

*Regional Cooperation for
Limited Area Modeling in Central Europe*



LACE verification activities

Authors: Doina-Simona Taşcu with contributions of LACE partners



ARSO METEO
Slovenia

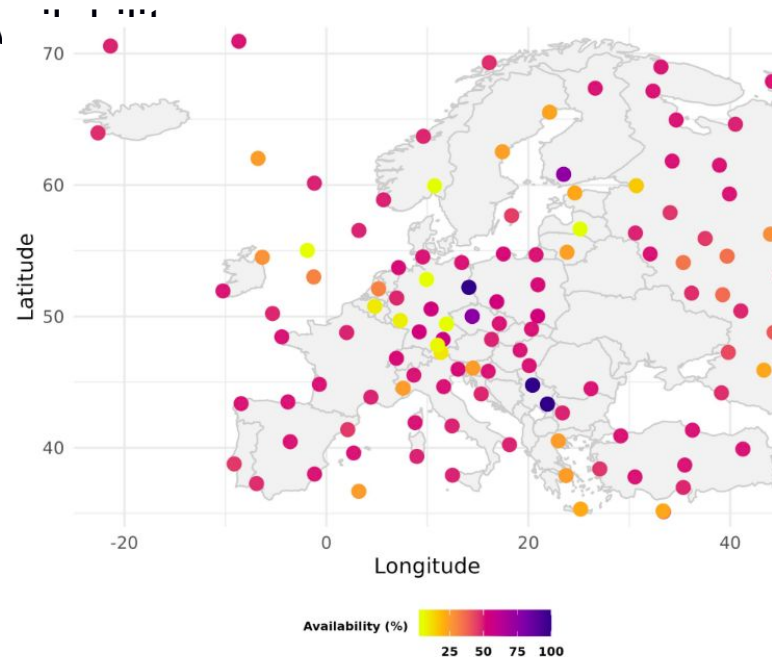
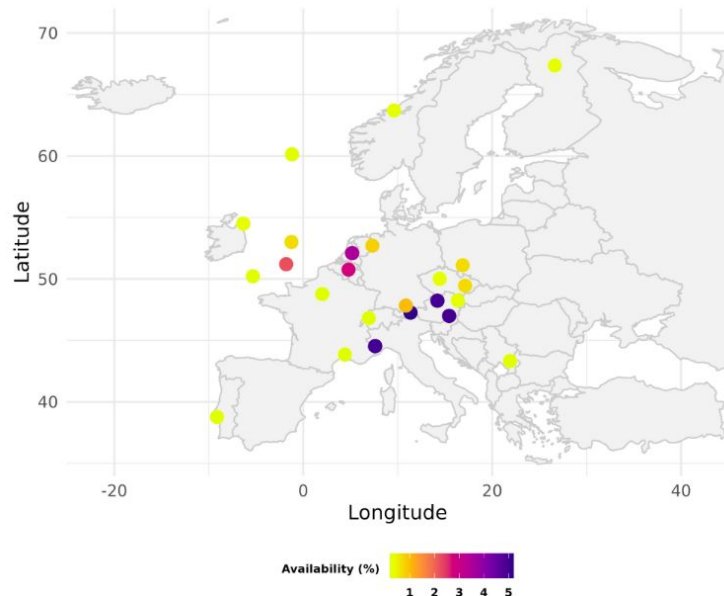
Martin Petráš's stay in Prague, 2025, with Alena Trojáková helping

Comparing TEMP in two available formats: OBSOUL $\leftrightarrow$ VOBS

- by identification of geographic and temporal gaps in the datasets
- characterize patterns of data sparsity
- verify that the updated code functions
- June 2025

Development of HARP Extending harpIO to enhance its functionality for upper air verification within the OBSOUL framework

- small number of stations -> more than **75%** data av

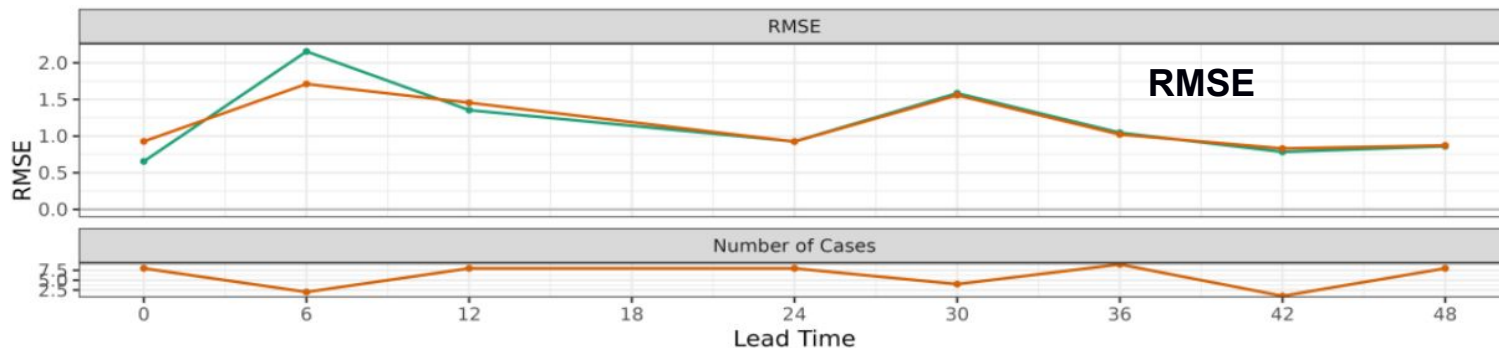


- the maximum data availability at non-synoptic does not exceed 5%

- **deode_clim:**
 - cy48t3_ALARO_CRO_500m
 - IC: global Digital Twin
- **deode_clim_init:**
 - cy48t3_ALARO_CRO_500m
 - IC: operational ALARO+ISBA model
 - 2.3 km, from CHMI
- 500 m horizontal resolution



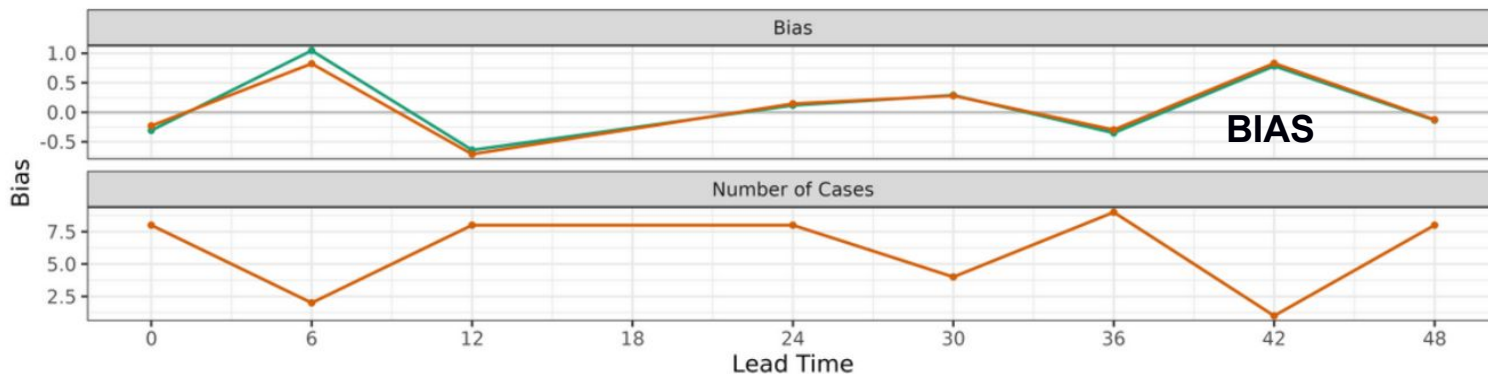
Development of HARP Extending harpIO to enhance its functionality for upper air verification within the OBSOUL framework



