

# Application and Verification of ECMWF Products 2018

This report should be a maximum of 6 pages and reach ECMWF by the **31 July 2019** via email to Sue Dunning (sue.dunning@ecmwf.int).

Please state your Organisation and Author(s)

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## 1. Summary of major highlights

It is expected that a more detailed description of any items included here will appear in section(s) below.

ECMWF products are the main source of information for preparation of medium and long range weather forecasts at SHMU. Our forecaster use basic HRES products, some ENS products and a few extended range products.

In the case when our customer requires weather forecast for more than 72h ahead, we use ECMWF products as the main source to cover required forecast range.

We download complete set of EPS products (all members). Development of processing software to compute statistics over EPS data (quantiles, median, mean) is ongoing.

ECMWF data are used as input for rainfall-runoff models in our hydrological forecasting department.

Air quality department uses ad-hoc ECMWF model data for their dispersion model.

## 2. Use and application of products

Include, as appropriate, medium-range high-resolution (HRES) and ensemble (ENS) forecasts, monthly forecasts, seasonal forecasts.

### 2.1 **Direct Use of ECMWF Products**

Describe how ECMWF products are used directly in operational duties, e.g. for severe weather situations. We would particularly welcome comment on the following recent ECMWF initiatives:

- The vertical profiles tool, introduced in June 2018, and available via web products and ecCharts
- New extended range (monthly) test products available here: <https://confluence.ecmwf.int/display/FCST/Test+products>

Forecasters do not use vertical profiles tool, some of them complain about slow reactions of ecCharts and claim this as the reason for not using it regularly.

Forecaster do not use new extended range (monthly) test products, they use regularly Weekly anomaly and Weekly probability anomaly from Extended range forecasts to produce internal monthly forecasts.

Forecasters use predefined set of ENS meteograms regularly.

Forecasters use usually basic HRES model outputs and outputs like CAPE, Dewpoint temperature at 2 m, Wind and Temperature at 500 hPa, 925 hPa, 10 m (wind shear, mean wind, lapse rate are computed by software VisualWeather) use to assess environment conditions for convection (thunderstorms).

Forecasters use products like EFI and Type of precipitation irregularly. They use sometimes probabilistic products created in ecCharts to assess precipitation amounts and extreme temperature forecast during weather warning preparation.

### 2.2 **Other uses of ECMWF output**

Describe the different ways in which you use ECMWF forecasts indirectly, in the following categories:

#### 2.2.1 *Post-processing*

Statistical adaptation - include post-processing strategies for standard HRES and ENS output.

ECMWF HRES forecasts are used to generate specific products for our customers for the ranges longer than ALADIN/SHMU LAM forecasts (3 days). Those are mostly screen level data (temperature, wind, precipitation, cloudiness) for particular locations or regions.

#### 2.2.2 *Derived fields*

Include modified ENS output e.g. clustering, probabilities.

### 2.2.3 Modelling

Include limited-area models, hydrological models, dispersion models etc. that use ECMWF model data (HRES and/or ENS) as input (e.g. for initial conditions / boundary conditions etc.)

ECMWF HRES and ENS data are used by SHMU hydrological forecasting department as an input for hydrological rainfall-runoff models to compute the expected discharge for cca 200 river profiles twice per day.

SHMU cooperates within RC LACE on the development and operational exploitation on the so-called ALADIN-LAEF EPS system which is coupled to ECMWF EPS members (first 16 members).

Air quality department uses ad-hoc ECMWF model data as input for WRF model and results are input for CMAQ model.

## 3. Verification of ECMWF products

HRES, ENS, monthly and seasonal forecasts are all within scope. ECMWF does extensive verification of its products in the free atmosphere. However, verification of surface parameters is in general limited to using synoptic observations. More detailed verification of these weather parameters by national Services is particularly valuable.

