

*Regional Cooperation for
Limited Area Modeling in Central Europe*



Verification activities in RC-LACE

Doina-Simona Taşcu with contributions of RC LACE partners



Czech
Hydrometeorological
Institute



OMSZ



ARSO METEO
Slovenia

Verification

- ◆ HARP implementation and verification for deterministic and probabilistic forecasts
- ◆ HARP linked to OPLACE database
- ◆ Multiple verification methods

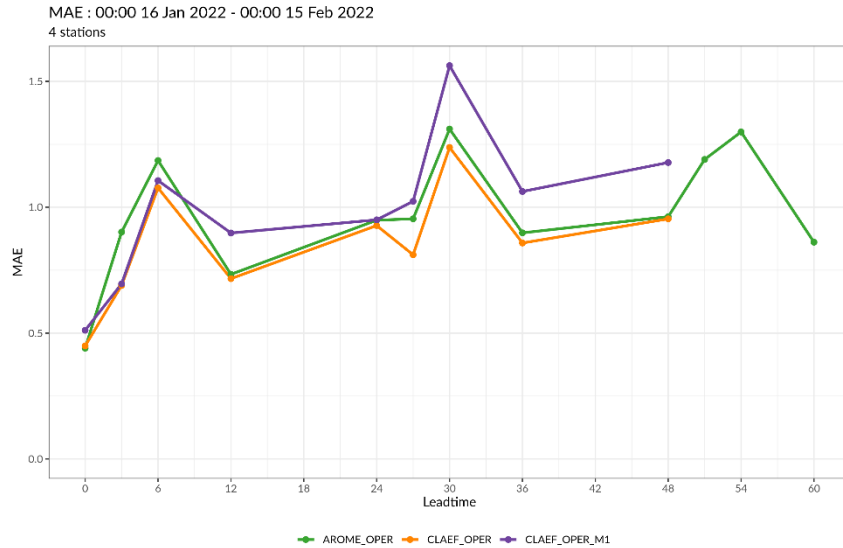
Applications

- ◆ Post-processing of model output
- ◆ RC-LACE gitlab platform
- ◆ Databases of cases
- ◆ Trainings

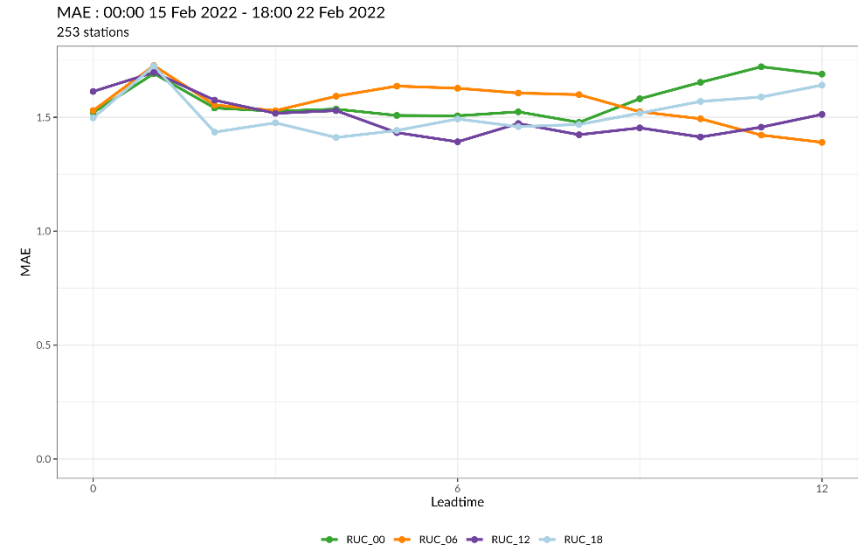
Austria

- ◆ Further work on Python-wrapper for HARP
- ◆ Python wrapper are now used for deterministic verification
- ◆ In addition to surface, the upper air verification with radiosondes is now included for deterministic verification of operational AROME-AUT and CLAEF-CTRL
- ◆ Verification of operational AROME-RUC implemented, only 4 runs per day are visualized on a regular basis
- ◆ Extraction of C-LAEF forecasts for HARP ported to ECMWF ecgate.

