

Advances in Rfdbk and Feedback File Verification at DWD

Felix Fundel

Deutscher Wetterdienst

FE 15 – Predictability & Verification

Tel.: +49 (69) 8062 2422

Email: Felix.Fundel@dwd.de



Rfdbk

- R Package
- Functions to efficiently read and process data from feedback files
- <https://gitlab.com/rfxf/Rfdbk>

Feedback File Verification (FFV)

- R scripts doing the verification
- Separate score and aggregation script for each observation system (TEMP, SYNOP,...) and forecast system (det. & EPS)
- Station based verification scripts
- Control by namelist
- Needs Rfdbk
- <https://gitlab.com/rfxf/FFV>

Visualization

- Collection of R Shiny applications to interactively plot the outcome of FFV
- <https://gitlab.com/rfxf/ShinyApps> (on request)



Changes to the “Rfbk” R-Package

- New data alignment function “align”
 - More exploiting the functionality of data.tables
 - Less code
 - More straight forward to put alignment options in the namelist (planned)
 - No significant changes to memory consumption or speed observable
 - Upcoming version of the verification script require the new Rfdbk package
 - <https://gitlab.com/rxf/Rfdbk>



Revised TEMP-EPS verification

- Old version scores were based on EPS-Mean and EPS-STD and Talagrand index.
 - Assumption of normality is not always true, therefore scores might be wrong.
 - CRPS was used in its continuous formulation assuming normally distributed ensemble forecasts.
 - Not possible to select a subset of members.
 - Not possible to correct for differences in ensemble size N (CRPS is increasingly biased with smaller N).
-
- New version uses EPS member information just like the SYNOP-EPS verification.
 - New version uses discrete version of CRPS.
 - New version has fair CRPS included (CRPSF) showing bias corrected CRPS.
 - Selection of a member subgroup is possible.
 - Member size has to be given in namelist.
 - Outlier statistic is no longer available (planned to re-implement).
-
- Test found the differences in CRPS between old and new version to be very small but new functionality is deciding.





SYNOP-EPS Outlier Handling

- Not all observations come with a useful quality flag (e.g. accumulated variables).
- Filtering options are hard coded in the FFV scripts.
- Handling in EPS verification differs from deterministic.
- The EPS SYNOP verification is lacking some features because it is initially unclear on what ensemble statistics the difference should be calculated on.

- A recent update now filters wind observation with large difference to the ensemble mean.
- SYNOP deterministic and EPS verification are now more consistent but not identical w.r.t. wind.

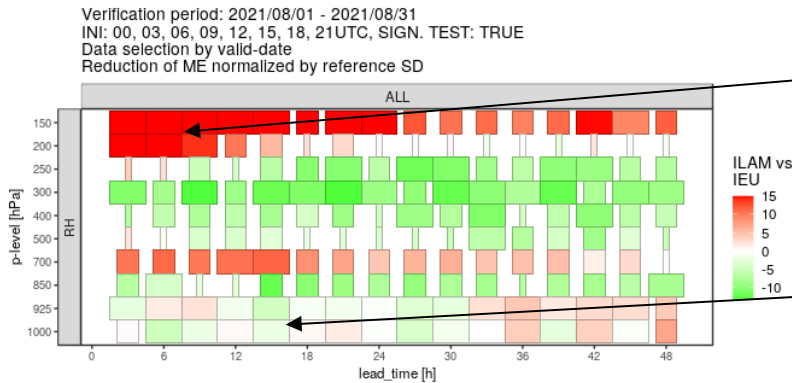
- Using wind direction only if wind speed $>3\text{m/s}$ in the EPS verification is still a open issue.