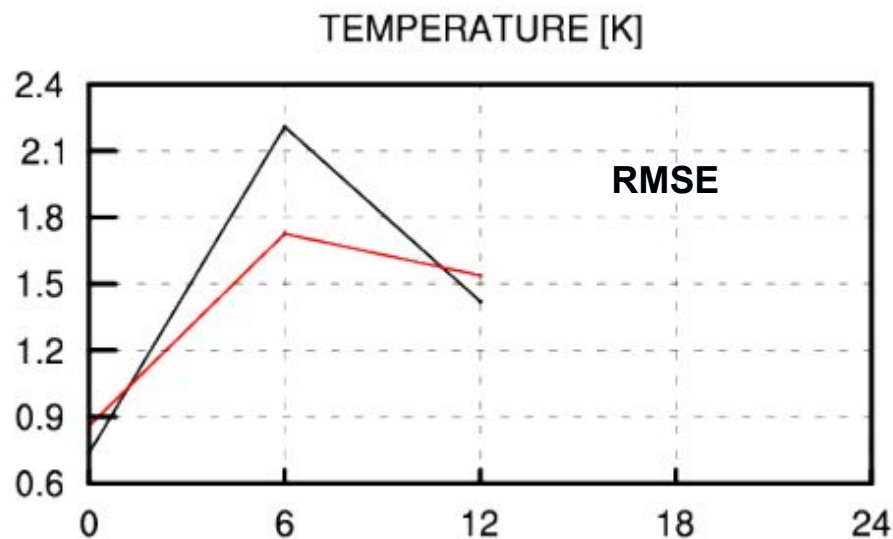
T850hPa
02.11 - 03.11.2024

deode_clim
deode_clim_init

by using HARP

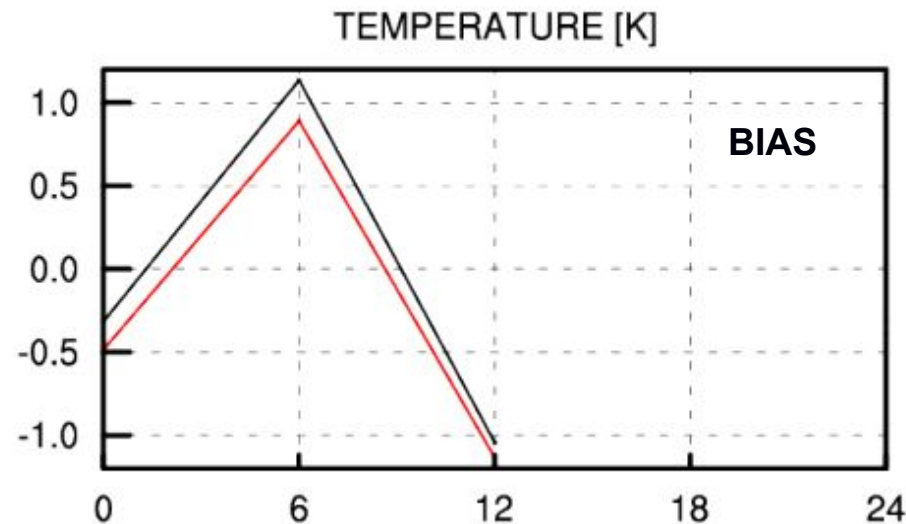


Development of HARP Extending harpIO to enhance its functionality for upper air verification within the OBSOUL framework



deode_clim

deode_clim_init



T850hPa

02.11 - 03.11.2024

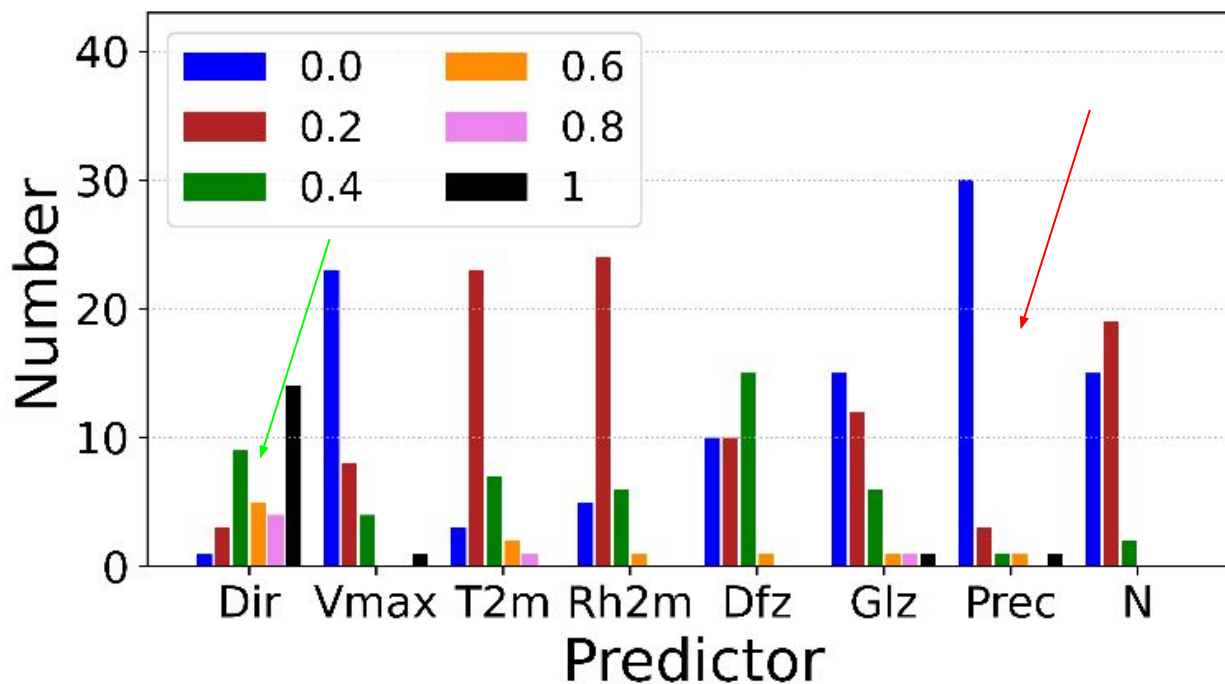
- by CHMI VERAL package -

Many thanks to Martin Petráš for his invaluable contribution over the years!

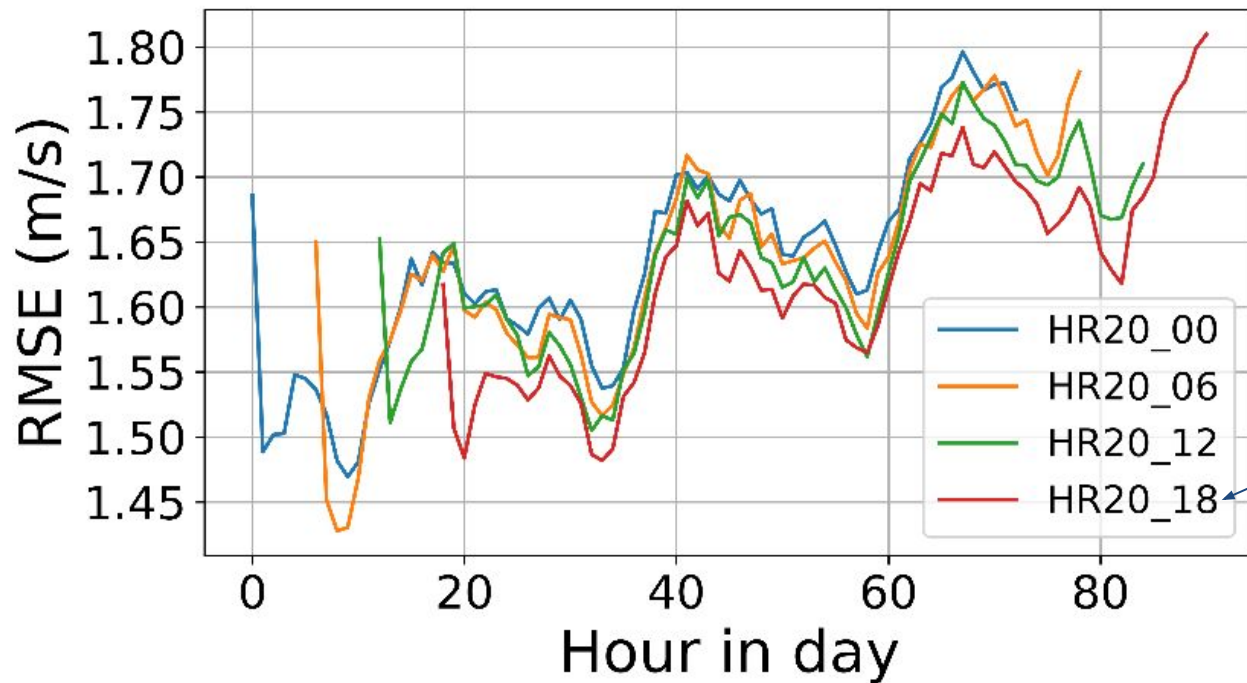
- They reviewed the recommendations of research groups of ACCORD and NCAR $\leftrightarrow$ covering approaches of object-, neighbourhood-, and distance-based measurements, spatial alignment and field deformation
 - **MODE** $\leftrightarrow$ Method for Object-based Diagnostic Evaluation $\leftrightarrow$ from NCAR
 - **SAL** $\leftrightarrow$ Structure-Amplitude-Location
 - **Hausdorff-distance and Baddeley's delta metric**
 - **Measures of G and G_β**
 - **Image Warping**
 - **FSS** $\leftrightarrow$ Fractions Skill Score tests the ability to hit fractions correctly within a specified size of spatial window frame
 - **Panelification** $\leftrightarrow$ development of GeoSphere Austria