Austria



Temperature at 850hPa - Austrian radiosonde sites for AROME-AUT, C-LAEF and Member 1 of C-LAEF



10m Windspeed for selected AROME-RUC runs

Verification – HARP implementation and verification

Austria - HARP based scorecards

- Interface written to ZAMG-Verification tool
- HARP-scorecard extended to use spatial precipitation verification from ZAMG-Verification tool
- Some optical adaptations implemented

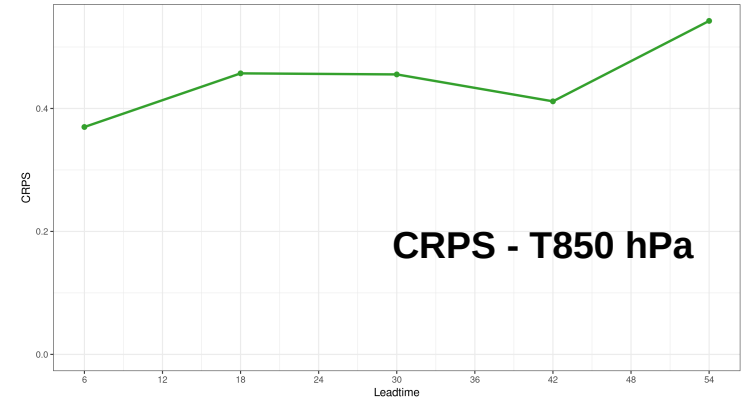
Apr 2019 to Jun 2019



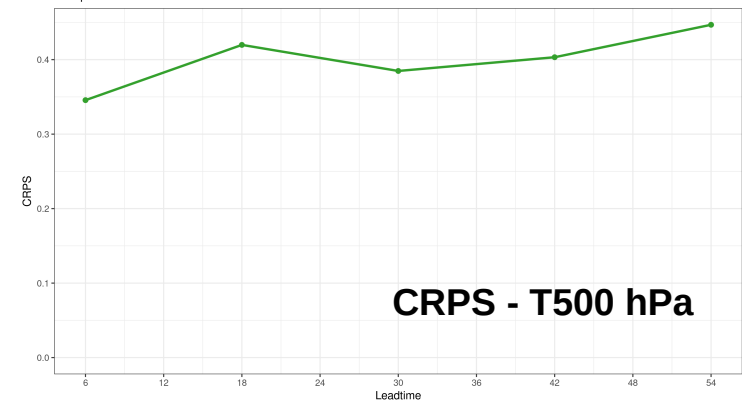
Hungary - first tests

- Ongoing work of testing HARP with radiosonde measurements
- netCDF observations were converted to the SQLite database
- a sample verification was made for the 11-member AROME-EPS forecasts for Budapest station in June 2020

CRPS : 18:00 31 May 2020 - 18:00 29 Jun 2020
Budapest - 12843



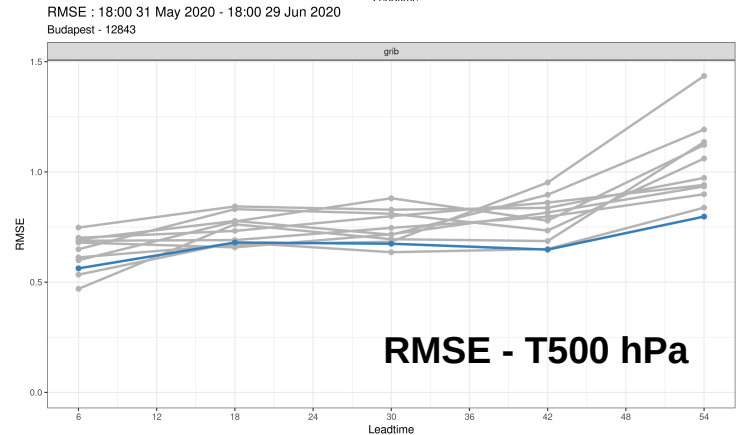
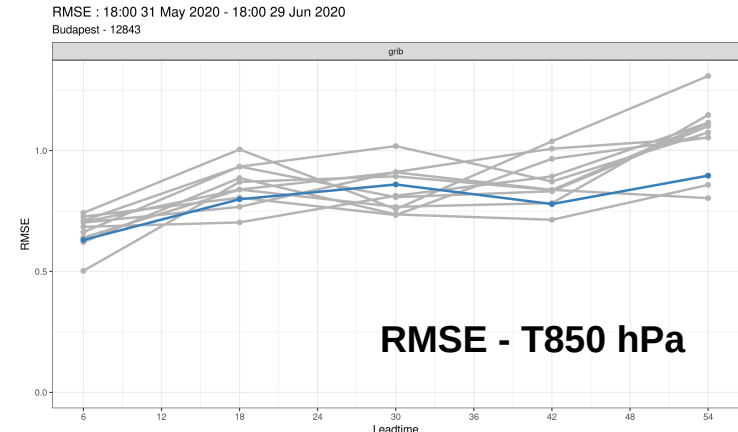
CRPS : 18:00 31 May 2020 - 18:00 29 Jun 2020
Budapest - 12843



Verification – HARP implementation and verification

Hungary - first tests

- Ongoing work of testing HARP with radiosonde measurements
- netCDF observations were converted to the SQLite database
- a sample verification was made for the 11-member AROME-EPS forecasts for Budapest station in June 2020



