ACC = RD

A Consortium for COnvection-scale modelling Research and Development

Verification activities in ACCORD

Carl Fortelius and Doina-Simona Taşcu with help and contributions from many many others, 25 Sept. 2023, 45th EWGLAM and 30th SRNWP meeting Reykjavik & online

Outline

- MQA in a large consortium
- working together (The rolling work plan)
- some achievements and ongoing efforts



MQA in a large consortium

- Heterogeneity
 - 3 canonical configurations: Arome, Harmonie-Arome, ALARO, 26 x n implementations
 - \circ wide range of climates
 - diverse data sources and formats
 - diverse software for verification
 - diverse hardware



Working together

- Common verification software (harp) ~ 2 FTE
- New methods, new data sources ~2 FTE
- Applications ~16 FTE
 - Evaluation of implementations and new developments
 - Describing and understanding errors
 - Interaction with users
- Communication: All Staff Workshop, Newsletter, Working Weeks and Scientific Missions, Community Meetings, MQA bi-annual progress report (on ACCORD wiki)



Harp: a collection of R-packages

- Ingesting, analysing, and displaying data
 - observations: vobs¹, OBSOUL², netcdf
 - forecasts: vfld¹, grib, FA³, netcdf
- Computing and displaying verification metrics
 - Pointwise verification of deterministic and probabilistic forecasts displayed via shiny app
 - Spatial scores: FSS, SAL
 - Panelification (ranking of forecasts based on FSS, MAE, RMSE, R_{Pears})
 - Score cards, markdown fact sheets, ..
- Common scripts for basic verification
- User support: Training courses, tutorials, slack channels, ...
- Open source: <u>https://github.com/harphub/</u>
- Applications: UWC-W⁴, MetCoOp⁵, Algeria, Austria, Belgium, Croatia, Hungary, Poland, Turkey
- 1) used within HIRLAM
- 2) used in observation data base within LACE
- 3) native output format of ACCORD models
- 4) UWC-West: Denmark, Iceland, Ireland, The Netherlands, Spain
- 5) Estonia, Finland, Latvia, Norway, Sweden



Harp development: the panelification tool

- Displays ranking of forecasts by summary scores and FSS for several thresholds and percentiles
- Developed by GeoSphere Austria, added to HARP under DE_330, to be shared on harphub

Ranking of hourly precipitation forecasts at 17 UTC on 21. 6. 2023



ACOnsortium for COnvection-scale modelling Research and Development

graphics by Polly Schmederer, GeoSphere Austria

Harp: the panelificaqtion tool



graphics by Polly Schmederer, GeoSphere Austria

A Consortium for COnvection-scale modelling Research and Development

New metrics and methods

- Neighborhood Brier Divergence for ensemble forecasts verification (France)
 - rewards forecasts of events spatially slightly misplaced and allows compensations between members (France)
 - Proper score for the scale given by the neighborhood size
 - Skill score dsn_B keeps the order given by the Brier divergence (unlike fss)
 - Stein and Stoop (2023) in revision for Monthly Weather Review; ACCORD ASW 2023
- Properly quantifying skill versus spread in an EPS (Sweden)
 - U.UI (U-statistics on Unbiased and Identical members) spread-skill relationship makes no reference to the ensemble mean
 - Verification against BLUE (Best Linear Unbiased Estimate) concept used in variational data assimilation
 - Johansson in Wednesday Parallel session on verification



New metrics and methods

- verification of convective events using object tracking and AI (Spain)
 - Gonzales Alemán: Wednesday Wednesday Parallell session on verification
- verification methodologies of variables highlighted by users
 - cloud base height, visibility, solar radiation, (Hungary)
 Toth: Poster
 - standard verification procedure for wind speed at 80 m height (Croatia)



New data sources

- spatial verification using earth observations
 - MSG SEVIRI BT 10.8 μm: (Austria, UWC-W)
 - MSG SEVIRI cloud water path: (UWC-W)
 - NASA-IMERG precipitation retrievals: (Spain)
 - HY-2B/2C 25 km scatterometer winds: (UWC-W)



New data sources

- in situ observations
 - correctly located soundings: (UWC-W)
 - Mode-S: (UWC-W)
 - surface radiation, clear sky index: (Hungary, UWC-W)
- observations and operators used in data assimilation
 - SCOOPS: scores using OOPS screening (France)
 - ODB (UWC-W)



Applications (a few examples)

- interface between the model run database DCMDB and HARP panelification, allowing the user to specify case and experiment as well as the verification period (Austria)
- generation of a Fact Sheet based on model verification with HARP using Markdown (Hungary)
- subjective validation of 1.3 km RUC model- to run consistency and the ability to simulate the (severe) weather events while they are in progress (Slovenia)
- adaptation of machine learning post-processing methods on NWP forecasts (Hungary, Poland)
- adaptation of EMOS and machine learning post-processing methods for global radiation and low-level winds on AROME-EPS forecasts (Hungary)



Forecasts from three models compared over a full year @Poland



graphics by Gabriel Stachura, IMGW

ACC RD A Consortium for COnvection-scale modelling Research and Development

Forecasts from three models compared over a full year @Poland

variability of forecast error within a given temperature range



ACC and RD A Consortium for COnvection-scale modelling Research and Development

graphics by Gabriel Stachura, IMGW

Clear sky index using Irish data @Ireland



- hourly clear sky index (ratio of global SW radiation to its clear-sky value) model versus observations
- left: CY43 operational in Met Éireann
- right: UWC-W e-suite,
- 20 sites in Ireland
- January 2023.

graphics by Emily Gleeson, Met Éireann



Clear sky index using Irish data @Ireland



ACC and RD A Consortium for COnvection-scale modelling Research and Development

graphics by Emily Gleeson, Met Éireann

Effect of improved physiography on 10m wind demonstrated using local observations in HARP @lceand

(m/s)

Bias : S10m : 2023-01-01-00 - 2023-01-22-12 IS stations (146) : All cycles used : Average



Bias : S10m : 2023-01-24-00 - 2023-01-31-12 IS stations (144) : All cycles used : Average



10 m wind speed bias (m/s) in ECDS IGB operational runs and over Iceland for the time period (top) 1–22 January 2023 and (bottom) 24-31 January. During the first period ECDS has a distinguished negative bias in most places while the bias in IGB is mainly positive. After the update of physiography in ECDS on 23 January the bias is close to zero while the IGB 2.5 0.0 bias hasn't changed much. -2.5



Graphics by Guðrún Nina Petersen, IS

Thank you for your attention