At this point in time (2019) ECMWF would particularly welcome:

- Evaluation of systematic errors in near-surface parameters
- Evaluations related to visibility, humidity, clouds, precipitation type
- Conditional verification results (e.g. 10m wind bias stratified by topographical aspects/cloud cover)
- Comparisons between ECMWF ENS and external LAM-EPS systems (for probabilistic forecasts)

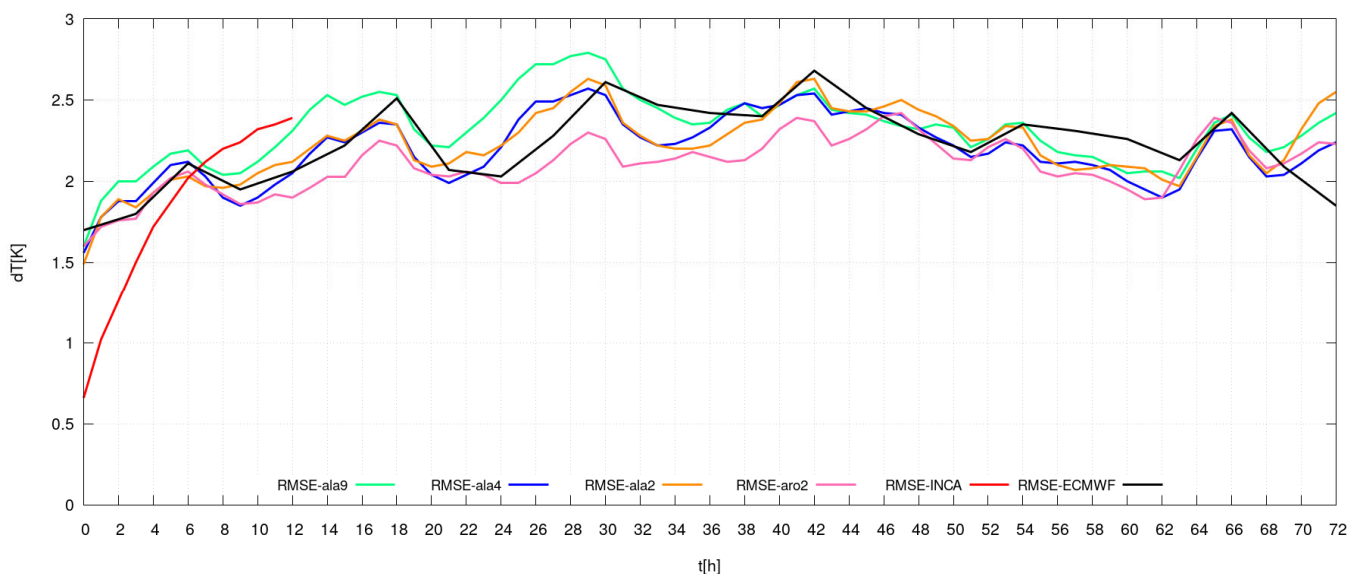
### 3.1 Objective verification

Describe verification activities and show and discuss related scores.

#### 3.1.1 Direct ECMWF model output (both HRES and ENS), and other NWP models

Focus on local weather parameters verified for locations that are of interest to your service, including comparisons, where possible, with other NWP models used by your service. For lead times up to day 15.

ECMWF deterministic forecasts are occasionally verified against the automatic weather station network over Slovakia for screen level parameters. The scores are compared with short-range high resolution LAM models operationally exploited by SHMU to check their overall performance. An example of such verification of 2 m temperature RMSE for October 2018 is shown on Fig. 1 (9 km ALADIN model in green, 4.5 km ALADIN model in blue, 2 km ALADIN model in orange, 2 km AROME in pink, INCA nowcasting system in red, ECMWF in black). For the time being there are no regular verification activities performed.