Slovakia - HARP linked to OPLACE database (Ongoing)

- ◆ Thanks to Andrew Singleton, the work of Martin Petras regarding the obsoul reading function was added to the development version of harpIO
- ◆ The work of Martin is ongoing, taking into account the Alena Trojakova's proposals, to add:

# varno	name	harp_name
79	RR1h	PE1
80	RR6h	PE6
81	Tmin	TM
82	Tmax	TX

Hungary - Validation of AROME-SEKF

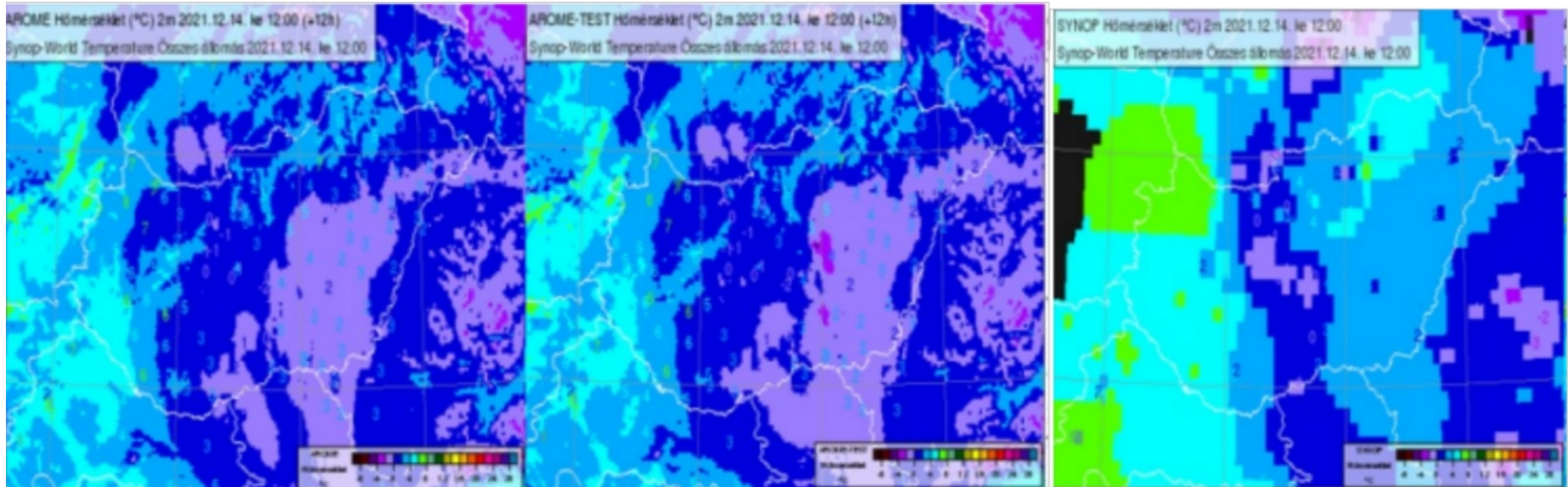
- comparison of AROME-SEKF (Simplified Extended Kalman Filter) with AROME/HU operational version
- AROME-SEKF was applied in the test run for surface assimilation
- 1-month: 15.11 - 15.12.2021
- **Subjective evaluation**
- carried out by forecasters and model developers in interesting weather situations
- forecasters involved in doing differences between two model versions for synoptic hours (00, 06, 12 UTC)
- model developers made also subjective verification by ranking weather parameters (T2m, W10m, 10FG, PREC, cloudiness forecasts) from 1 to 5 (5 is the best forecast)

Hungary - Validation of AROME-SEKF

- comparison of AROME-SEKF (Simplified Extended Kalman Filter) with AROME/HU operational version
- AROME-SEKF was applied in the test run for surface assimilation
- 1-month: 15.11 - 15.12.2021
- Objective evaluation
- pointwise verification (Perl-based OVISYS verification system)
- RMSE, bias and other scores for different parameters:
 - - surface: MSLP, TCC, T2M, DewT2M, RH2M, W10M, 10FG
 - upper-air: T850, RH700, RH925, Z500 hPa, Prec12h, Prec24h

