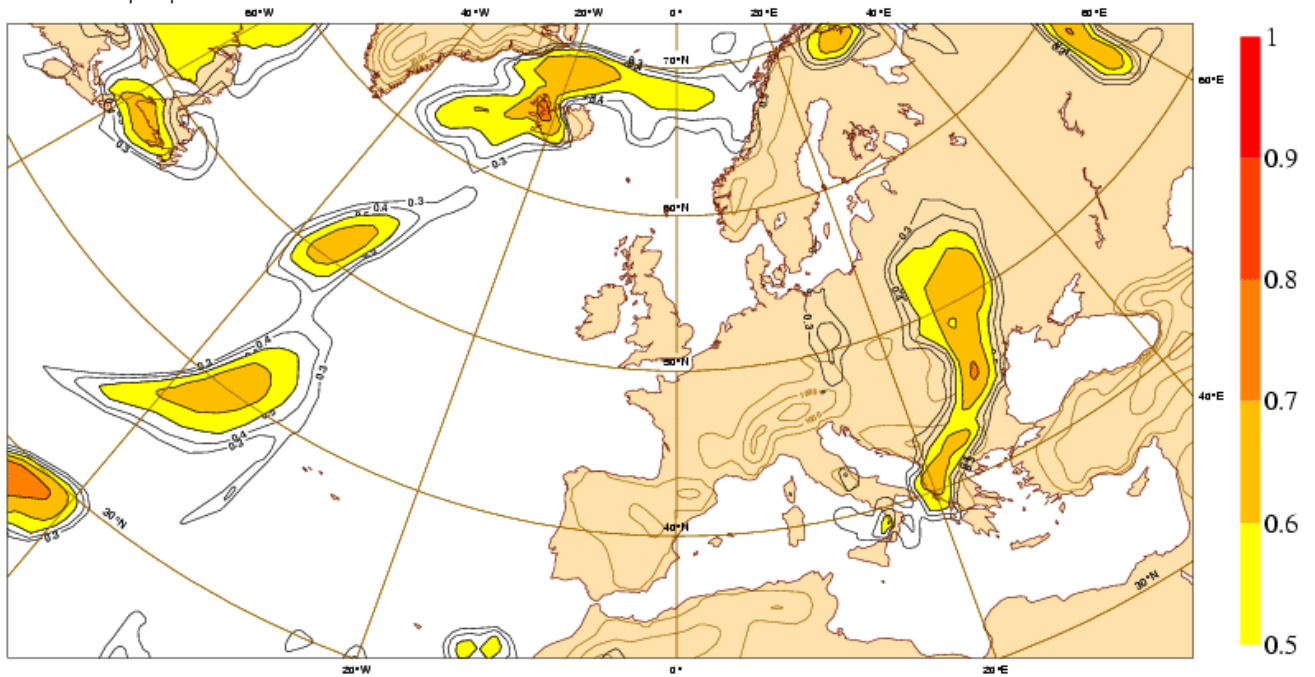


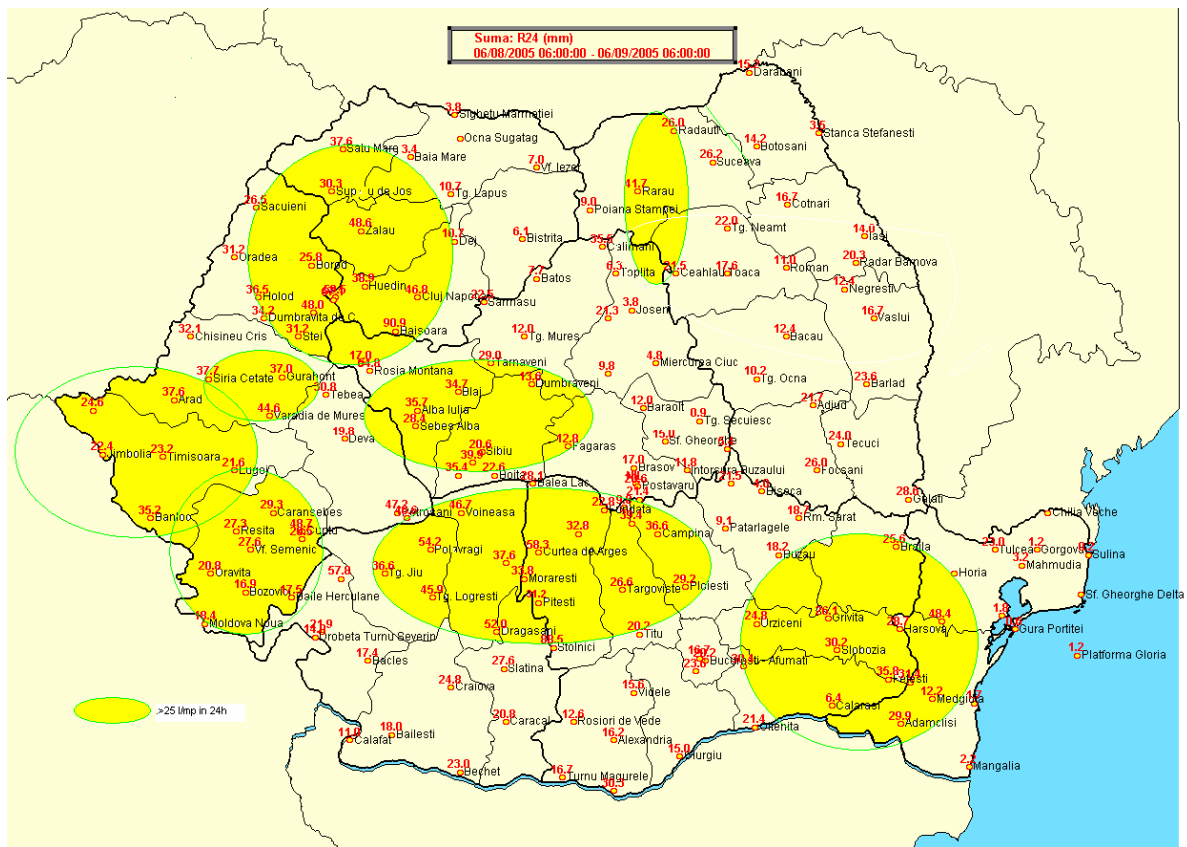
Monday 6 June 2005 12UTC ©ECMWF Forecast t+060 VT: Thursday 9 June 2005 00UTC
850 hPa Temperature / 500 hPa Geopotential



it is evident that the accuracy of the model increases as we approach the date of the event.

Monday 6 June 2005 12UTC ©ECMWF Extreme forecast index t+018-042 VT: Tuesday 7 June 2005 06UTC - Wednesday 8 June 2005 06UTC
Surface: Total precipitation





NMA specialists are working now on :

- making available all levels products (in 6h fields) for the ECMWF model 00 GMT RUN , visualised on the Nex_REAP application on SIMIN.
- Making available on the Nex_REAP application of the CAPE fields
- objective verification of ECMWF model direct out-put and of the deterministic and EPS forecasts
- starting in the next year the run of a high-resolution limited-area model based on ECMWF global ensembles .