Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Comparison of ICON- and COSMO-EU forecast quality

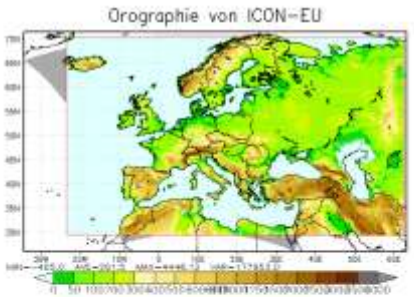
Ulrich Damrath

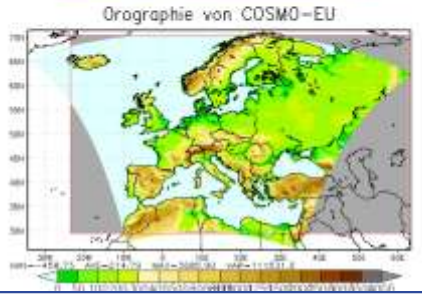
Ulrich.Damrath@dwd.de

Models - slide got from Felix Fundel

Deutscher Wetterdienst
Wetter und Klima aus einer Hand
DWD

ICON (no nest)	Non-hydrostatic, icosahedral 13.2 km, 90 vertical levels (~75km) 3D Var analysis
ICON-P1 (incl. EU Nest)	Non-hydrostatic, icosahedral 13.2 km, 90 vertical levels 3D Var analysis Including the 2-way coupled nest
ICON-EU Nest	Non-hydrostatic, icosahedral 6.5 km, 60vertical levels (~22 km) Boundaries ICON-P1 Operational July 2015
COSMO-EU	Non-hydrostatic, lat-lon 7 km, 40vertical levels (~22 km) Initial & boundaries from ICON Nudging analysis





Overview

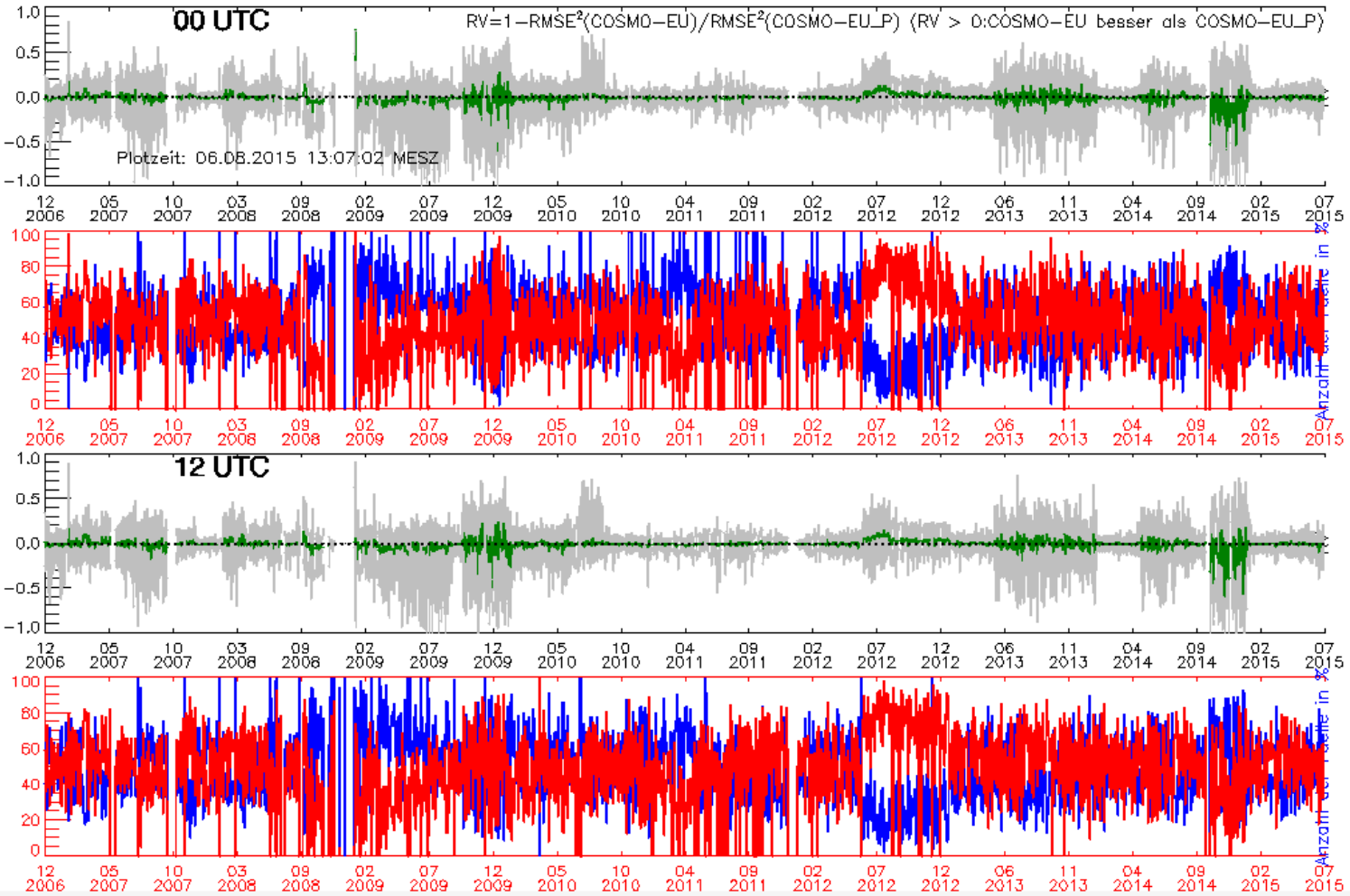
Deutscher Wetterdienst
Wetter und Klima aus einer Hand
DWD