Hungary - Validation of AROME-SEKF

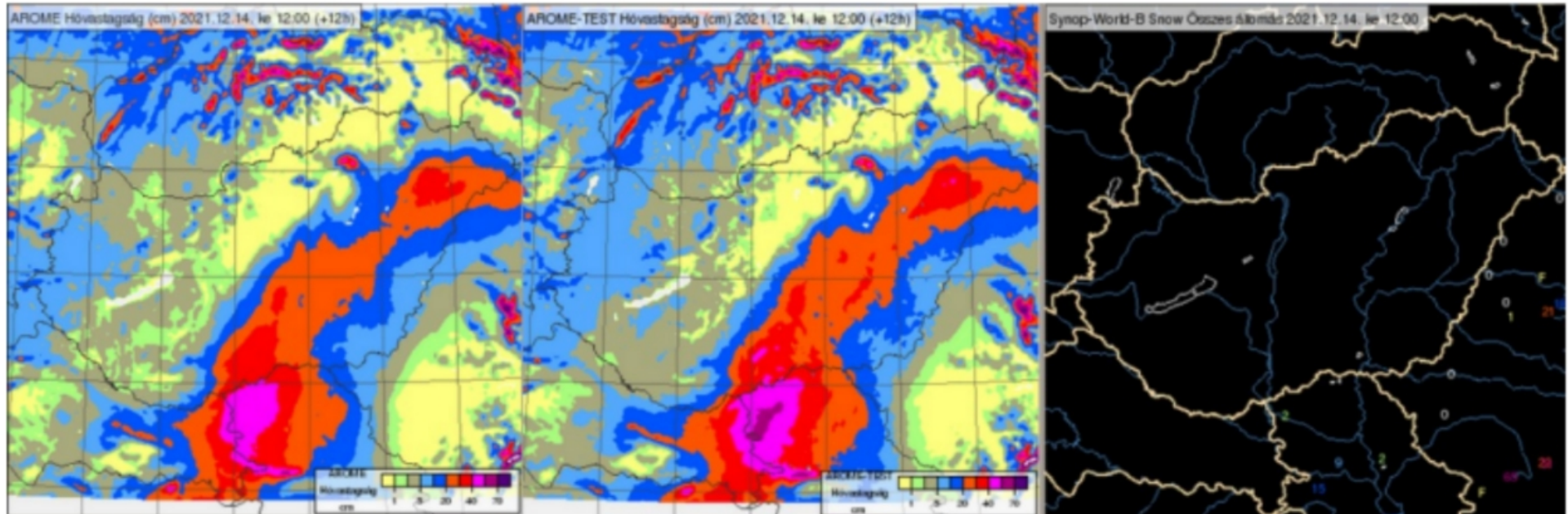
T2m (°C): 12 UTC on 14 December 2021, + 12 UTC



- ◆ systematic underestimation for 2-meter temperature during test period by both model versions
- ◆ temperature underestimation was especially large in the middle of the day; even greater when using Kalman filter

Hungary - Validation of AROME-SEKF

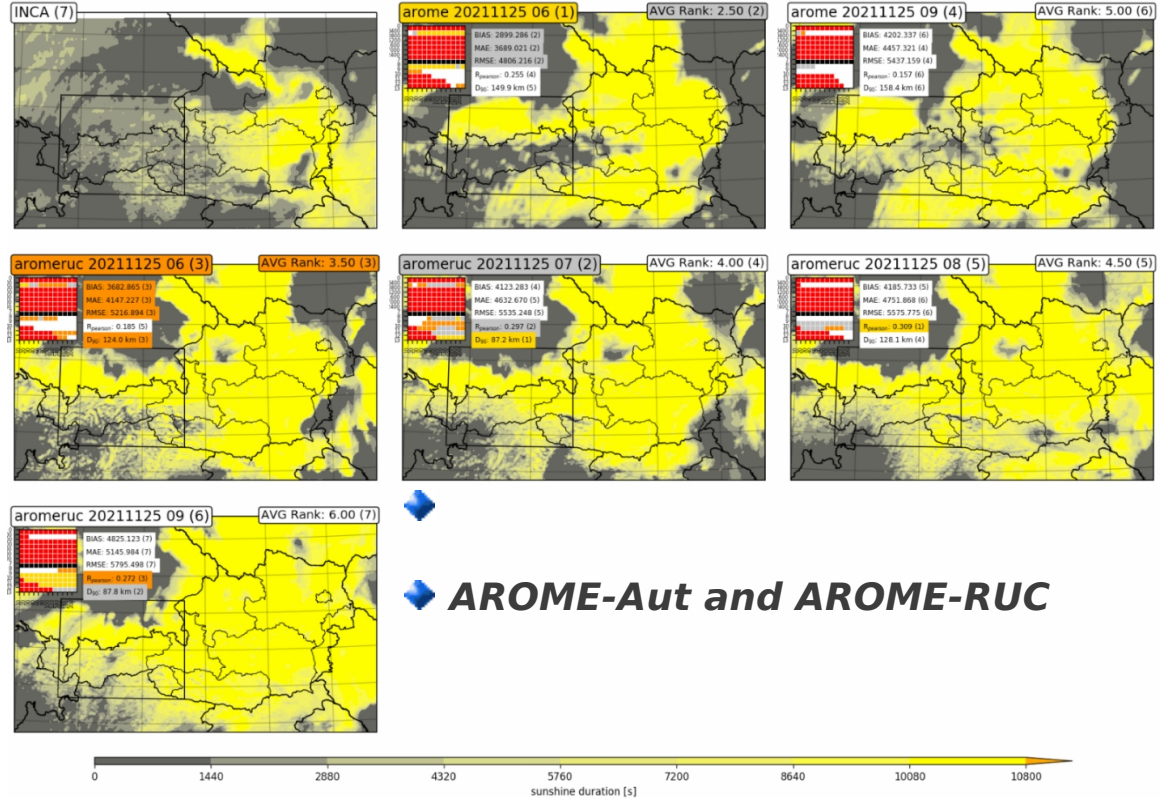
Snow depth (mm): 12 UTC on 14 December 2021, + 12 UTC



