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Green Book 2024 - aka Use and verification of ECMWF products in the Member and Co-operating States

Fields marked with * are mandatory.

Introduction

Welcome to ECMWF new "Green Book" online submission system (aka "Use and verification of ECMWF products in the Member and Co-operating States")

This time we have two options for completion:

- Filling out the online questionnaire below (new for this year based on feedback from the Meteorological Representatives meeting in November 2023)
- Producing a single report offline (as done in previous years), and emailing the report as detailed in Section 1.

Both methods ask the same questions, however the questionnaire method requires no formatting and aims to make analysis of all responses easier. The questionnaire option also allows you to part-complete, and save your entries to come back to later (using the "Save as Draft" button in the top right corner of this page). Note that the EUSurvey page will timeout after 60 minutes of no activity, responses are usually saved however to be sure please "Save as Draft" to avoid losing responses.

The deadline for all submissions is 23:59UTC on Wednesday 15th May 2024

A summary of responses will be presented at UEF2024 with a summary report available in the ECMWF Publications library in due course.

Section 1: Background - please fully complete

* **1.1 Which Country is your submission for?**

SK - Slovakia

* **1.2 Please provide your name(s)**

Jozef Csaplar

* **1.3 Please provide your organisation**

Slovak Hydrometeorological Institute (SHMU)

* **1.4 Please select your preferred submission method:**

- ( ) Producing a single report offline
- (•) Online questionnaire

Online questionnaire

Please answer the following questions, and illustrate your answers, where appropriate, by also uploading clearly annotated images with image/figure numbers (max 1MB per file). More questions or options may appear, depending on answers to particular questions. Mandatory questions are marked with a '*'. Free text boxes appear to have a 5000 character limit (if your answers are longer than this please email them to Becky and they will manually added), answers don't need to fit the box size given, the boxes expand.

Responses to the questionnaire can be saved and returned to at a later date before submitting. To do this click the 'Save as Draft' button on the left, this will provide you with a link which you can return to to continue /complete your submission.

Section 2: Summary of major highlights

* **Please detail major highlights since January 2022**

You may wish to complete this section at the end, after completing all others**.**

Our highlight - operational download of chemical boundary conditions from CAMS EUROPE model (forecast) for our operational chemical-transport model.
Your highlight - increase of horizontal resolution of cycle 48r1 which makes ensemble forecasts for medium range equivalent to former deterministic forecasts.

Section 3: Forecast products

3.1. Please outline what direct use you make of standard ECMWF model products (on ecCharts / OpenCharts / own workstation), for operational duties, in the following 4 categories (noting that new AI model output should be dealt with separately, via question 3.4).

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

ECMWF standard model products are used for:
Operational Medium range Weather forecasts for public (4-th to 7-th day) and occasionaly for customers,
Crosschecking with LAM models (deterministic or ensemble) for hints about predictability for short range forecasts
Forecasters do use own workstation equiped with SW package Wisual Weather but use also ecCharts and OpenCharts

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

Once per week forecasters prepare "monthly" text forecasts covering 4 weeks for internal use. They are available for general public since April 2024.

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

Preparation of seasonal forecaststst by forecasters is very rare.

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

CAMS and Fire-related output in graphical form are not used for operational duties.

3.2. ECMWF cycle 48r1 went live at the end of June 2023. Changes included a much higher resolution medium range ensemble, and much more frequent monthly forecasts.

* **a) Please describe any positive impacts of model cycle 48r1 for your service**

Improvement of spatial resolution of ECMWF ENS had very positive impact on forecasting over Slovakia. Slovakia is situated in very complex terrain, thus better description of orography results in better forecast of local phenomena, mainly associated with mountains and valleys and deep moist convection.