- **The influence of boundary conditions from ICON to the forecast quality of COSMO-EU**
- **Comparison of forecast quality for COSMO-EU with ICON global**
- **Comparison of forecast quality for COSMO-EU with ICON EU-nest**

The effect of ICON-boundary conditions to the quality of forecasts for non surface parameters – reduction of variance

Quality of DWD-parallel suite compared to operational run since 2006

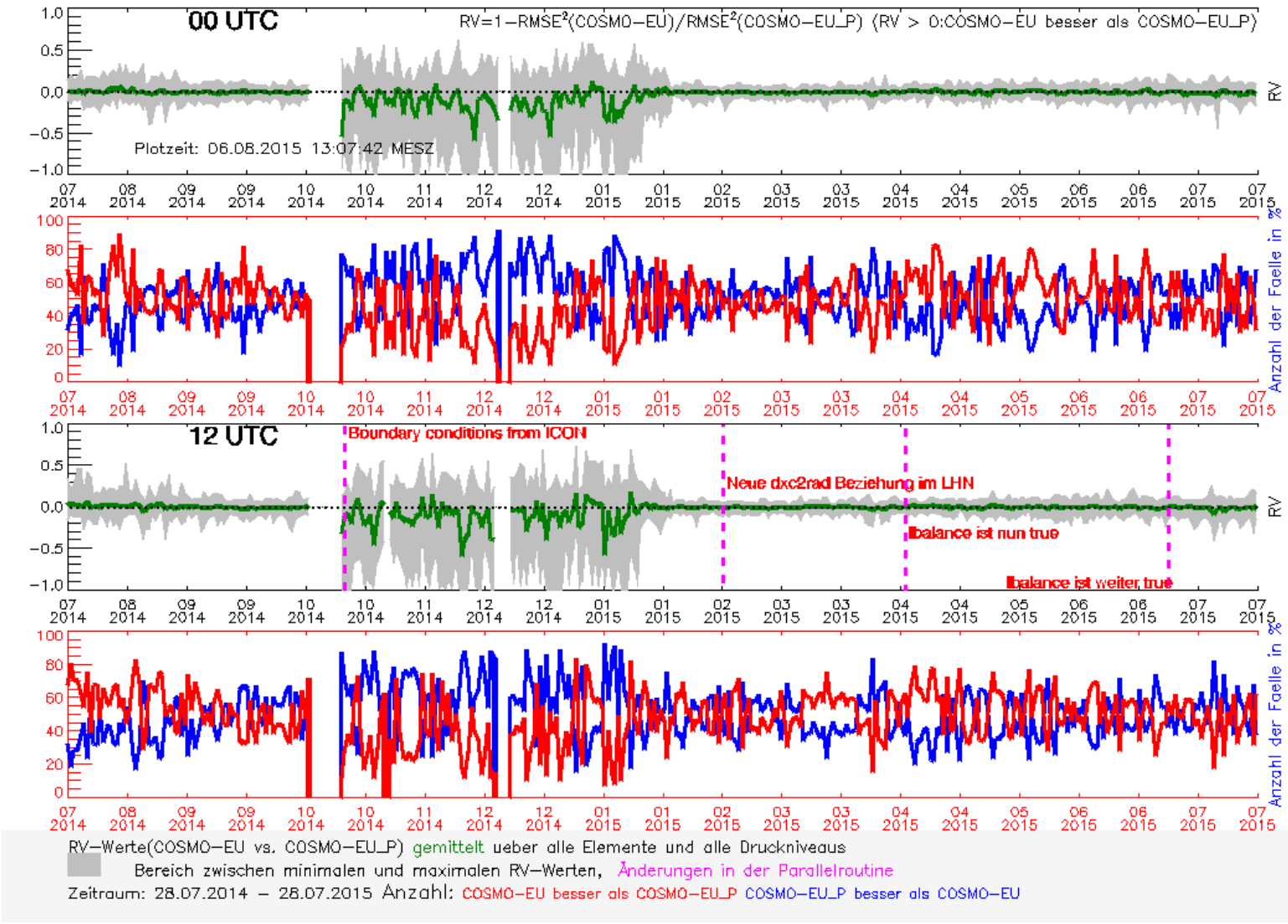
Deutscher Wetterdienst
Wetter und Klima aus einer Hand



