ACCORD

A Consortium for COnvection-scale modelling Research and Development

Meteorological quality assurance in ACCORD

Carl Fortelius, MQA-team, …, 30 September 2021, 43rd EWGLAM/28th C-SRNWP

ACCORD Strategy Workshop Feb. 2020

Uses of meteorological quality assurance:

- **monitoring the quality of the operational NWP systems from cycle to cycle**
- **verification in support of model development**
- **feedback between developers and users**

- *several canonical configurations: AROME, ALARO, HARMONIE-AROME*
- *very large number of different systems: models, resolution, domains, coupling, ensembles, use of observations*
- *questionnaire about quality assurance has been launched; answers are coming in*

Cooperation:

methods, practices, software, data; **5 strategic goals**

ACCORD Strategy Workshop Feb. 2020

Strategic goals for Meteorological Quality Assurance

1. jointly developed Harp verification system
2. develop common methods/metrics for high-resolution spatial-temporal verification and high impact weather.
3. enhance the verification of 3/4D physical processes to aid model development, including the necessary observations
4. exploit synergies with data assimilation wrt. observation usage
5. enhance the user-developer interaction

Common verifiaction software

Strategic goal 2021-2025:

Make the jointly developed Harp verification system attractive as a common verification tool

- **H**irlam-**A**ladin **R** **P**ackage for verification: harp
- https://github.com/harphub/harp
- deterministic scores, probabilistic scores, spatial methods, ensemble-calibration, visualization,...
- flexible regarding input

Common verification engine: harp

- Harp: a **suite of packages** for reading, manipulating and analysing meteorological and climate data in R.
- ***harpIO*:** read and write meteorological and climate data. Can handle grib, NetCDF, FA, vfld/vobs, **OPLACE**, SQLite; **sub-hourly lead times**
- ***harpPoint*:** point verification for deterministic and ensemble forecasts, new **block bootstrapping** for arbitrary pooling of data
- ***harpSpatial*:** spatial verification for deterministic forecasts (FSS, SAL)
- ***harpVis*:** visualization of meteorological / climate data + web browser app(s) for visualization, charts, graphs, **score cards**
- ***harp*:** all packages together

harp user support

- **Tutorial:** https://harphub.github.io/harp_tutorial/index.html
- **Slack channel**: https://harp-network.slack.com/
- **Training course**: 2022, announcement in slack

