Application and verification of ECMWF products 2010

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1. Summary of major highlights

At the Moroccan Meteorological Service (DMN), ECMWF products constitute a fundamental source of meteorological information used in the operational weather forecasting system, particularly for medium- and long-range forecasts.

In the short range, ECMWF products are used in conjunction with other products such as those from Aladin-Maroc local model and Arpege-France global model.

Regular verification is usually done based on a point-to-point basis, with synoptic data verified against nearest grid- point of the model. The emphasis is put on temperature, precipitation and wind fields. However, other methods are occasionally also applied (e.g., area-to-area basis).

The usage of a combined Aladin and ECMWF products continues to lead to a further increase in forecast accuracy over Morocco, particularly during the last two rainy seasons that recorded above-normal precipitation amounts.

2. Use and application of products

The ECMWF deterministic forecasts are used extensively on a daily basis by the duty forecasters (mainly at the DMN services that produce general forecasting, marine assistance, and aeronautical assistance). Many of the ECMWF products from deterministic and probabilistic models are visualized on a weather station (Synergie).

It should be noted that the ECMWF model is of considerable and incontestable benefits for the DMN. In fact, the duty forecasters have been confirming this assessment for many reasons, mainly:

a. The ECMWF model has permitted deterministic forecasts up to 8-days, and 10-day forecasts are planned in the near future;

b. The ECMWF model permits the comparison of the two models Aladin-Maroc and Arpege (often similar) with other models;

c. The ECMWF model permits to issue alert, warning and emergency notices about severe weather (classical synoptic situations, heavy rain generated by a low-pressure system, cut-off, heat waves, swell caused by a low-pressure system, etc.)

d. The ECMWF products assist the forecasters in taking better decisions in case of rapid storm development (the model has a good performance in forecasting convection).

Furthermore, the EPS products are regularly consulted on the ECMWF website.

The Monthly and seasonal forecasts are also consulted and used to provide guidance to various sectors. These monthly and seasonal forecasts are becoming more and more interesting for public as well as for special users mainly from the following sectors: water resources, agriculture, and energy.

2.1 Post-processing of model output

2.1.1 Statistical adaptation

2.1.2 Physical adaptation

2.1.3 Derived fields

2.2 Use of products

The ECMWF products are utilized in operational duties, as well as in severe weather situations (e.g., winter rainy situations, summer convective storms).

3. Verification of products

At the present time, there is no objective or systematic subjective verification procedure of ECMWF products carried out at the DMN. Instead, the general scores calculated and published by ECMWF are considered herein informative. Considering the general character of medium-range weather forecasts, the verification scores from neighbouring countries are assumed to be well applicable for Morocco in some synoptic situations.

3.1 Objective verification

3.1.1 Direct ECMWF model output (both deterministic and EPS)

3.1.2 ECMWF model output compared to other NWP models

3.1.3 Post-processed products

3.1.4 End products delivered to users

3.2 Subjective verification

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

Subjective comparisons of the performance of the ECMWF model to the other NWP models employed at the DMN have also been performed. Various scores are computed occasionally; especially against the Aladin local model but the verification procedure is still not fully operational.

Seasonal forecasts

A seasonal forecasting system at the DMN is quasi-operational since 1998 using Météo-France Arpege-Climat model. Currently, this model (run on the DMN calculator) is used to forecast temperature and precipitations. These forecasts are presented in deterministic form and are expressed under three classes: near-, below- or above-normal. This gives “warm”, “normal” or “cold” for temperature, and “wet”, “normal” or “dry” for precipitations.

In addition, a bulletin of seasonal forecasts is issued every month. It integrates forecasts produced by other models such as ECMWF, IRI, and UK Met Office under “image” format. Then the final synthesis of prediction takes into consideration the forecasts outputted from the four models.

Verification

A subjective evaluation of ECMWF precipitation forecasts was made over Morocco for the rainy seasons from 2003 to 2006. This evaluation reveals a score of 53%; that is 53% of succeeded cases over this time period. Note that this comparison remains subjective: it is based on a simple comparison between the different outputs under “image” format. It is also limited by the short time period considered.

3.2.2 Synoptic studies

Occasionally, synoptic studies have been performed to evaluate the behaviour of the DMN forecasting system. It should be noted that the ECMWF model has good performance in forecasting convective phenomena.

4. References to relevant publications