- HR20 at 2 km < – > the analogue method HRAN
- 10-minute averaged 10-meter wind speed forecasts
- 2024
- IC and LBC <—> from HR40 which in turn is using IFS-ECMWF as input in a lagged model
- the usage of the weighted combination of selected meteorological parameters
- stations having more than 10% data missing or those which were invalid data were excluding
- for the optimization of the predictor weighting < – > **8 parameters**
- training dataset – > based only on **00 UTC**
 - one-year training dataset
 - one from a separate eight-month

- the most important benefit of predictors → **by the wind direction**
- the smallest impact → **by the precipitation field**

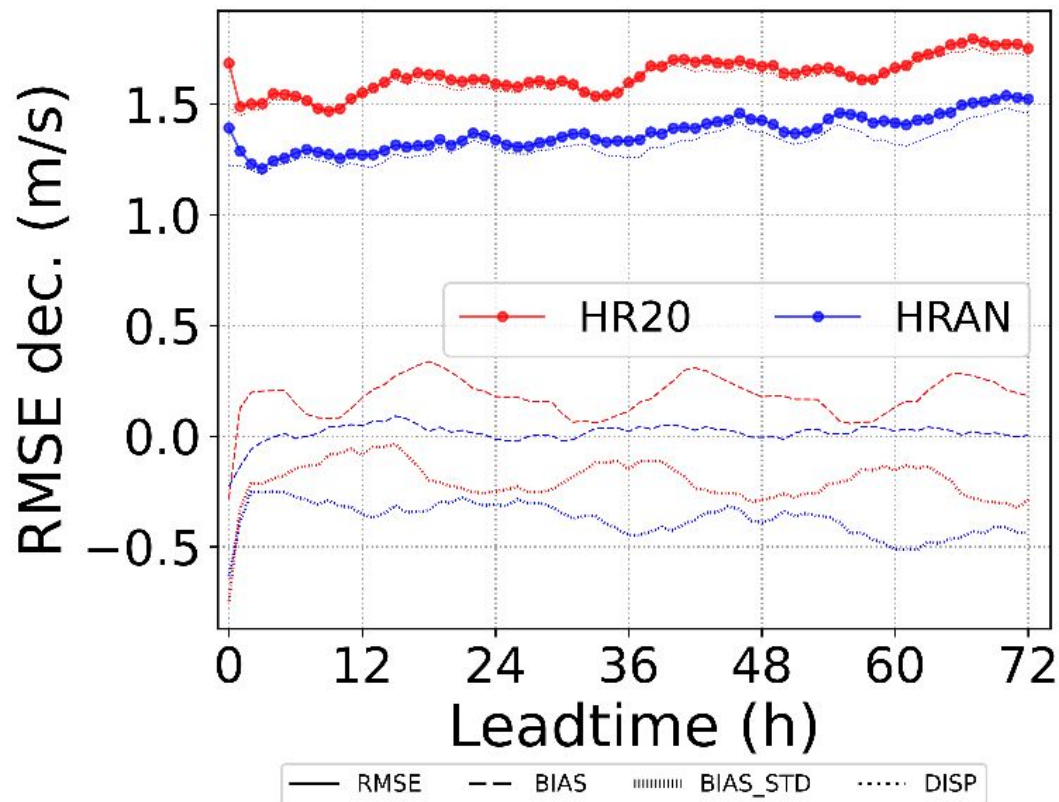


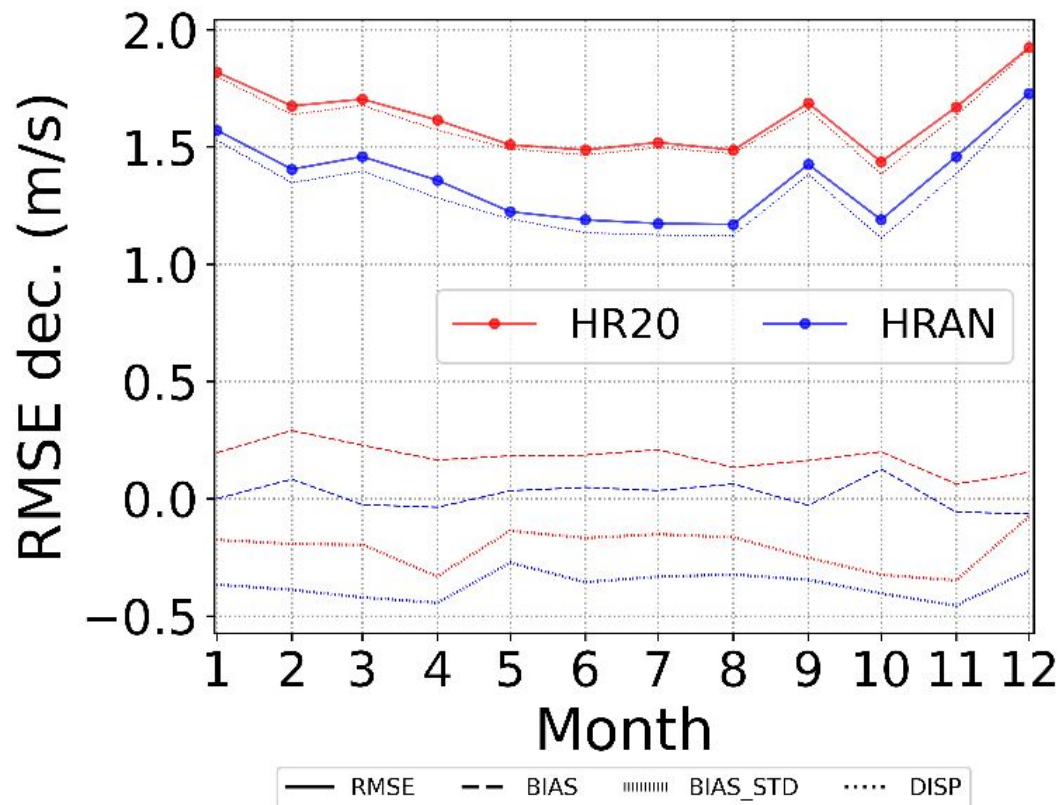
10-m wind speed



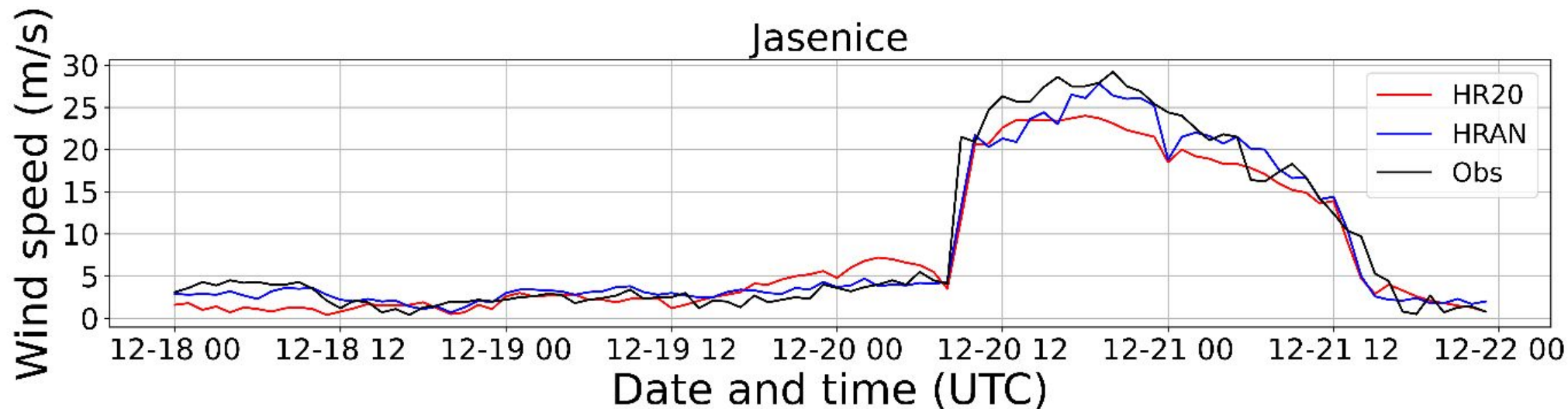
- different initialization times
- 36 locations

◆ lowest value

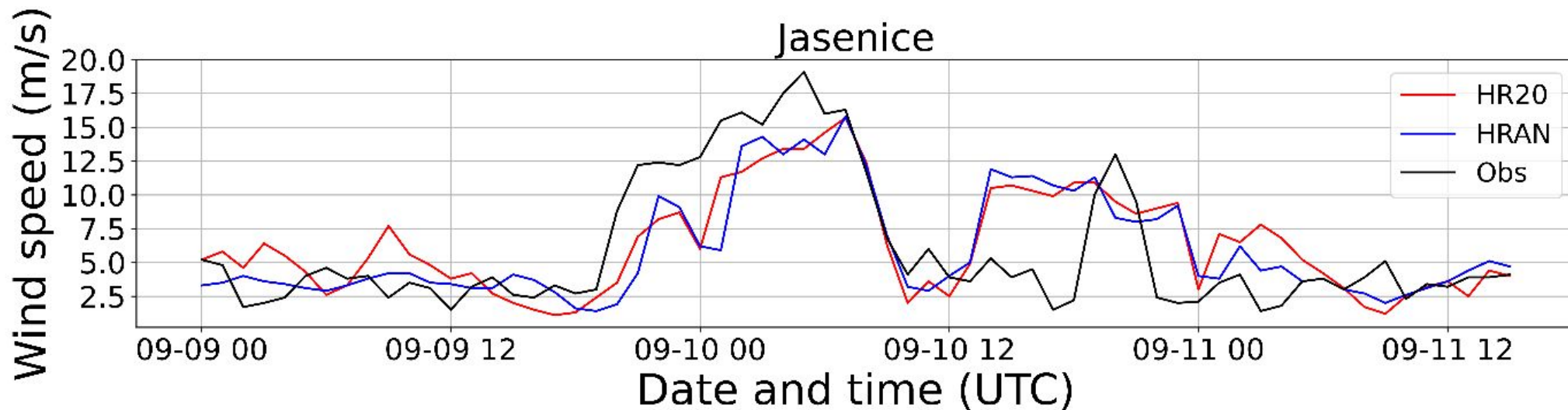




❖ Case study: 18 to 22 December 2024

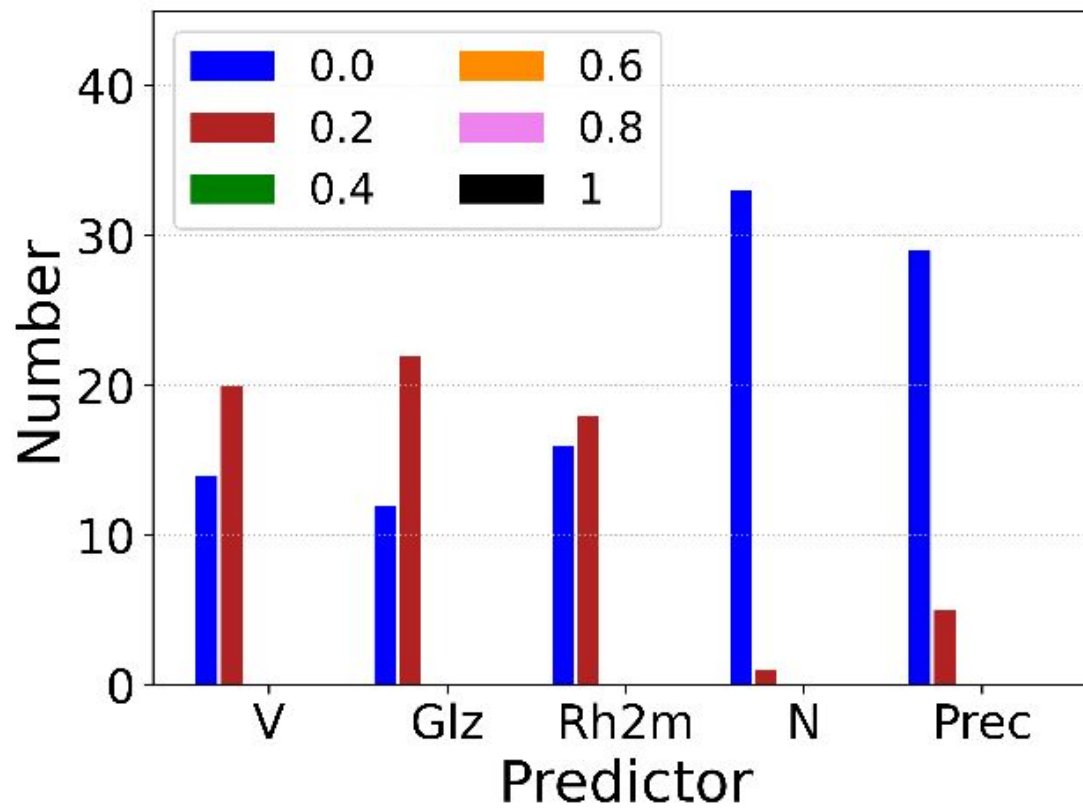


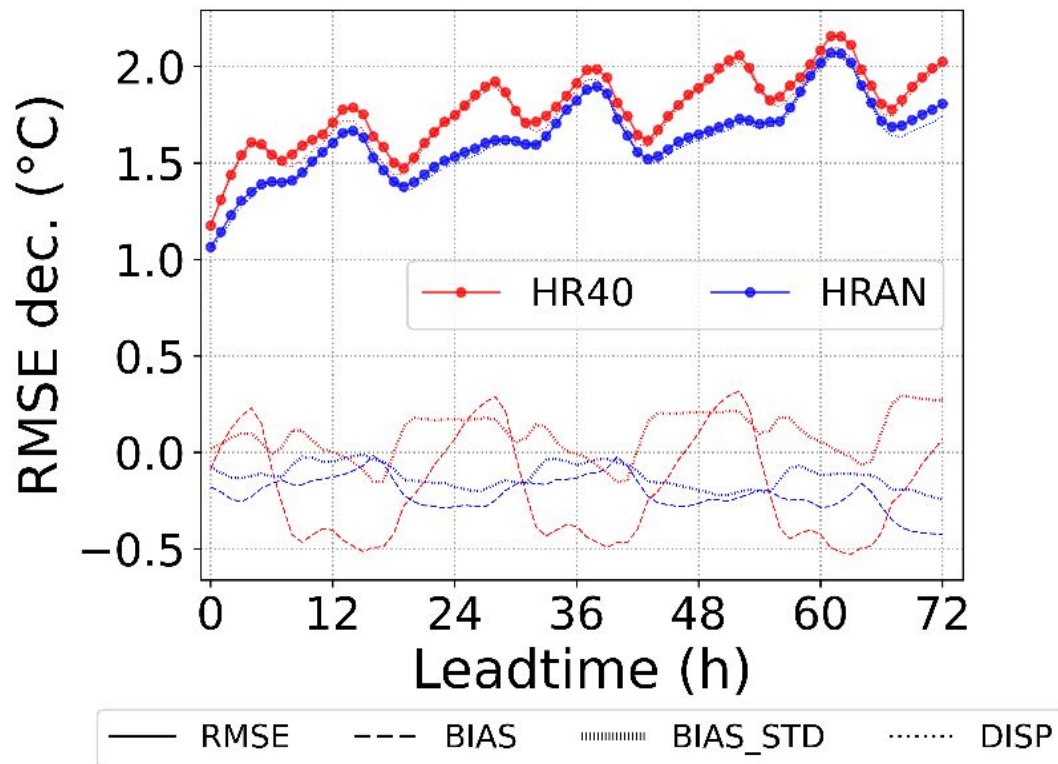
❖ Case study: 9 to 11 September 2024



- ❖ Submitted article “Verification of 10-m wind speed ALADIN-HR forecasts HR20 and HRAN”, authors: Iris Odak, Ivan Vujec, Mario Hrastinski