If you have any annotated graph/diagram/plot that would help clarify your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

* **b) Please describe any negative impacts of model cycle 48r1 for your service**

Overestimation of the spatial occurrence of the convective precipitation forecast (very similar to the previous cycle)

If you have any annotated graph/diagram/plot that would help clarify your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

* **c) Have you noticed any systematic changes in forecast output since model cycle 48r1 was implemented?**

- ○ Yes
- ◉ No

* **3.3: Do you modify ECMWF model output to create 'derived fields' (e.g. post-processed output, regimes, probabilities).**

- ◉ Yes
- ○ No

Please describe what you modify and how

New epsgrams (using sw package High Charts based on computations of median and quartils from ECMW's ensemble forecasts of temperature, cloudiness, precipitations, pressure, wind speed and direction and gusts) are available for public since 8-th March 2024.
Products covering next 13 days (computed medians of maximum daily and minimum of nightly temperature for Slovak territory, percantage of Slovak territory excceeding threshold of sum of computed medians of total precipitation for 24 hours on Slovak territory below an limit of mean see level high) for customer.

Forecasters use probabilities and percentiles of daily maximum/minimum temperature, amount of precipitation, cloud coverage, highest winds and windgusts for different thresholds; several combination of synoptic maps from ENS (e.g. MEAN height of 500 hpa + MEAN MSLP + MEAN 850 hPa Temperature + St. Dev. 850 hPa Temperature; MEAN MSLP + 4K anomaly 850 hPa Temperature, etc.); 24/48/72 h comparison of various temperature characteristics at different levels, pressure tendencies (3/6/12/24 h), pressure gradient, advection of vorticity/temperature at various levels, lapse-rate at various layers; the strongest inversion layer in 950-700 hPa layer (computed by maximum of difference temperature among each available layer) with relative humidity over 70 % - product for better forecast of low clouds coverage; wind direction by colours (very useful for identification of mesoscale boundaries), minimal 2m dewpoint temperature in 12 h (usually better estimation of 2m minimal temperature), vapour pressure of water, amount of freezing rain (computed from precipitation in rain in temperature max 0.1 °C in each available step in required time interval) - a product for distinguishing the level of warnings, etc... all parameters are computed in Visual Waether software by IBL

If you have any annotated graph/diagram/plot that would help support your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

* **3.4: Do you currently use Artificial Intelligence (AI) and/or Machine Learning (ML) techniques in your service, in conjunction with standard ECMWF model output?**

- ○ Yes
- ◉ No

* **3.5: Does your NMHS use ECMWF data for modelling purposes - e.g. by providing initial/boundary conditions for limited area model runs, or for hydrological models, or for dispersion models, etc...**

- (●) Yes
- ( ) No

Please describe these activities

Ensemble initial conditions from ECMWF are used to feed A-LAEF system, running as a project of RC LACE and Turkey at ECMWF's HPC.
Local convection-permitting version of ALADIN NWP system is using ECMWF as LBC.
Chemical boundary conditions for operational chemical-transport model are downscaled from CAMS EUROPE model (forecast). The respective CAMS product are downloaded operationally using cds_api. The main aim of the new CAMS NCP project, which will start from the June, is to use other CAMS products for the scientific purposes and public awareness.

If you have any annotated graph/diagram/plot that would help support your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

* **3.6: In the last year or so ECMWF has made available, on ecCharts and OpenCharts, selected fields from AI models (e.g. Pangu Weather, AIFS). Were you aware of this?**

- (●) Yes
- ( ) No

* **a) What are your views on this initiative?**

Basicly positive. It seems, the available forecasts generated by AI models in general are comparable to forecasts generated by IFS. Perhaps AI models could save computation costs for generation of ensemble members based on sets of ensemble initials conditions. Verification of maximal length of usefull forecasts (scores comparable with scores of IFS) generated by AI models could reveal time range limits of use AI based models.

* **b) Do you currently use AI forecasts for operational purposes?**

- ( ) Yes
- (●) No

What would you need in order to use AI models in your forecast activities?

More information on AI models forecasts limitation and knowledge of ML.