The effect of ICON-boundary conditions to the quality of forecasts for non surface parameters – reduction of variance

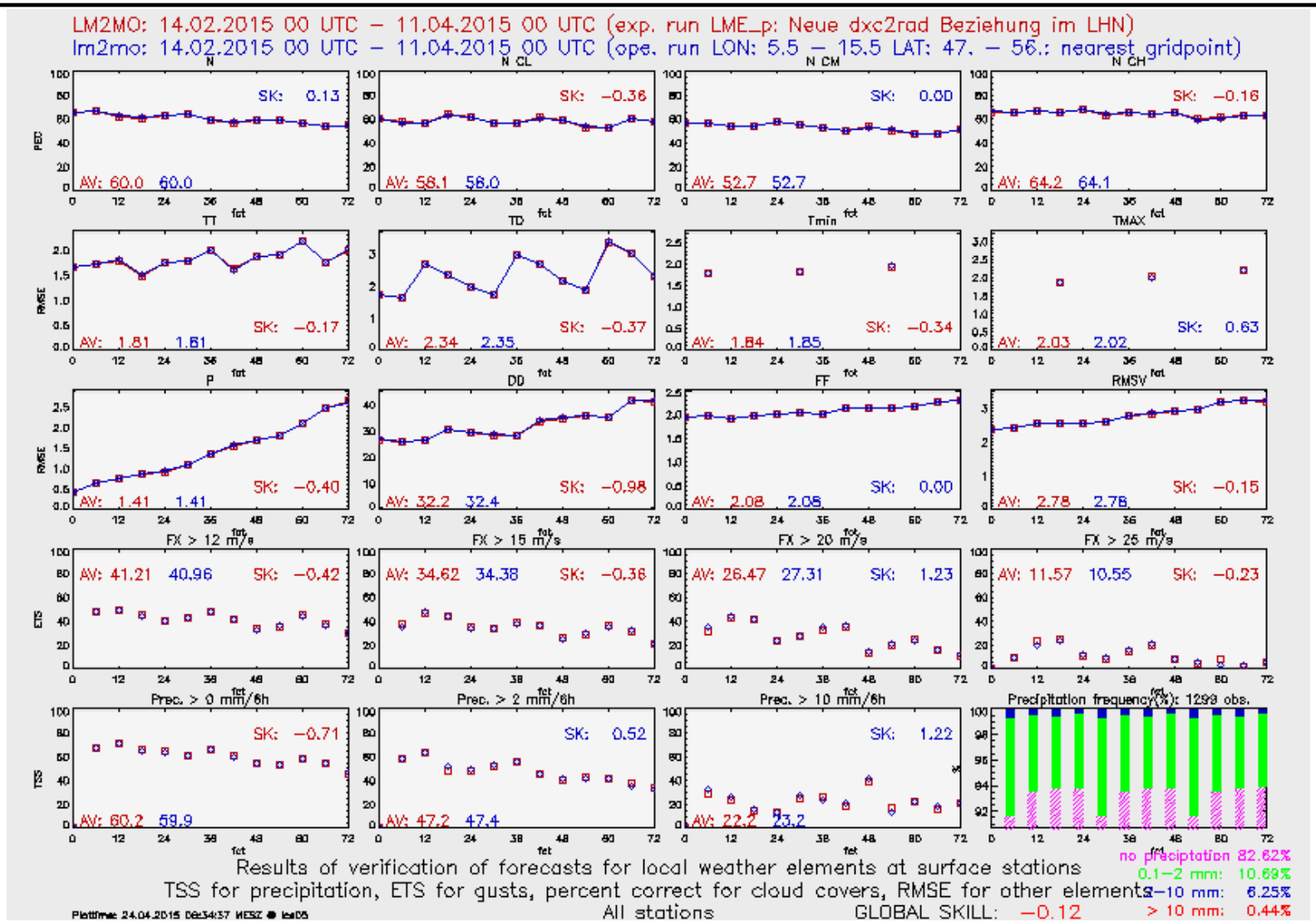
Quality of DWD-parallel suite compared to operational run last year