- ◆ some fake snow persistence in December - partly related to overestimation of low-level cloud existence in some weather situations

Sunshine duration, 25.11.2021, 12 to 15 UTC

Acc. Sunshine Duration [s] from 20211125 09 to 20211125 12 UTC



➡ **AROME-Aut and AROME-RUC**

- ➡ Verification against the INCA analysis (1 km gridded product)
- ➡ Refactoring of code to facilitate code extensions in the future
- ➡ Implementation of *sunshine duration* for panel tool
- ➡ Implementation of visualization of selected parameter (atmospheric and soil fields) for in-house monitoring

Hungary - Post-processing of AROME and AROME-EPS (ongoing)

- ◆ motivated by the partners of OMSZ producing wind and solar energy
- ◆ the main objective: to improve the forecasts for global radiation and 100-meter wind speed
- ◆ to improve AROME 100-meter wind speed forecasts: are used 100-meter wind speed and wind direction, surface pressure and temperature
- ◆ to improve AROME radiation forecasts: are used temperature and global radiation
- ◆ observation from wind and solar energy farms (100-meter wind and radiation) and OMSZ
- ◆ two types of ML techniques:
 - ◆ - combined convolutional and artificial/feedforward neural networks
 - ◆ - convolution autoencoder
- ◆ time period: 17.04 – 31.12.2020, with different training period
- ◆ the autoencoder showed better results for 100-meter wind speed forecasts, but poor results for radiation

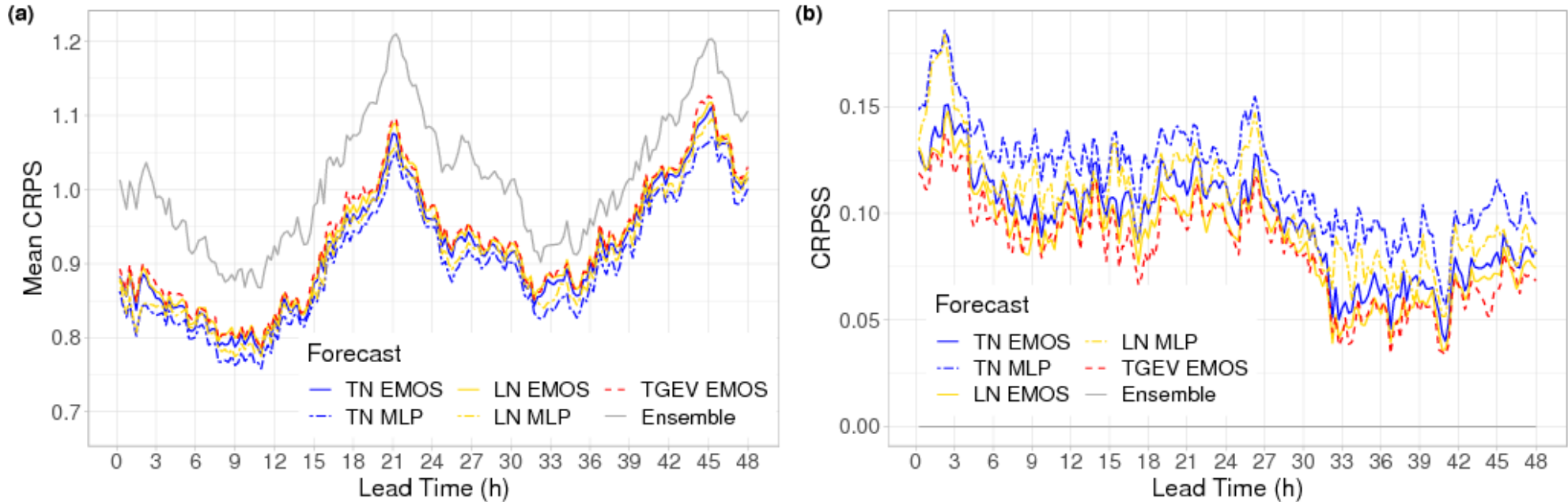
Hungary - Post-processing of AROME and AROME-EPS (ongoing)