Section 4: Verification

ECMWF does extensive verification of its products in the free atmosphere. However, our verification of surface parameters is more limited and can be constrained to only using synoptic observations. More detailed verification of these surface weather parameters by National Services is always valuable to us. We are most interested in results for the last 1 or 2 years. Also, any evidence you have of performance changes since the introduction of cycle 48r1 would be very valuable.

* **4.1 Do you routinely verify raw model output from ECMWF model(s) and/or other operational models /ensembles?**

- ○ Yes
- ◉ No

Please describe your verification activities and show and discuss related scores in the the two lead-time categories shown below, including, where possible, comparisons with your own models /ensembles, and other models/ensembles.
Ideally focus on surface weather parameters in your own territory. Inclusion of conditional verification results is also strongly encouraged - e.g. stratification by a weather type - as these can provide very useful insights into model weaker points.

a) Short Range and Medium Range

If you have any annotated graph/diagram/plot that would help support your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

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

If you have any annotated graph/diagram/plot that would help support your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

* **4.2 Do you routinely verify post-processed products and/or tailored products delivered to users?**

- ○ Yes
- ◉ No

* **4.3 Do you perform any subjective verification of forecasts?**

- ○ Yes
- ◉ No

4.4: Case Studies. Please describe and illustrate any case study verification you have undertaken. Examples of both good and bad model performance are welcome. Severe weather events (and non-events) are of particular interest to us.

a) Case Study 1 - Please describe the forecast(s) and what happened

Freezing rain of 10-20 mm around the Tatra Mountains.

The mentioned forecast materials are only from own archive, so they do not cover all the options available at the time. The first figure shows the forecast amount of freezing rain in mm (calculated from the product of rain combined with a temperature below 0.1 °C). The ECMWF model predicted the least amount of freezing precipitation in the Tatra region, which may be partly due to the orography of the model.
ALADIN 2 km (SHMI) is computed from ECMWF boundary conditions and also predicted a relatively small amount of precipitation in the Tatra region. Apparently, for this reason, the forecast came out better with the ALADIN 4.5 oper (SHMI) and ICON-EU (DWD) models. Product from ENS ECMWF for forecast amount of freezing rain was not available. The resulting precipitation totals for 24 hours are shown in fig. 2, in the area around the Tatras almost all precipitation fell in freezing rain (except for values of 25 and 30 mm, which are at high altitude and part of the precipitation fell there in the form of snow or rain at a positive temperature (very strong inversion).

If you have any annotated graph/diagram/plot that would help support your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

34872643-bb10-4af2-81dd-d16c364d277e/231202_24h_precipitation.jpg
61d89771-7c33-4cee-a28d-079d494fc5d7/231202_freezing_rain_24h.png

Case Study 1 is an example of:

- ○ Good model performance
- ◉ Bad model performance
- ○ Mixed (good and bad) model performance
- ○ Other (please describe above)

Add another Case Study?

- ○ Yes
- ◉ No

Section 5: Output Requests

5. Please describe, and illustrate if necessary, any particular requests you may have for new or modified ECMWF products.

a) Product request 1 - title / summary

Q-vector divergence field

Product request 1 - description of request

Q-vector divergence field on various pressure levels (like ESSL uses in their weather data displayer)

If you have any annotated graph/diagram/plot that would help support your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

Add another Product Request?

- ( ) Yes
- (•) No

Section 6: References

6. Are there any recent internal or external publications that relate to the questions in this survey? Please list them including the respective link/s. For any publications that cannot be readily downloaded via a link please attach a copy below (or email Becky Hemingway (becky.hemingway@ecmwf.int) and Tim Hewson (timothy.hewson@ecmwf.int) if too large to upload here).

NA

If you have any annotated graph/diagram/plot that would help support your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

Section 7: Additional comments and Feedback

7.1. Please use the box below if you have additional comments on topics that have not been covered in any of the questions above

NA

If you have any annotated graph/diagram/plot that would help support your answer to the previous question, please upload here.
File types: most accepted, File Size: max 1MB per file.