- HR40 at 4 km (ALARO-1 at 4 km) < – > the analogue method HRAN
 - 2-m temperature forecasts
 - 2024
 - 34 stations
 - the usage of the weighted combination of selected meteorological parameters
 - stations having more than 10% data missing or those which were invalid data were excluding
 - for the optimization of the predictor weighting < – > **6 parameters**
 - training dataset – > based only on **00 UTC**
- one-year training dataset





- ❖ Submitted article: “Evaluation of 2-Meter Temperature ALADIN-HR Forecasts from HR40 Model Configuration and HRAN Post-Processing”, authors: Ivan Vujec, Iris Odak, Endi Keresturi

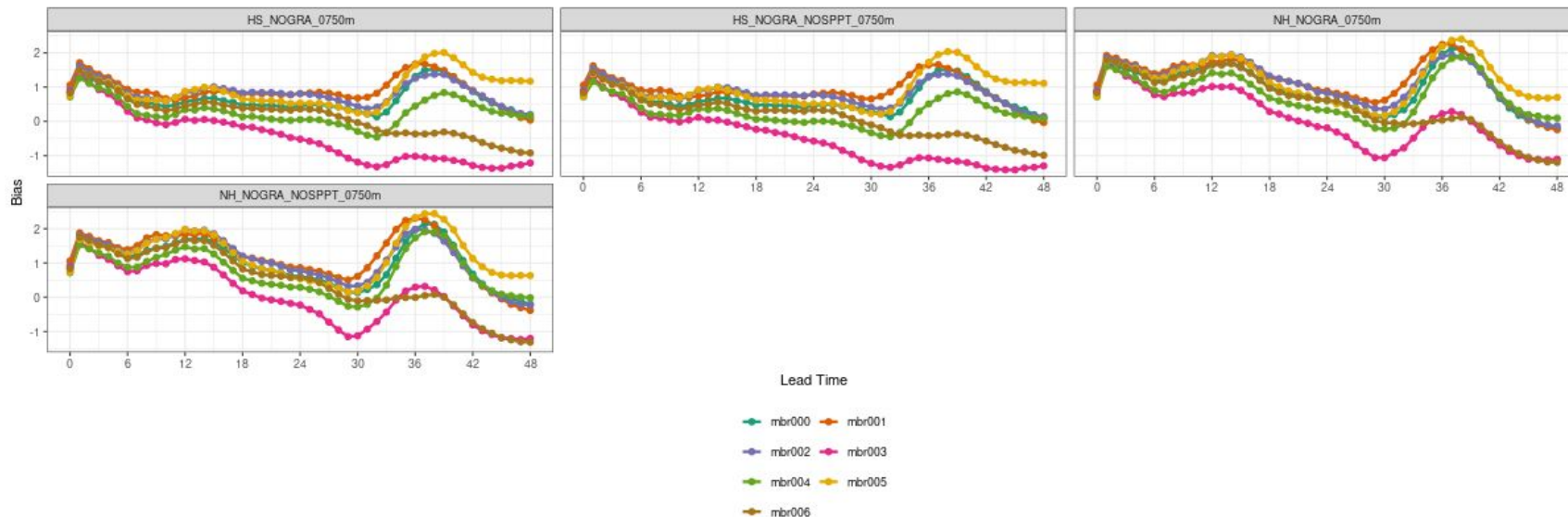
- Taking into account the work of Martin Bellus based on
 - ALARO-EPS
 - 750 m
 - 87 vertical levels
 - validation $\leftrightarrow$ 13th September 2024

Many thanks to Martin Belluš for the fruitful and special collaboration over the years!

- EPS: 6 members + 1 control
- 4 versions of ALARO setup:
 - hydrostatic (HS)
 - non-hydrostatic (NH)
 - no prognostic groupels (NOGRA)
 - no stochastic physics (NOSPPT - i.e. only multiphysics)
- the calculation of the verification scores
 - point-to-point verification by using the HARP system
 - 443 synop stations from the OPLACE database
 - for several meteorological parameters: T2m, RH2m, MSLP TP1h, 10WS

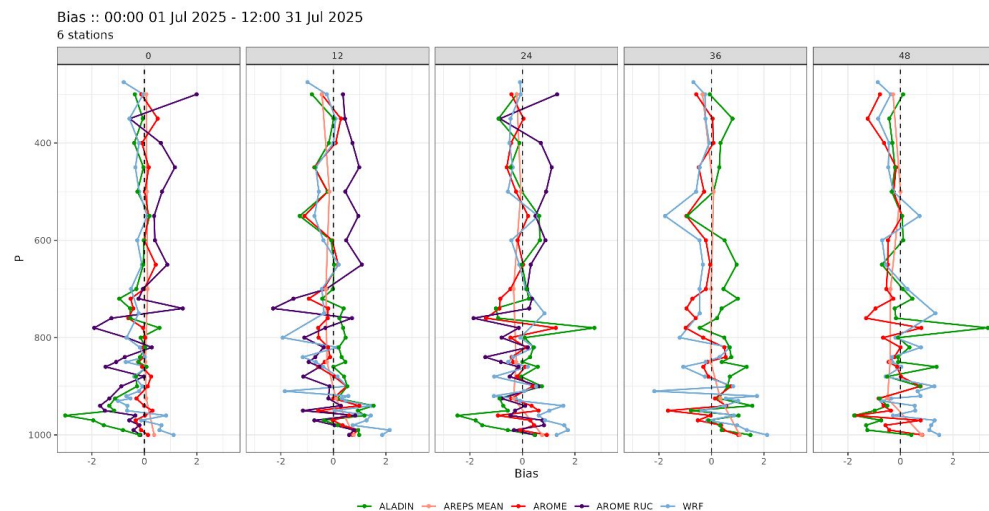
Validation of ALARO-EPS at 700 m by using HARP

Bias :: 00:00 13 Sep 2024 - 00:00 13 Sep 2024
443 stations

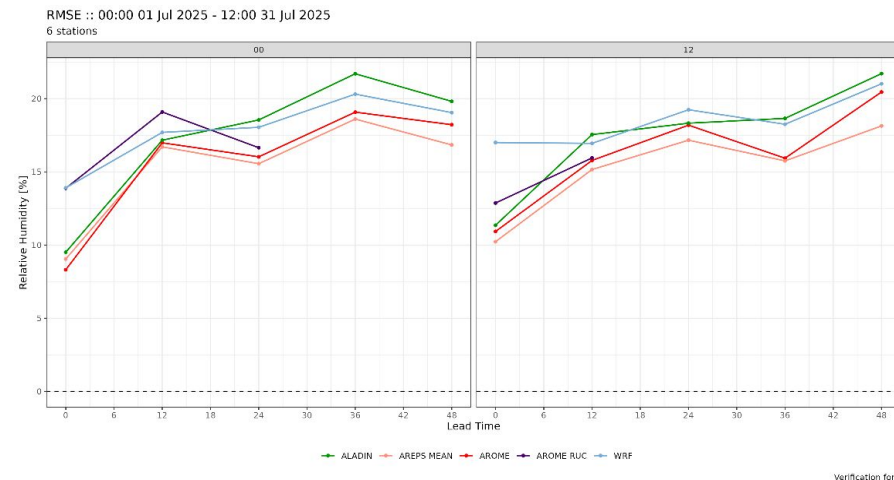


Verification for T2m

- operationalization of the 28 pressure level location verification
- TEMP observations of 6 stations within the AROME/HU domain



