MS/CS “Green Book’ Report 2024

Section 1: Background

*** 1.1 Country**

Czech Republic

*** 1.2 Author(s)**

František Šopko

*** 1.3 Organisation**

Czech Hydrometeorological Institution (CHMI)

* Section 2: Summary of major highlights

ECMWF products have been widely used by the Central and Regional Forecasting Offices in Czech Hydrometeorological Institute (CHMI) for short-range and medium-range weather forecasts. Probabilistic products are considered to evaluate the credibility of the main deterministic forecast as well as to prompt for possible scenarios in situations of low determinism. The Extreme Forecast Index and other probabilistic products are used especially in severe weather forecasting.

A great number of products of deterministic model and some probabilistic products are visualised at weather station Visual Weather (IBL soft.) both at the Central Forecasting Office and at the Regional Forecasting Offices. Using this weather station, also products of other models, including Aladin model (operated in CHMI), GFS and ICON are displayed and compared to ECMWF products.

Most of products of ECMWF are also used by the Weather Service of Army of the Czech Republic.

Section 3: Forecast Products

3.1. Direct use of ECMWF forecast products

*** a) Medium Range (e.g. for high impact weather forecasting)**

ECMWF products are used as the main products to issue short-range and medium-range weather forecasts including severe weather for both the whole territory of the Czech Republic and particular regions of the Czech Republic. It consists both general weather forecasts for media and the public and special forecasts for aviation, winter maintenance of roads and motorways, energetics, gasworks etc.

They are also used to issue weather forecasts for state authorities and in the national Warning and Alert Service. Warning system has become the most important component of our service. Also probabilistic products and the Extreme Forecast Index are used to issue warnings. Ensemble products are considered in order to evaluate the credibility of the main

deterministic forecast and to issue weather forecasts more than approximately 4 days in advance.

ECMWF deterministic temperature and precipitation forecasts serve also as optional input to hydrological model in cases when prolonged lead time is demanded (especially for the purpose of reservoir management).

Some of meteorological parameters (pressure, temperature, wind) predicted by ECMWF are used as an automatic input to some our products that are controlled and modified by forecasters.

Only some products from ecCharts are used – e.g. precipitation state, precipitation probability and some others.

*** b) Extended Range (monthly)**

Extended range forecasts are consulted in the monthly forecast process. Currently the results of both deterministic and ensemble forecasts up to 15 days in advance and monthly forecasts are used for identification of the weather type in the analogue-based forecasting method for monthly forecasting.

*** c) Long Range (seasonal)**

Seasonal forecasts are used as a guideline for estimating the development of temperature and precipitation anomalies (hot and dry periods, wet periods).

*** d) CAMS and Fire-related output (ecCharts mainly)**

ECMWF data are also used to compute fire risk danger up to ten days in advance and CAMS modelling.

3.2. Cycle 48r1

*** a) Positive impacts of model cycle 48r1**

Daily runs of monthly forecasts.

*** b) Negative impacts of model cycle 48r1**

c) Systematic changes in forecast output since model cycle 48r1 was implemented

3.3: Derived Fields

Derived fields are calculated to improve detection and prediction of severe weather, mainly severe thunderstorms with heavy rain, hail and severe wind gusts. They are calculated by weather station Visual Weather and they are depicted to tables, maps and diagrams by this weather station.

It is calculated instability of the atmosphere (CAPE, Lifted index, Showalter index, convective inhibition CIN, temperature gradient between 500 and 850 hPa), wind shear between different levels, SWEAT index, jet stream, low-level jet stream, mixing ratio and

precipitable water. These parameters are used to improve prediction of thunderstorms and their dangerous events.

Other derived filds like type of precipitation, low level clouds and fogs, rime, snow drifts, ventilation index are used for prediction of other events.

Temperature, humidity, precipitation and wind speed predictions are also used for calculation of natural fire danger.

Three-dimensional wind forecasts over the Northern Hemisphere up to +120 hrs are used as the input to the trajectory model used for assessing of risk of distant nuclear or other major accidents.

3.4: Artificial Intelligence (AI) / Machine Learning (ML) techniques

No

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3.5: Dynamical Adaptation

3.6: Data-driven (AI) models

*** a) ECMWF's real-time AI model initiative**

*** b) Use of AI forecasts for operational purposes**

Section 4: Verification

4.1 Raw model output from ECMWF, and other operational models/ensembles

a) Short Range and Medium Range

CHMI carries out automatic evaluation of the main weather parameters (averages of minimum and maximum temperature, sunshine duration, precipitation total, percentage of region with precipitation, thunderstorms and fogs) of four numerical weather prediction models (Aladin, ECMWF, ICON, GFS) for both the whole Czech Republic and individual regions for five days ahead. The same method is used for evaluation of general forecasts issued by forecasters. Method is based on adapted Brádka's method of evaluation used by forecasters since the year 1958 and now uses new database system and computing capabilities.

b) Extended Range (Monthly) and Long Range (Seasonal)

4.2 Post-processed products and/or tailored products delivered to users

4.3 Subjective verification

4.4 Case Studies

Section 5: Output Requests

a) Product request 1:

b) Product request 2:

Section 6: References

Section 7: Additional comments and Feedback