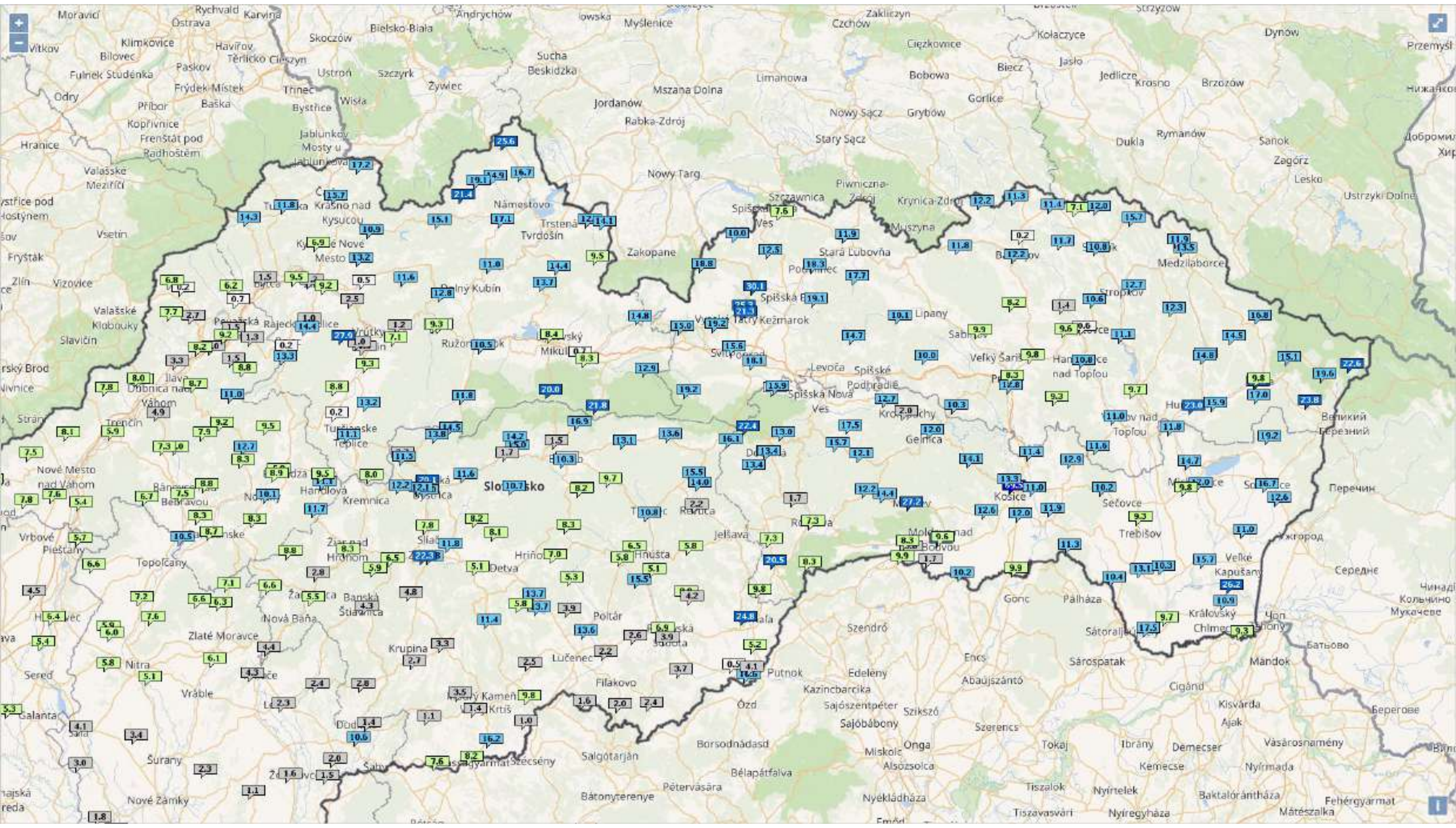
7.2. This is the first time we have used a survey style structure for Green Book submissions. You thoughts and feedback on this process are very welcome

New online Green Book submission is definitely better option than offline submission.

