

Application and verification of ECMWF products 2018

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1. Summary of major highlights

Met Éireann continue to use ECMWF products as primary guidance for the medium-range (days 2 – 10) weather forecasting and as lateral boundary conditions for operational limited area NWP models. The application and verification of these products is described in more detail in Sections 2 and 3. There were a few noteworthy weather events 2017-2018 that affected Ireland. Storm Ophelia (winds, October 2017), Storm Emma (snow, March 2018) and drought (summer 2018) impacted on Ireland during the year. Storm Ophelia is discussed in detail in Section 3.2.2. Feedback on “forecast user” initiatives is summarised in Section 4.

The primary users of ECMWF products in Met Éireann are the Forecasting Division and Research, Environment & Applications Division. Much of the report content and feedback is stratified by Met Éireann divisional structure.

2. Use and application of products

2.1 Post-processing of ECMWF model output

2.1.1 Statistical adaptation

Currently no post-processing is being done by the operational forecast database system, WDB (Weather DataBase). HRES forecasts are converted to NetCDF format for ingestion by WDB. It is planned to start work on processing ENS data to produce a consensus forecast for use both by WDB and the forecast office.

2.1.2 Physical adaptation

ECMWF fields are used as boundary conditions for both of our limited area models, Hirlam and Harmonie. Both models produce 54-hour forecasts four times per day. Hourly HRES data files (T+000 – T+078) are available for use by operational NWP.

ECMWF fields are used as the meteorological input to the Hysplit dispersion model by Met Éireann. Hysplit is a very important decision support tool for emergency management in radiation related events. We also generate a blue tongue virus threat product using Hysplit which is disseminate to our Department of Agriculture who in turn pass this information to vets and other interested parties around the country.

2.1.3 Derived fields

2.2 ECMWF products

2.2.1 Use of Products

Describe how ECMWF products are used in operational duties, in particular for severe weather situations. For example:

- Does the EFI help to identify areas of potential hazard?
- Do the cyclone tracks help the forecast areas at risk of severe storms?
- Does the new precipitation type make your decision-making more efficient?

2.2.2 Product requests

Include here any particular requests you may have for new or modified ECMWF products

3. Verification of products

3.1 Objective verification

Monthly objective verification is routinely carried out for HRES. Results are compared with the operational limited-area HARMONIE model, using observations from synoptic stations within the HARMONIE domain.

3.1.1 Direct ECMWF model output (both HRES and ENS)

Verification of direct ECMWF HRES model output is compared with HARMONIE model output. This is discussed in more detail in Section 3.1.2. At present, no routine objective verification of ENS is carried out. However, it is planned to do this in the near-future with the aim of comparing with Met Éireann’s regional ensemble system which is currently in pre-operational testing phase.

3.1.2 ECMWF model output compared to other NWP models

Observations from SYNOP and TEMP reports are used to validate ECMWF HRES and HARMONIE forecasts within the HARMONIE domain which covers Ireland, the United Kingdom and part of Northern France. In Figure 1 below we show monthly RMSE (left) and biases (right) of all 24-hour forecasts since 2014 for the following parameters: 2m temperature (T2m), 10m wind-speed (U10m), mean sea-level pressure (MSLP) and 500hPa height.

Seasonal variations in performance are evident, particularly for T2m and U10m. We note also a general cold bias in T2m in HRES, as well as a negative bias in U10m.