#### 3.1.2 Post-processed products and end products delivered to users

none

#### 3.1.3 Monthly and Seasonal forecasts

none

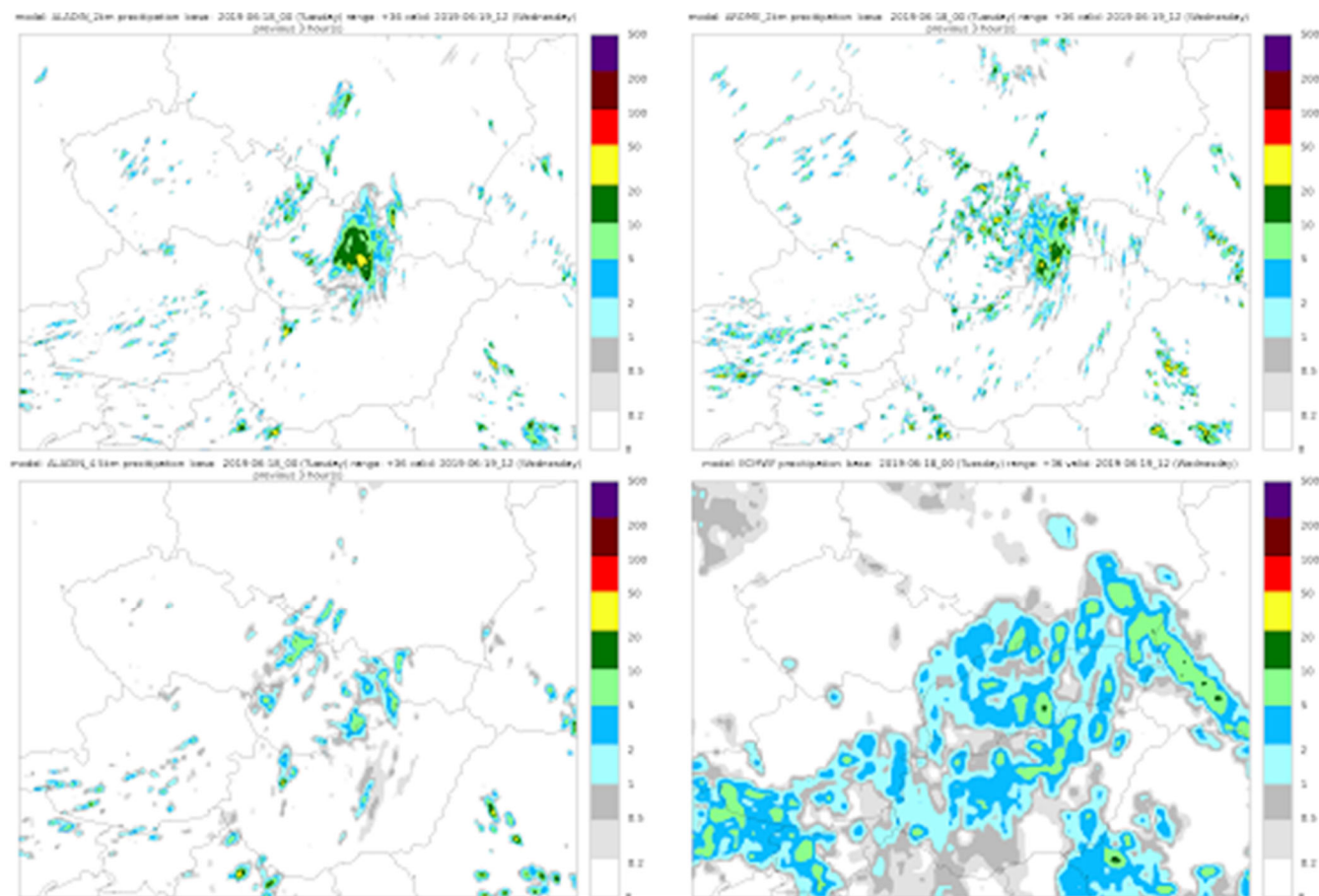
## 3.2 Subjective verification

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

#### 3.2.2 Case studies

Severe weather events/non-events are of particular interest. Include an evaluation of the behaviour of the model(s). Reference to major forecast errors, even if they are not in a “severe weather” category, are also very welcome.

Non-realistic convective precipitation in the morning hours is often observed in the ECMWF forecasts. See an example of +36 hours forecast of 3 hours cumulated precipitation valid for 2019-06-19 12 UTC for experimental 2 km models (top: ALADIN left, AROME right), ALADIN 4.5 km operational (bottom left) and ECMWF (bottom right).



## 4. Requests for additional output

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

NWP department does not require additional outputs. Forecasters would like to have available more indices of CAPE and clear and comprehensive description of their computation (principles).

## 5. Feedback on ECMWF “forecast user” initiatives

We invite comments on how useful you find the information provided on ECMWF’s “Forecast User Portal”, see: (<https://software.ecmwf.int/wiki/display/FCST/Forecast+User+Home>), and on any changes you would like to see. The web-based “Forecast User Guide” was introduced in May 2018 (<https://confluence.ecmwf.int/display/FUG/Forecast+User+Guide>) and we would particularly welcome feedback on that.

## 6. 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. *Mon. Wea. Rev.*, **20**, 134–148

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## **(7. Structure of these Reports)**

ECMWF is reviewing the way in which contributions such as these are gathered and collated. We have made some simple changes to the structure this year, as can be seen above. Please provide any comments you have on the whole process (e.g. schedule for collecting input, report content, report layout, TAC summary). Comments entered in this section will be examined and used by ECMWF, but will be removed prior to publishing your reports on the ECMWF website.