Thank you for taking the time to complete your Green Book report. Your feedback and comments are very valuable to us!

Contact

Contact Form



Ostrava
Karviná
Bielsko-Biała
Myślenice
Zakliczyn
Czchów
Strzyżów
Dynów
Přemysl
Nový Targ
Zakopane
Nowy Sącz
Stary Sącz
Limanowa
Gorlice
Krosno
Sanok
Dukla
Jordanów
Rabka-Zdrój
Żywiec
Trstená
Tvrdošín
Námestovo
Dolný Kubín
Ružomberok
Poprad
Kežmarok
Stará Ľubovňa
Levoča
Spišská Nová Ves
Prešov
Svidník
Stropkov
Medzilaborce
Humenné
Snina
Michalovce
Sobrance
Trebišov
Košice
Gelnica
Rožňava
Moldava nad Bodvou
Revúca
Jelšava
Hnúšťa
Poltár
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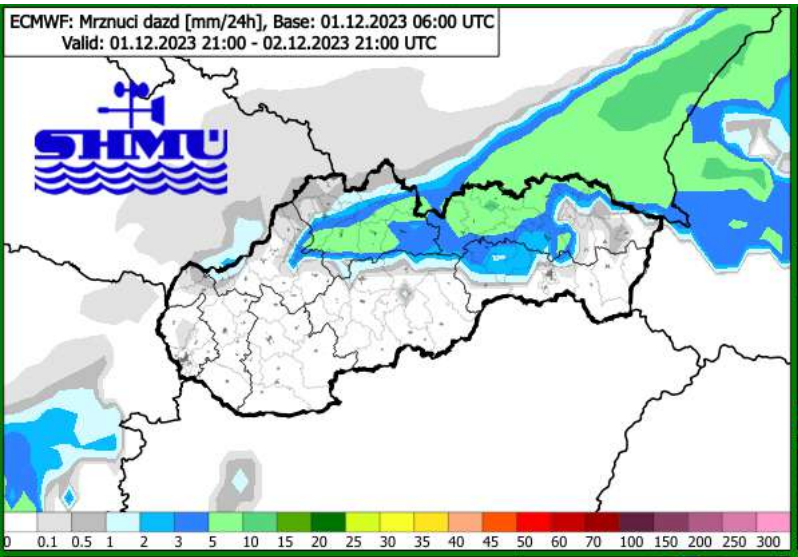
Fiľakovo
Detva
Banská Bystrica
Kremnica
Žiar nad Hronom
Banská Štiavnica
Krupina
Zlaté Moravce
Nitra
Topoľčany
Piešťany
Trenčín
Bánovce nad Bebravou
Prievidza
Handlová
Žilina