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



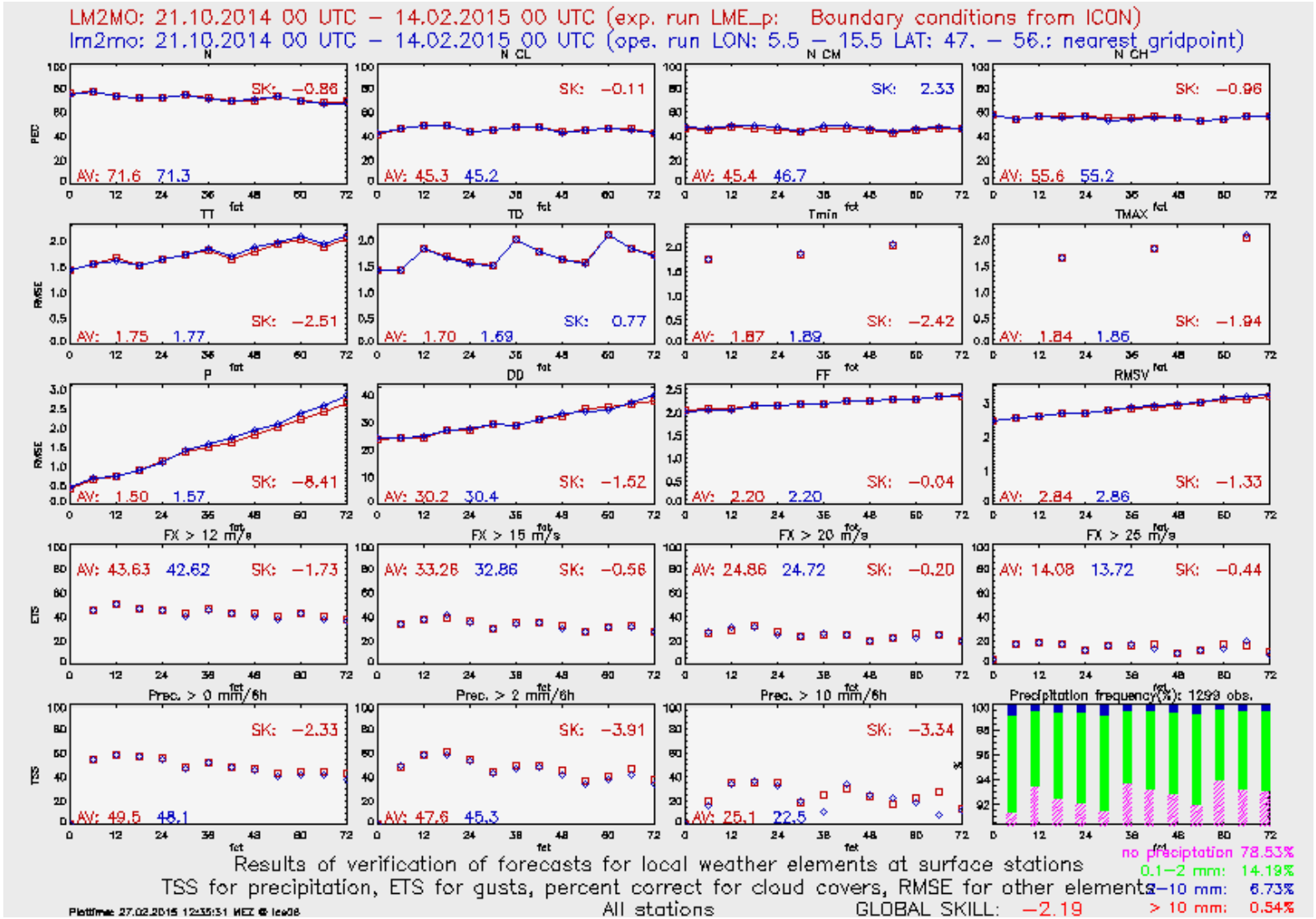
Quality of DWD-parallel suite compared to operational run, surface weather elements
New dx2rad relation in LHN