Verification for S

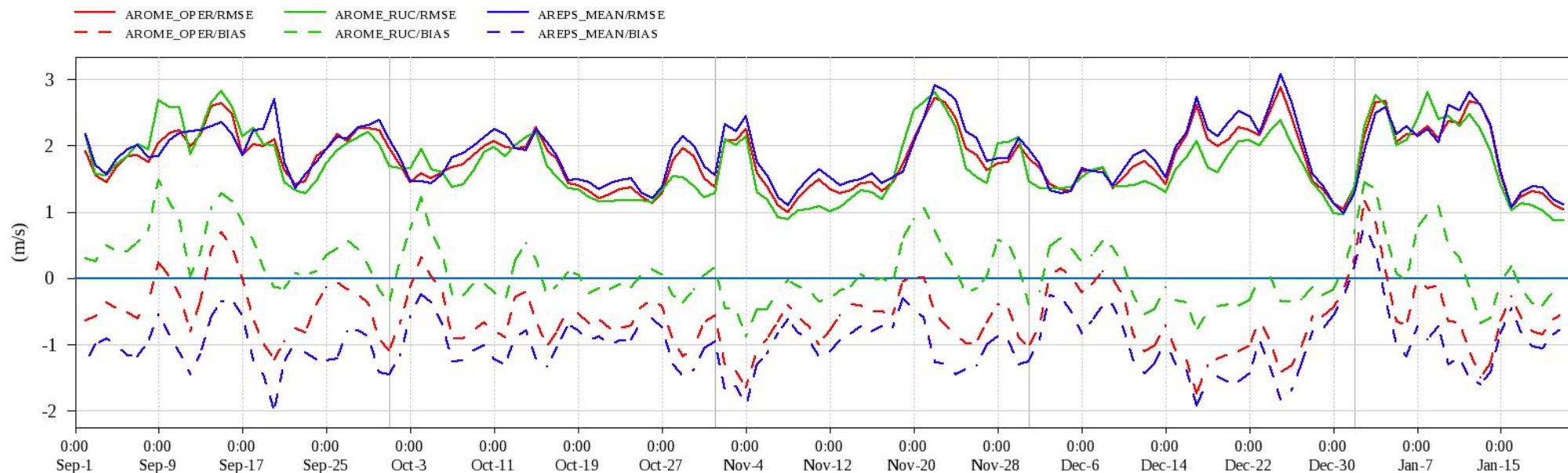


Verification for r

- developing an automatic and objective method:
 - the daily maximum wind gust
 - for a given location
 - by interpolation of station measurements onto a fine grid
 - with background information from high-resolution numerical weather predictions
 - for spatial interpolation the MISH (Meteorological Interpolation based on Surface Homogenized data basis) method:
 - developed by the Hungarian Meteorological Service specifically for meteorological purposes
 - forecasts of AROME, AROME-RUC and AROME-EPS (the mean values)
 - verification period: 1 September, 2024 to 21 January, 2025

Verification of wind gust forecasts of AROME, AROME-RUC and AROME-EPS for development of a wind hazard product

Legend (Model/S core)

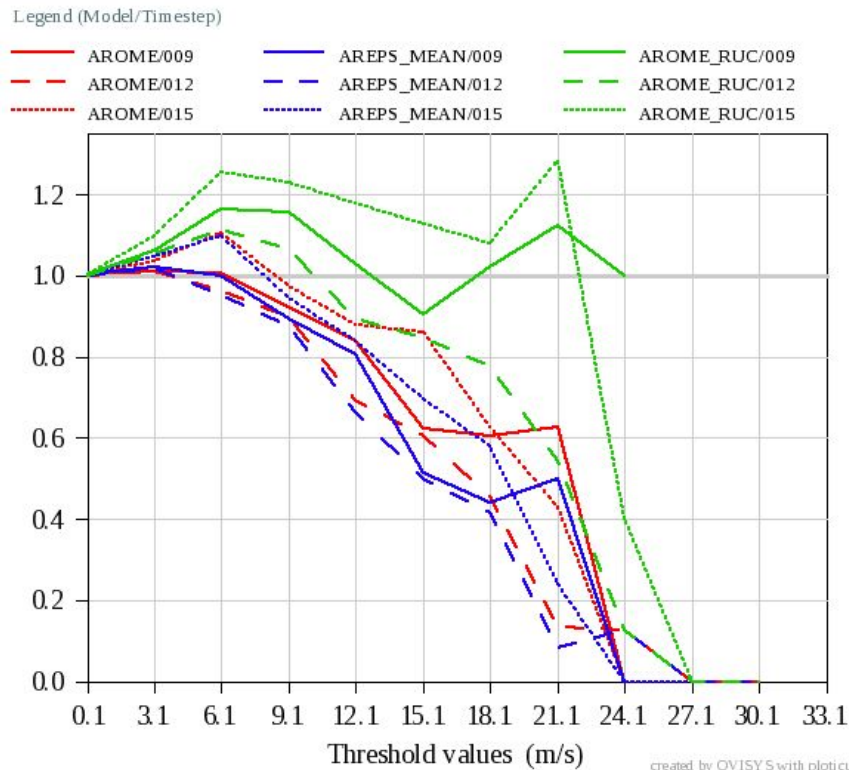


created by OVISYS with ploticus 2025.08.18 09:57:02

- ❖ **AROME**
- ❖ **AROME-RUC**
- ❖ **mean of AROME-EPS**

Verification of wind gust forecasts of AROME, AROME-RUC and AROME-EPS for development of a wind hazard product

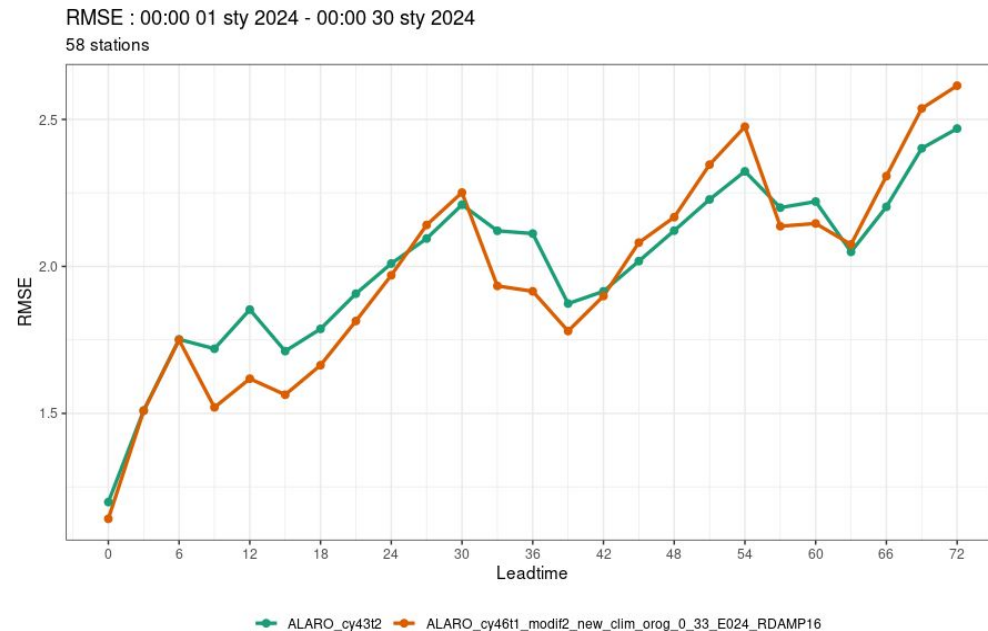
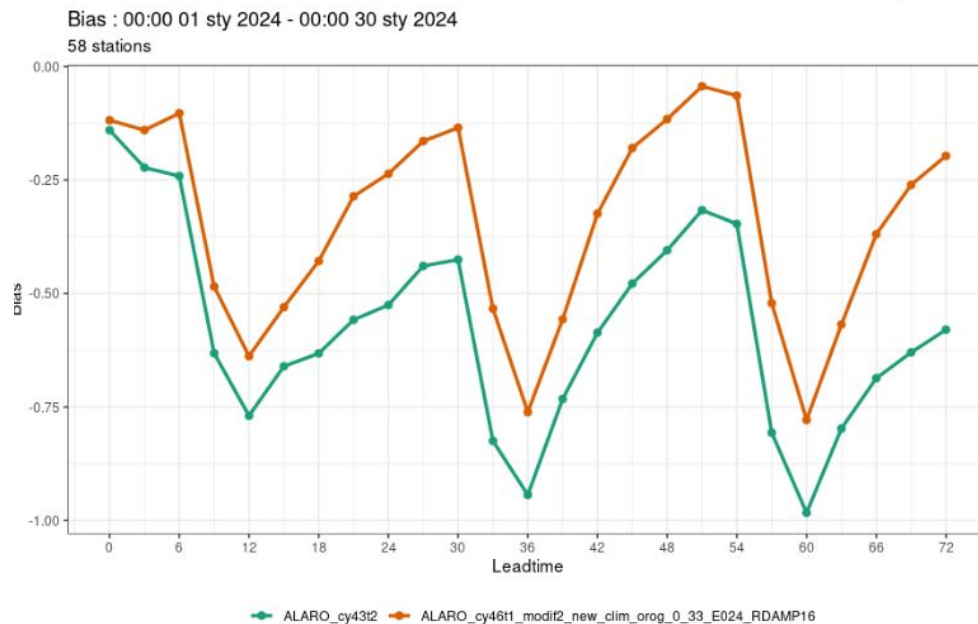
- wind gust in the 9- (solid line), 12- (dashed line) and 15-hour (dotted line)
- 00 UTC runs