Multiple methods were developed to improve AROME-EPS *100-meter wind speed forecasts* (Baran and Baran, 2021):

- ◆ EMOS (ensemble model output statistics) models
- ◆ MLP (multilayer perceptron neural network) approach
- ◆ wind speed observations from wind farms and ensemble forecasts
- ◆ the training was conducted over a 51-day rolling training period
- ◆ EMOmodels were tested applying several predictive distributions: truncated normal (TN), log-normal (LN), truncated generalized extreme value (TGEV)
- ◆ data for all points from the training period are considered together providing a single set of EMOS parameters or the model was trained separately for the different locations
- ◆ the best result, 12% reduction in CRPS, is obtained with truncated normal distribution supported with multilayer perceptron method

Baran, S. and Baran, Á., 2021: Calibration of wind speed ensemble forecasts for power generation. *Időjárás* 125, 4, 609–624. DOI:

Hungary - Post-processing of AROME and AROME-EPS (ongoing)



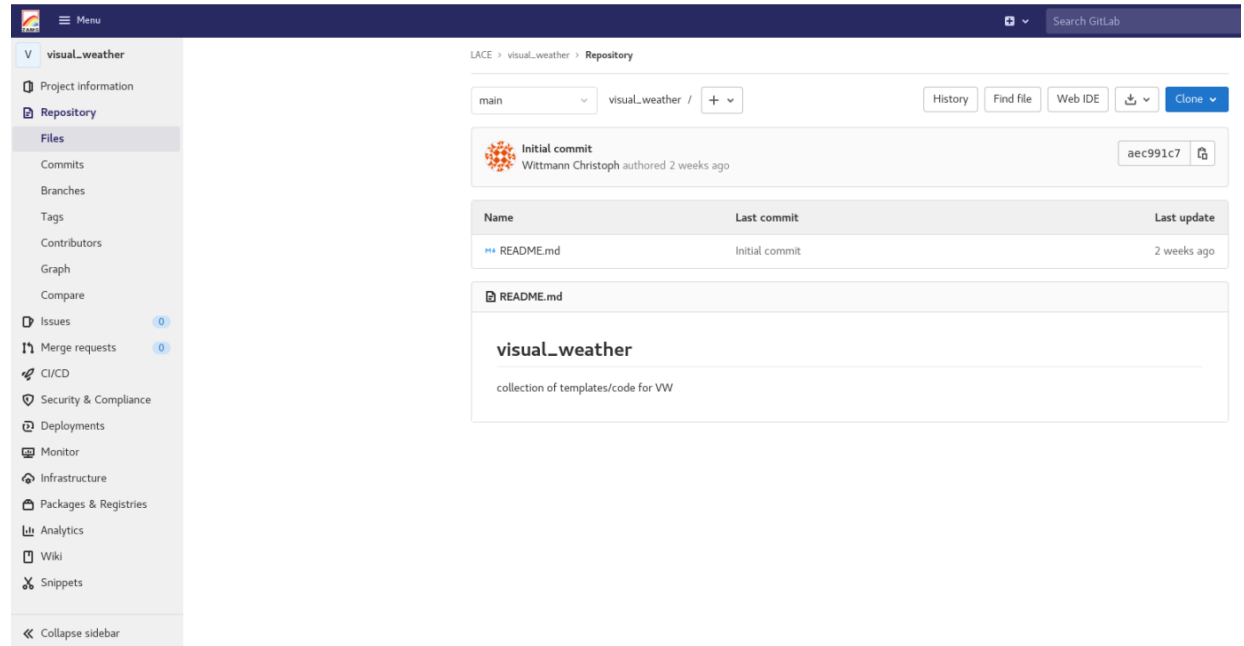
Mean CRPS of AROME-EPS 100-meter wind speed forecasts for the raw ensemble (grey) and for the ensemble post-processed with different methods.

Hungary - Post-processing of AROME and AROME-EPS (ongoing)

Multiple methods were developed to improve AROME-EPS *global radiation forecasts* (Baran and Baran, 2021):

- ◆ EMOS models: censored logistic (CL0) and censored normal (CN0) predictive distributions
- ◆ a 31-day rolling training period
- ◆ input: radiation ensemble forecasts and observations from OMSZ
- ◆ the methods decrease the CRPS with 10-15 % and increase the ensemble spread reducing the radiation underestimation