Summary Plot Extension

- Revised formulation for the bias, now normalized by standard deviation



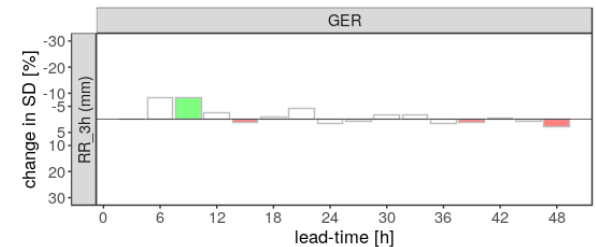
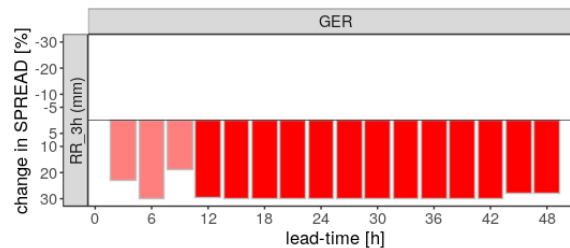
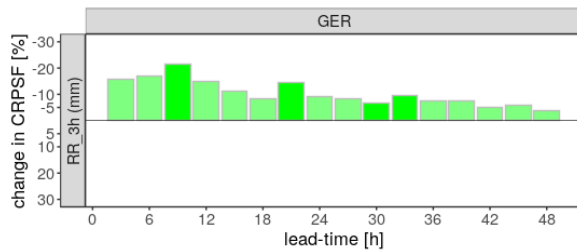
sign. larger bias, also relatively large w.r.t error variability

sign. bias changes, but relatively small w.r.t error variability

- Ensemble summary now also for SD, ME and SPREAD, in order to gain more insight on reasons for CRPS changes

Forecasts valid from 2021/08/01 00UTC - 2021/08/31 21UTC

Significance 0.00 0.25 0.50 0.75 1.00 IEUe better ILAME better





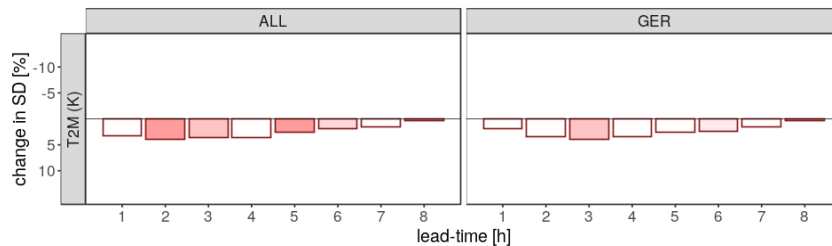
Adaptations for the RUC I

- RUC (Rapid Update Cycle) is started pre-operationally every hour from 06UTC to 18UTC with 8 hour lead-time.
- A comparison to the ICON-D2 routine (started 8 times a day) is needed, including also the RUC runs without routine counterpart (7,8,10,11,13,14,16,17 UTC runs).
- In the summary plot these missing reference runs can be artificially created by shifting the latest routine run accordingly.
- By this the added value of having more runs is shown.

Comparing only common runs 6,9,12,15,18 UTC

Forecasts initialized from 2021/05/24 to 2021/08/31
Reduction of SD [%], INI; 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18UTC

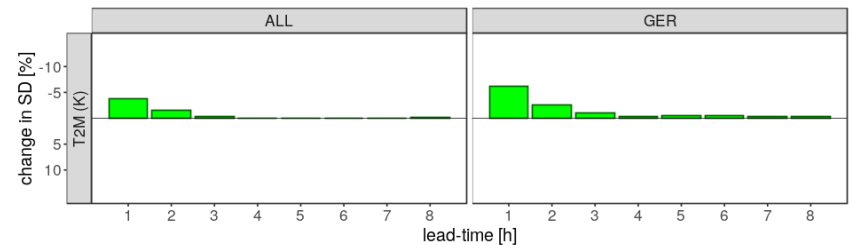
Significance 0.00 0.25 0.50 0.75 1.00 ILAM better