- ❖ **AROME**
- ❖ **AROME-RUC**
- ❖ **mean of AROME-EPS**

Pre-Operational tests of CY46T1 (Poland)

January, 2024 - T2m



ALARO-cy43t2

ALARO-cy46t1



2.45 km



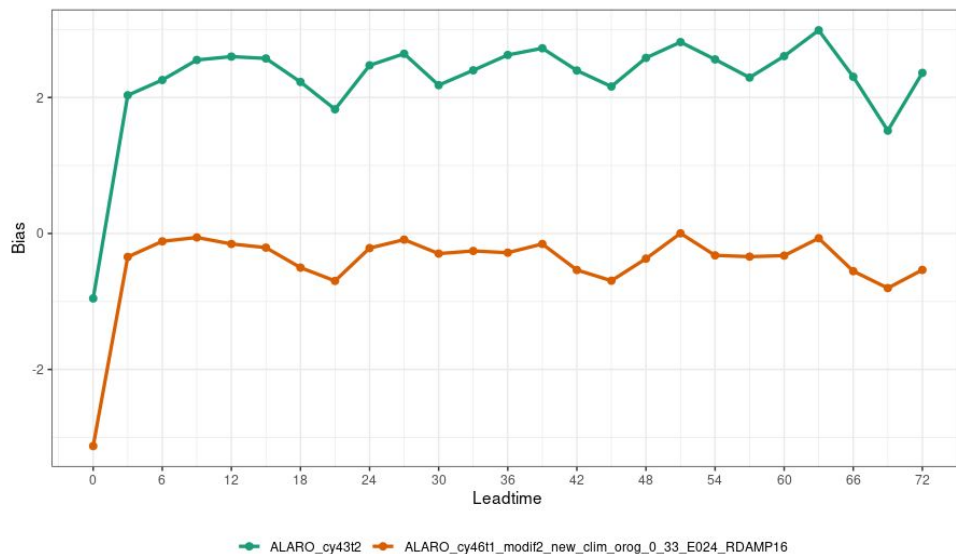
70 vertical levels



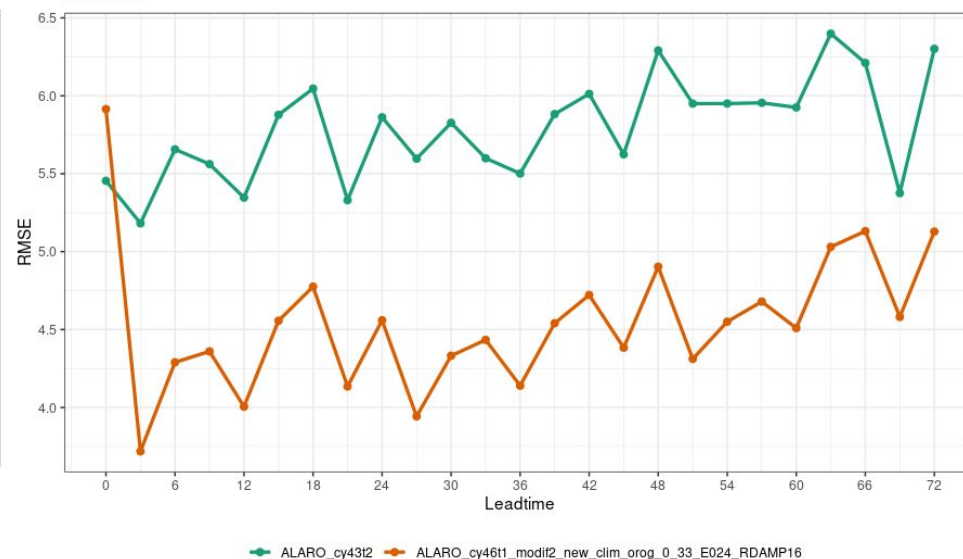
90s

January, 2024 - wind gust

Bias : 00:00 01 sty 2024 - 00:00 30 sty 2024
56 stations

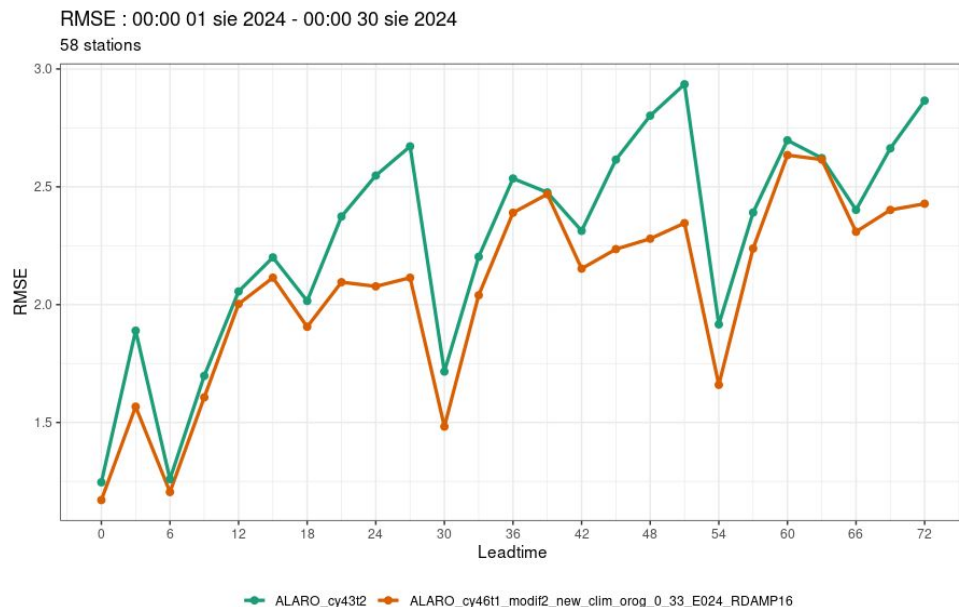


RMSE : 00:00 01 sty 2024 - 00:00 30 sty 2024
56 stations



ALARO-cy43t2 **ALARO-cy46t1**

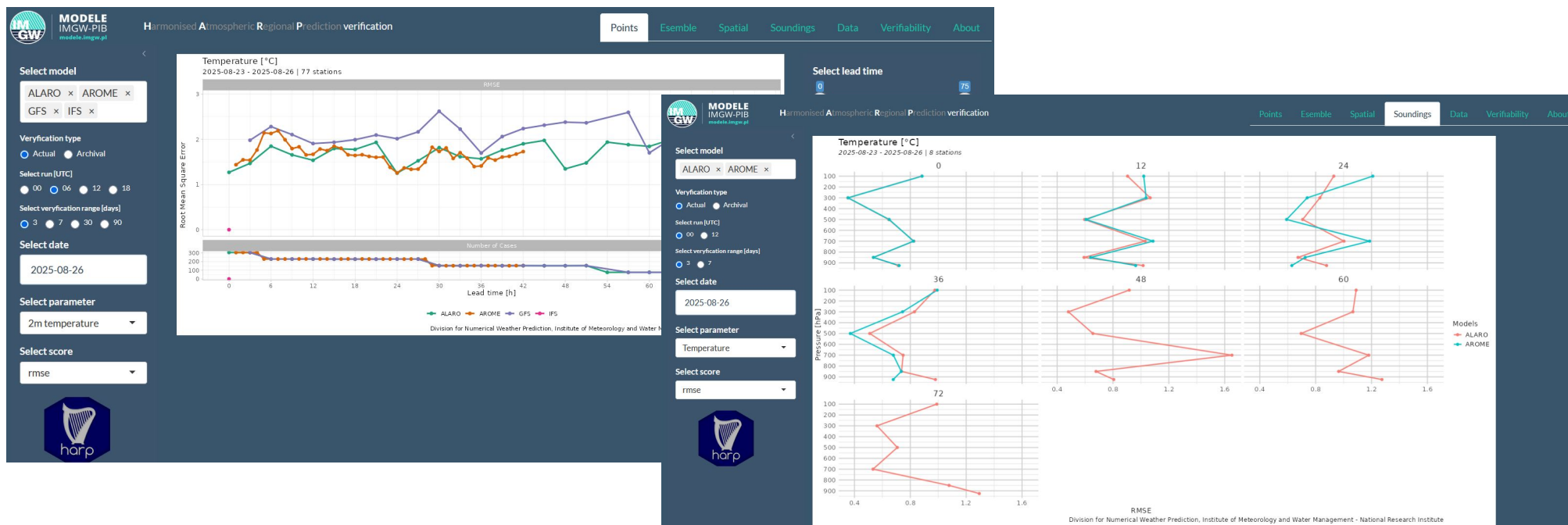
August, 2024 - wind gust



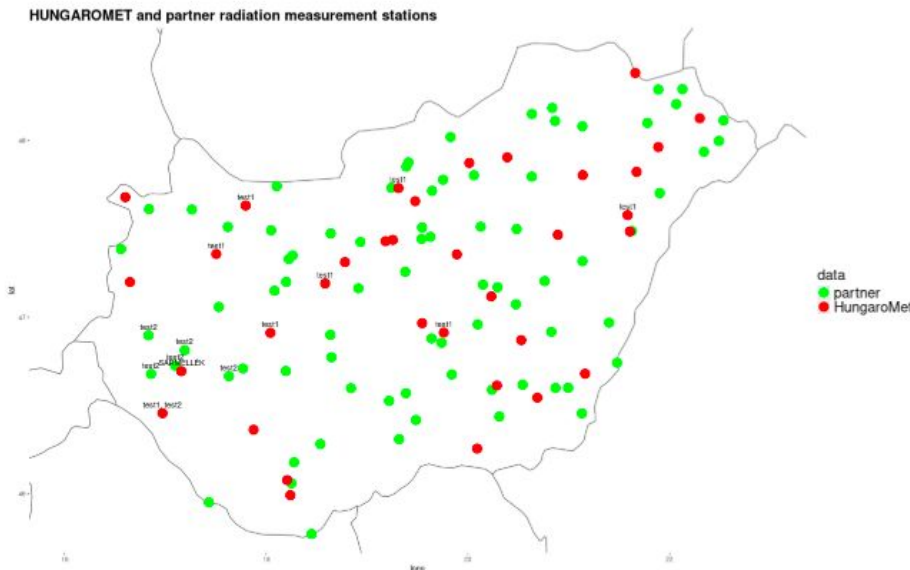
ALARO-cy43t2 **ALARO-cy46t1**