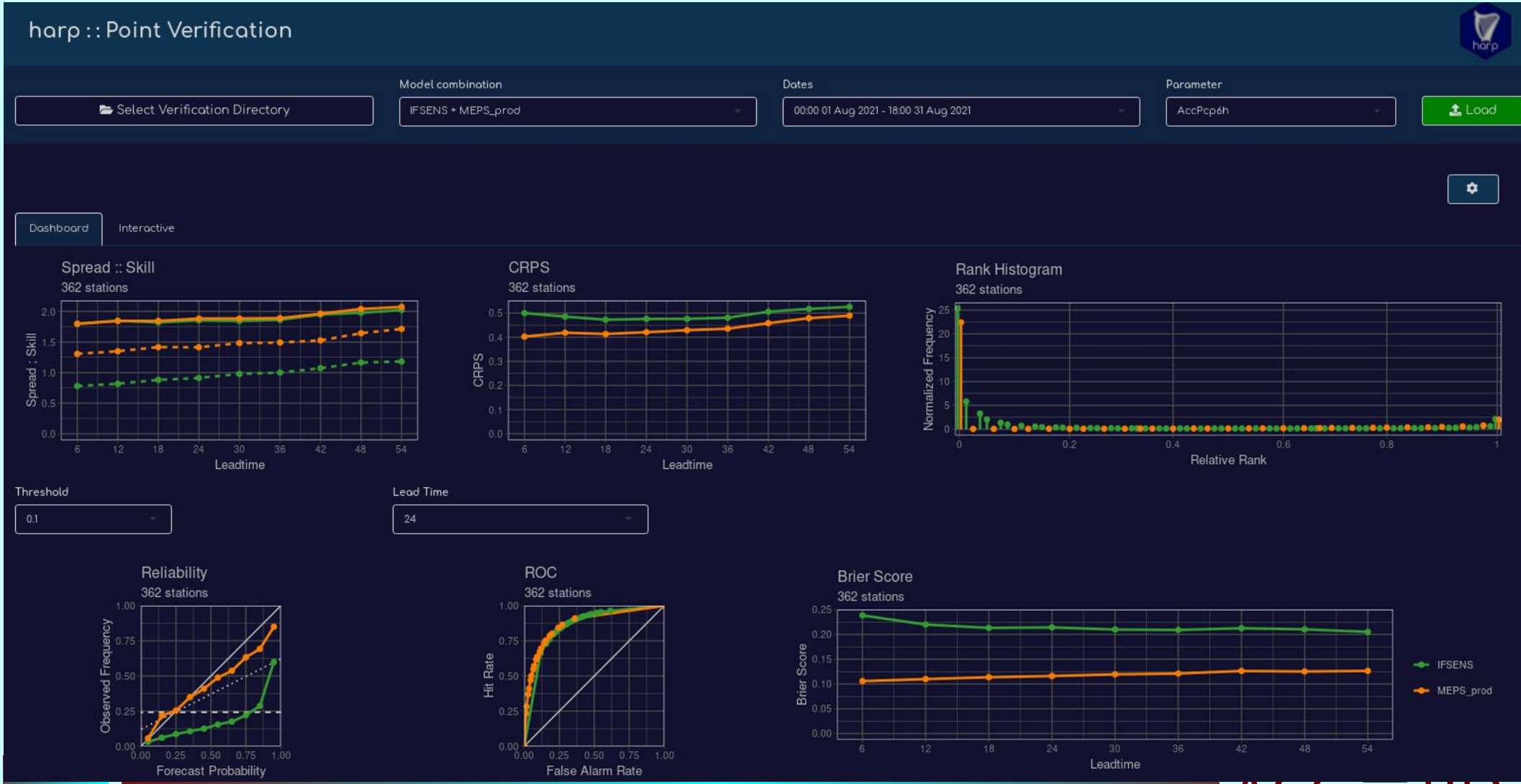
harp user support

Training course, themes

- Data structures in harp
- Reading forecasts and observations
- Point verification
- Spatial verification
- Statistical significance and score cards
- Plotting forecast / verification data
- harp and the tidyverse
- Advanced harp: conditional verification, joint probabilities, observation errors and verification for grouped data,...
- Contributing to harp

harp application

Operational verification at many institutes, including MetCoOp; here monthly summary scores for MEPS and IFS ENS:



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Quality measures

Strategic goal 2021-2025:

Further develop common methods/metrics, with a focus on methods for ***high density/resolution*** *spatial-temporal verification and* ***high impact*** *weather*

Two recent developments are introduced in the present session:

- "Neighborhood-based CRPS" by Joël Stein
- "Precipitation extremes in NWP : some results from spatial verification in DMI" by Bent Hansen Sass

verification to aid model development

Strategic goal 2021-2025:

Enhance the verification of 3/4D physical processes to aid model development, including the necessary observations

- help in assessing how well the models are able to represent complex physical processes and their interactions
  - increase the use of remote sensing data and retrieval products which offer good potential for process verification
  - make use of observatories/super-sites
  - encourage the use of tools such as DDH and Musc
  - encourage (participation in) model intercomparison exercises

- an example of combining DDH and data from Sodankylä observatory in Finland will be given by Marvin Kähnert in the u/a physics break out session

data and synergies with data assimilation

Strategic goal 2021-2025:

Consider greater synergies with the DA team on observation uses and quality control

- esp. crowd source data, eg TITAN
- more examples of novel data usage by Simona Tascu in the present session
- only a small fraction of the data which are assimilated, are also used for verification
  - what can we gain from applying methods of data assimilation for assessing forecasts of arbitrary range?
    - *ob-forecast* statistics for different observation types?
    - cost function (*pseudo Jb)*?
    - a way to summarize validation experiments?

User-developer interaction

Strategic goal 2021-2025:

Enhance the user-developer interaction

- interaction mainly locally
- user - developer
  - needs, experiences collected in summary reports locally and by CSC
- developer - user
  - model strengths, weaknesses, coming developments
  - new capabilities: e.g town variables such as UTCI, energy demand for heating, cooling
- need for consortium wide meetings

Thank you for your attention!

User-developer interaction

Questionnaire on meteorological quality assessment (ongoing):

Collecting feedback from users

Describe procedures for collecting and storing the experience of duty forecasters and other users. How are these findings used in research and development?

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