Applications



The screenshot shows a GitLab repository page for 'visual_weather'. The left sidebar contains navigation options: Project information, Repository, Files, Commits, Branches, Tags, Contributors, Graph, Compare, Issues (0), Merge requests (0), CI/CD, Security & Compliance, Deployments, Monitor, Infrastructure, Packages & Registries, Analytics, Wiki, Snippets, and Collapse sidebar. The main content area shows the repository path 'LACE > visual_weather > Repository'. Below this, there are buttons for 'History', 'Find file', 'Web IDE', and 'Clone'. A commit history table is displayed:

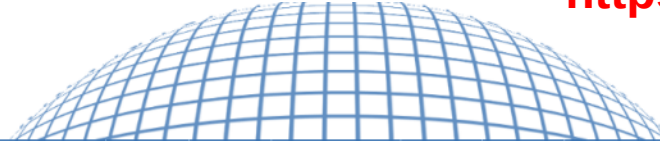
Name	Last commit	Last update
++ README.md	Initial commit	2 weeks ago

Below the table, the 'README.md' file content is shown, featuring the repository name 'visual_weather' and the description 'collection of templates/code for VW'.

Ongoing

Applications

<https://www.rclace.eu/data-base-of-cases>



🏠 > Data base of cases

Data base of cases

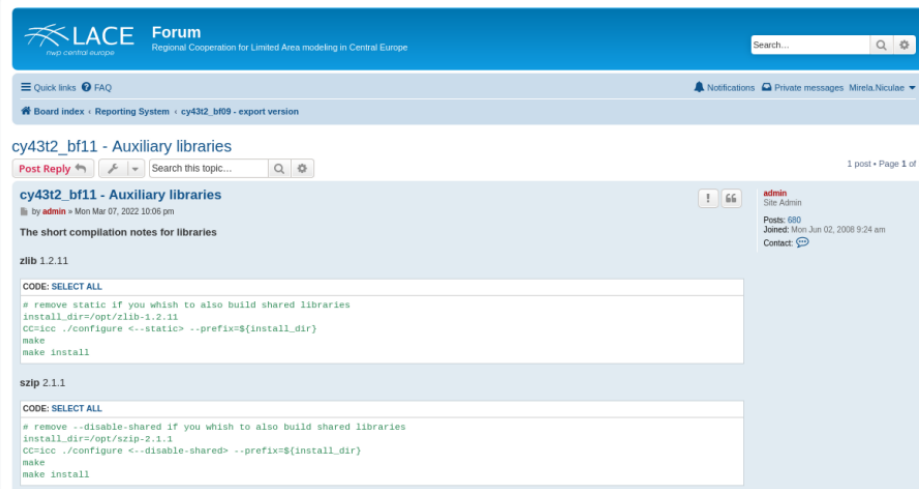
Idea is to have Data base for Cases studies. All suggestions and new cases are welcome.

Short description	Event date	Category	Country	name	Forecast & Report
EPS - Case studies report 2021	2021		A	Wastl Clemens	Report
Record rainfall in Italy, A-LAEF (case study)	04 October 2021		SK	Martin Belluš	Report
High spread and underestimation of 2m temperature over snow cover in case of the warm air advection	22 February 2021		SK	André Simon, Martin Belluš	Report
Temperature forecasts in very cold weather	12-13 February 2021		SK	André Simon	Report
False model advection of warm air over Bratislava	07 February 2021		SK	André Simon	Report
Forecasting fog and low cloudiness	24-11-2020		SK	NWP Team SHMÚ	Report
FACRAF tuning for the 4.5 km resolution ALARO SHMÚ	2020		SK	André Simon	Report
Odd outflows over water surfaces in non hydrostatic ALARO/AROME models ...	2019		SK, CZ	André Simon (Martin Dian, Radmila Brožková & others)	Report
Overestimation of minimum temperature during summer 2009	summer 2009		CZ, SI	Alena Trojakova	Report , A , B
Period with strongly overestimated convective activity in central Europe	2007-05-23/27		central Europe	Ján Mašek	Report
Large positive bias in very cold condition in Slovakia	2006 Jan/Feb		SK	Mária Derková	Report

Applications

Trainings

- ◆ Challenges and troubleshooting about installation of harp tool - **9th of May 2022**
- ◆ An introduction to GitHub/GitLab
- ◆ How to generate an integration domain and how to create the clim files
- ◆ An overview of the model compilation