Implementation of new version of HARP (Poland)

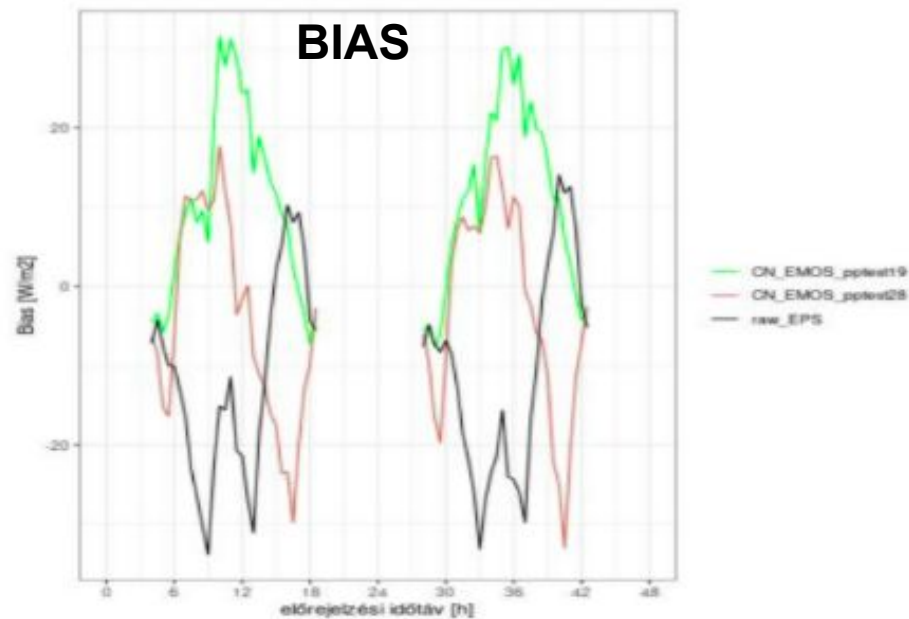
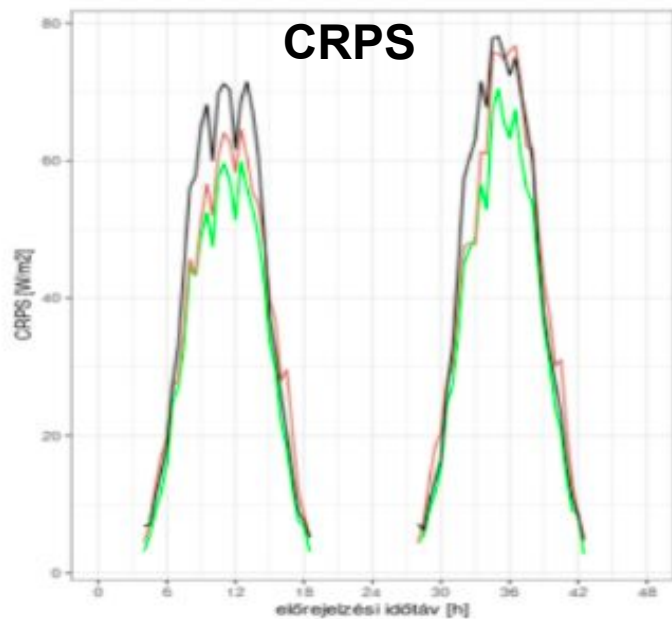
- a new version of HARP was installed locally
- for ALARO, AROME, IFS and GFS



- AROME-EPS EMOS postprocessing
- by using radiation measurements from:
 - a private company for more than hundred stations
 - 35 HungaroMet stations
- test experiments were run for three target locations



Testing improvement possibilities of AROME-EPS EMOS postprocessing for radiation



❖ raw EPS ❖ EMOS - best ❖ EMOS - best

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Thank you for your attention.