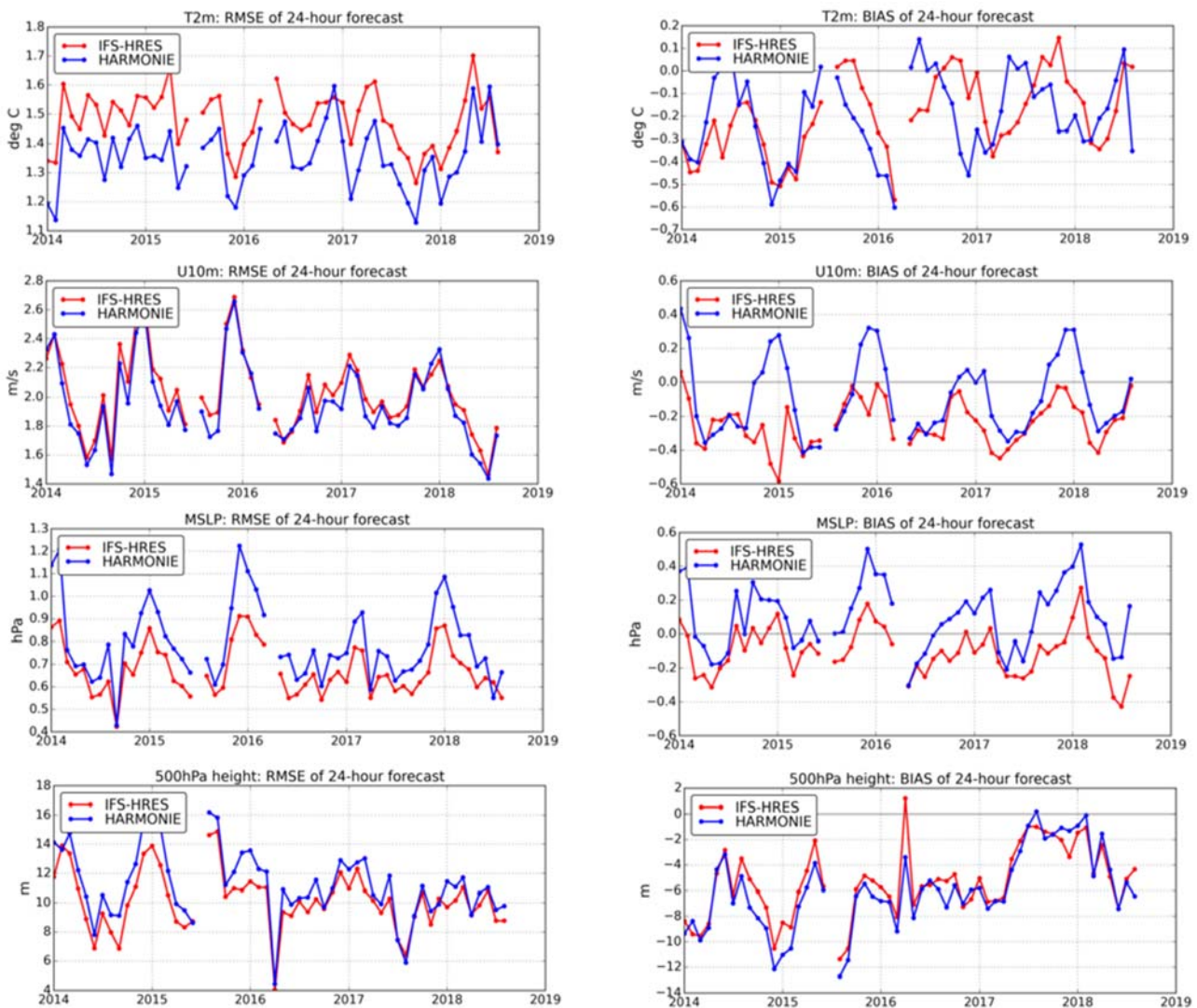


Figure 1: Monthly RMSE (left) and bias (right) of 24-hour forecasts from HRES and limited-area HARMONIE. Parameters are (from top to bottom): 2m temperature (T2m), 10m wind-speed (U10m), mean sea-level pressure (MSLP) and 500hPa height

3.1.3 Post-processed products

There are no post-processed products based on HRES/ENS forecast data.

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 Case studies

Storm Ophelia reached Ireland on the 16th of October 2017. Figure 2 presents MSLP forecasts at Valentia observatory in the south-west of the country, showing the accurate guidance from HRES and HARMONIE on the passage of the system, particularly in terms of the position of the storm track.

The extreme winds observed were slightly under-predicted by HRES, and were better captured by HARMONIE, as shown by the example in Figure 3.

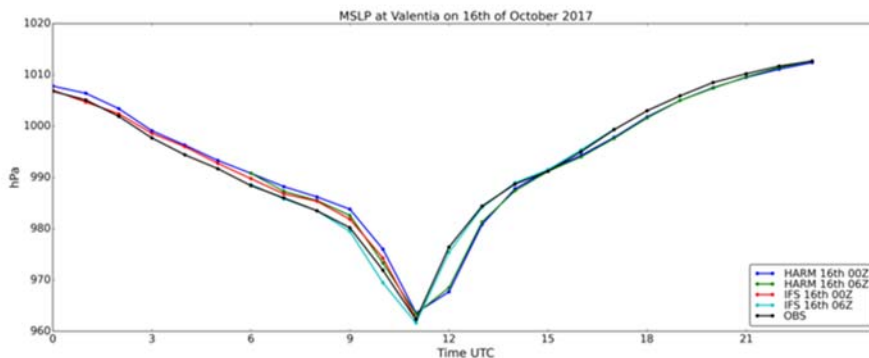


Figure 2: MSLP forecasts and observations at Valentia station during Storm Ophelia on the 16th of October 2017. Shown are HARMONIE and IFS-HRES forecasts from 00 and 06Z on the 16th

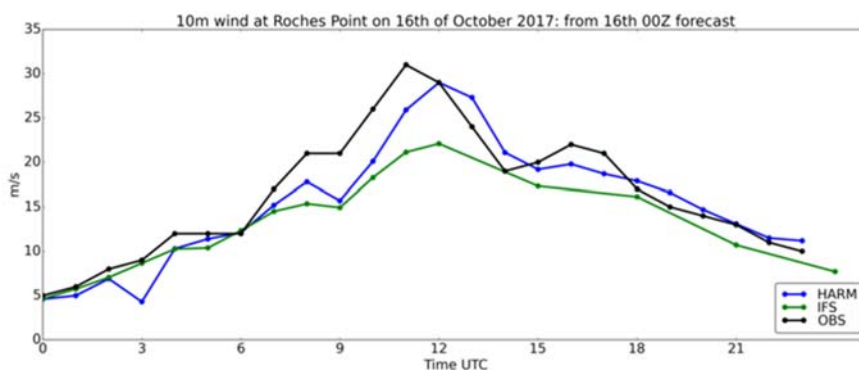


Figure 3: 10m wind forecasts and observations at Roches Point station during Storm Ophelia on the 16th of October 2017. Shown are HARMONIE and IFS-HRES forecasts from 00Z run on the 16th

4. Feedback on ECMWF “forecast user” initiatives

The UEF Conference (June 2018) was very useful to see how other NHMS use ECMWF products.

5. References to relevant publications