LACE Forum
Regional Cooperation for Limited Area modeling in Central Europe

cy43t2_bf11 - Auxiliary libraries

by admin • Mon Mar 07, 2022 10:06 pm

The short compilation notes for libraries

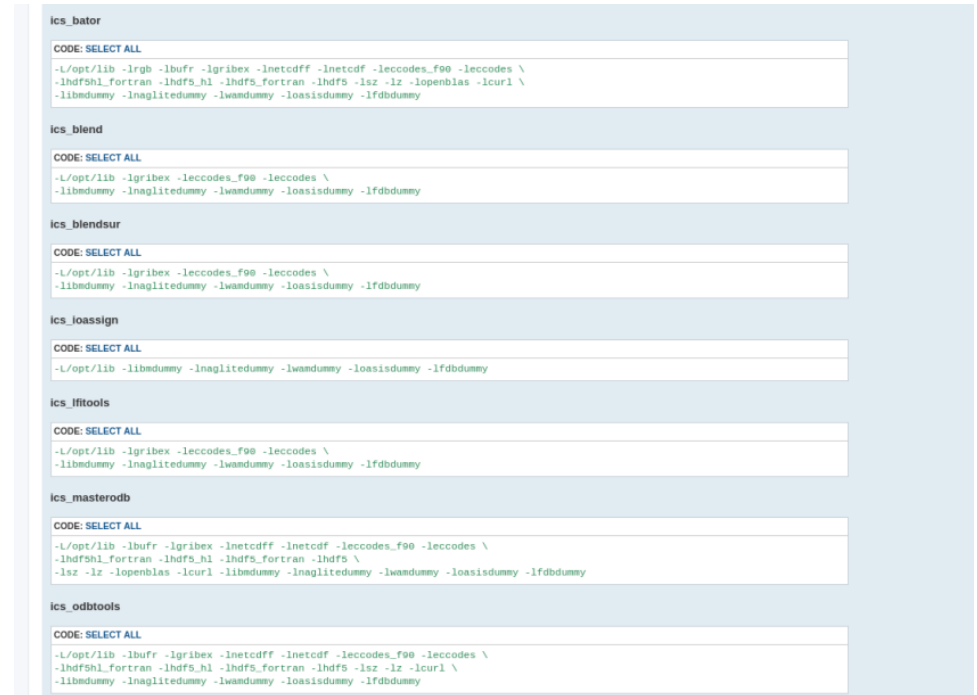
zlib 1.2.11

```
CODE: SELECT ALL
# remove static if you wish to also build shared libraries
install_dir=/opt/zlib-1.2.11
CC=icc ./configure <--static> --prefix=$(install_dir)
make
make install
```

gzip 2.1.1

```
CODE: SELECT ALL
# remove --disable-shared if you wish to also build shared libraries
install_dir=/opt/gzip-2.1.1
CC=icc ./configure <--disable-shared> --prefix=$(install_dir)
make
make install
```

admin
Site Admin
Posts: 600
Joined: Mon Jun 02, 2008 9:24 am
Contact



ics_bator

```
CODE: SELECT ALL
-L/opt/lib -lrgb -lbufr -lgribex -lnetcdff -lnetcdf -leccodes_f90 -leccodes \
-lhdfshl_fortran -lhdf5_hl -lhdf5_fortran -lhdf5 -lsz -lz -lopenblas -lcurl \
-libdummy -lnaglitedummy -lwandummy -loaisidummy -lfdummy
```

ics_blend

```
CODE: SELECT ALL
-L/opt/lib -lgribex -leccodes_f90 -leccodes \
-libdummy -lnaglitedummy -lwandummy -loaisidummy -lfdummy
```

ics_blendsur

```
CODE: SELECT ALL
-L/opt/lib -lgribex -leccodes_f90 -leccodes \
-libdummy -lnaglitedummy -lwandummy -loaisidummy -lfdummy
```

ics_loassign

```
CODE: SELECT ALL
-L/opt/lib -libdummy -lnaglitedummy -lwandummy -loaisidummy -lfdummy
```

ics_iftools

```
CODE: SELECT ALL
-L/opt/lib -lgribex -leccodes_f90 -leccodes \
-libdummy -lnaglitedummy -lwandummy -loaisidummy -lfdummy
```

ics_masterodb

```
CODE: SELECT ALL
-L/opt/lib -lbufr -lgribex -lnetcdff -lnetcdf -leccodes_f90 -leccodes \
-lhdfshl_fortran -lhdf5_hl -lhdf5_fortran -lhdf5 \
-lsz -lz -lopenblas -lcurl -libdummy -lnaglitedummy -lwandummy -loaisidummy -lfdummy
```

ics_odbttools

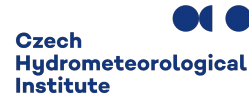
```
CODE: SELECT ALL
-L/opt/lib -lbufr -lgribex -lnetcdff -lnetcdf -leccodes_f90 -leccodes \
-lhdfshl_fortran -lhdf5_hl -lhdf5_fortran -lhdf5 -lsz -lz -lcurl \
-libdummy -lnaglitedummy -lwandummy -loaisidummy -lfdummy
```

oldrich.spaniel@shmu.sk

*Regional Cooperation for
Limited Area Modeling in Central Europe*



Thank you for your attention.



ARSO METEO
Slovenia