Comparing runs 6,7,8,9,...18 UTC with artificial, shifted reference runs

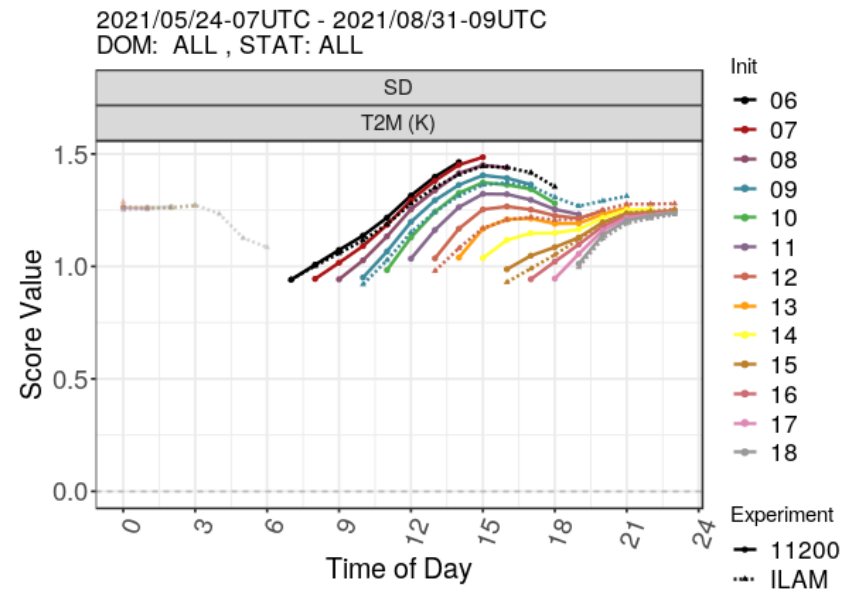
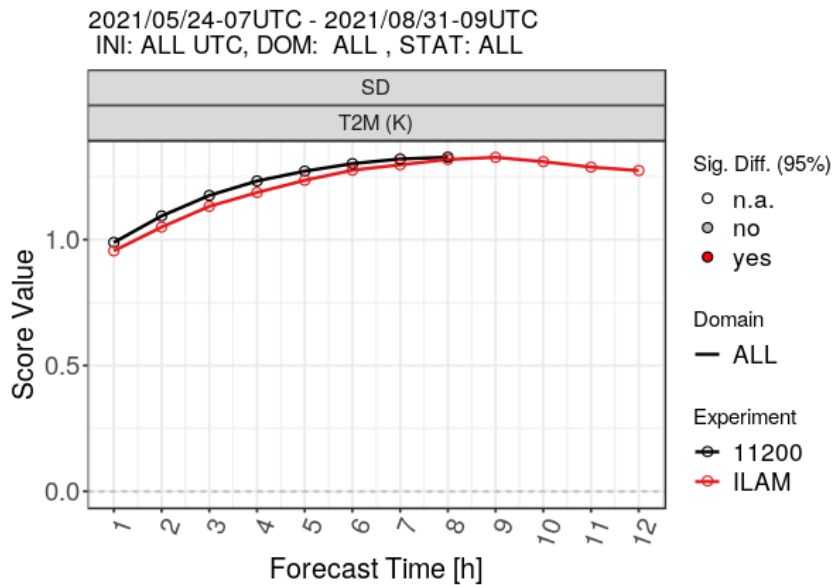
Forecasts initialized from 2021/05/24 to 2021/08/31
Reduction of SD [%], INI; 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18UTC

Significance 0.00 0.25 0.50 0.75 1.00 11200 better



Adaptations for the RUC II

- Scores can additionally be shown as a function of day-time.
- Plotting scores from all runs next to each other
- Better understanding of daily cycles





- Update of the visualization scripts on COSMO Server in progress
- Re-implementing outlier statistics in the EPS verification
- Continue on topics from ICCARUS 2021 (verification at fronts, easier configuration of Shiny Apps)





Rfdbk Package

<https://gitlab.com/rfxf/Rfdbk>

FFV Scripts

<https://gitlab.com/rfxf/FFV>

Shiny Visualization

<https://gitlab.com/rfxf/ShinyApps> (restricted)

Documentation

<http://www.cosmo-model.org/shiny/users/fdbk/RfdbkVeriDoku.html>



Thank you!