Martin
Čadca
Kysucké Nové Mesto
Bytča
Považská Bystrica
Púchov
Ilava
Dubnica nad Váhom
Nové Mesto nad Váhom
Vrbové
Sereď
Galanta
Šurany
Nové Zámky
Vráble
Dudince
Šahy
Veľký Krtíš
Salgótarján
Putnok
Ózd
Miskolc
Edelény
Szendrő
Sátoraljaújhely
Sárospatak
Kisvárda
Mándok
Čierna nad Tisou
Kráľovský Chlmec
Veľké Kapušany
Sečovce
Vranov nad Topľou
Lipany
Sabinov
Veľký Šariš
Hanušovce nad Topľou
Bardejov
Krynica-Zdrój
Muszyna
Piwniczna-Zdrój
Szczawnica
Slovensko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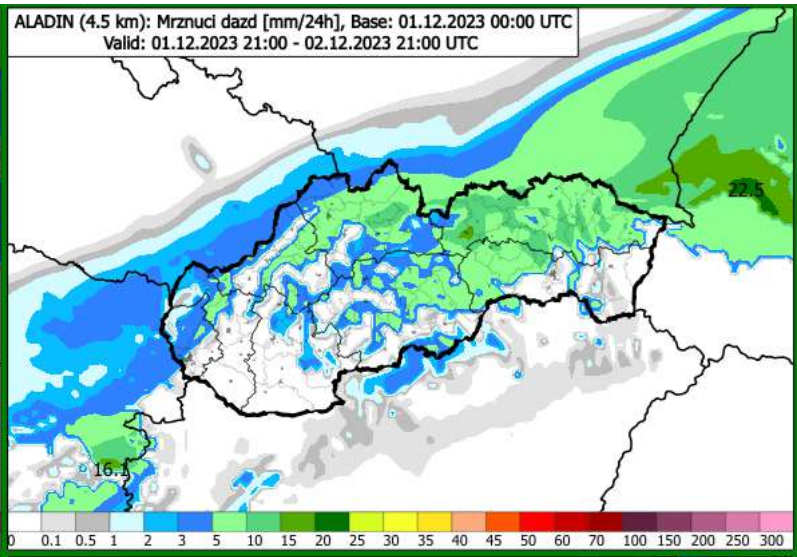
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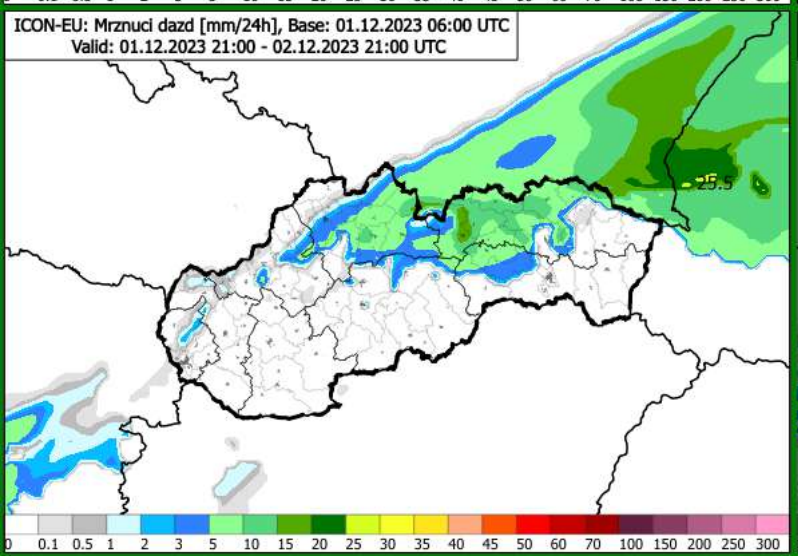
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25.5
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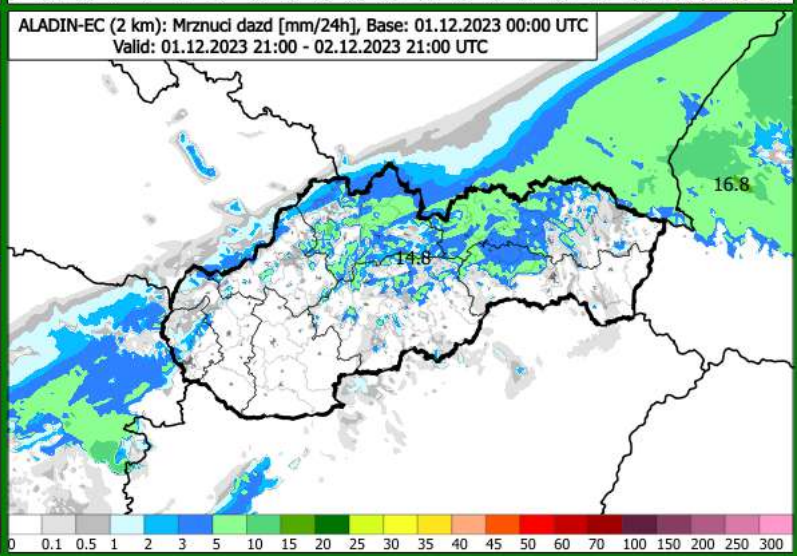
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