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



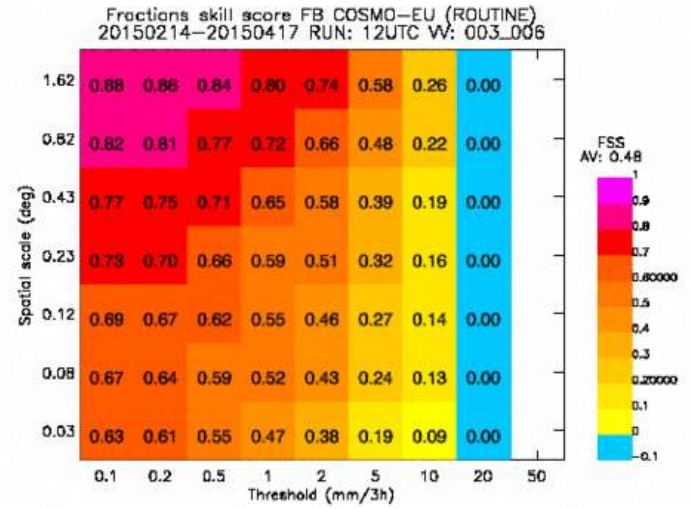
Quality of DWD-parallel suite compared to operational run, surface weather elements
ICON boundary conditions from ICON

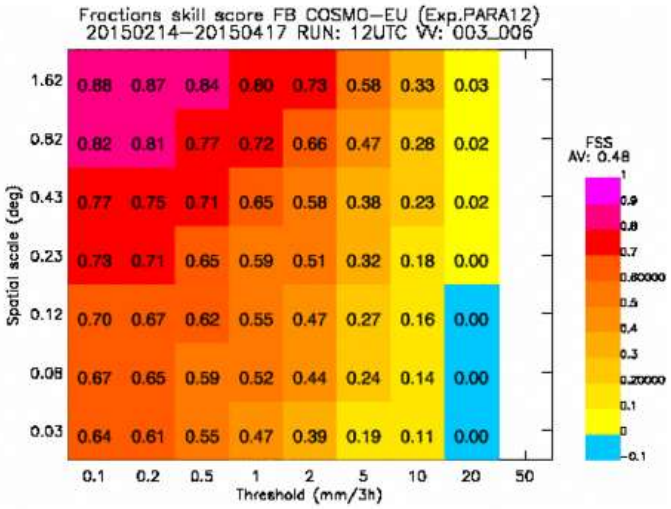
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

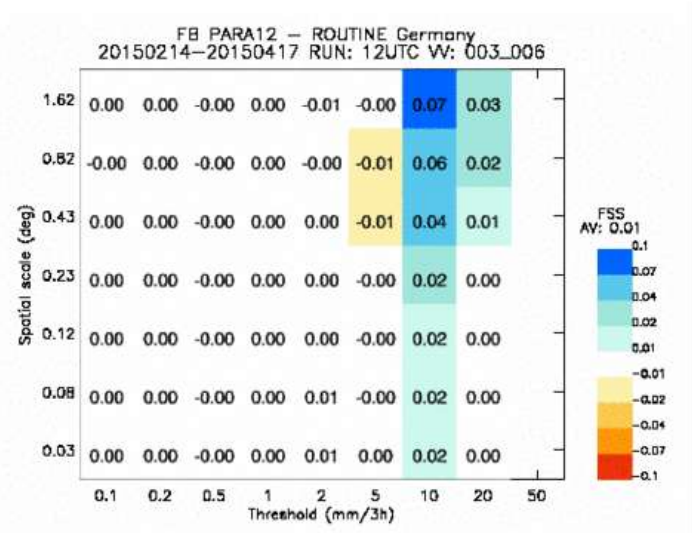


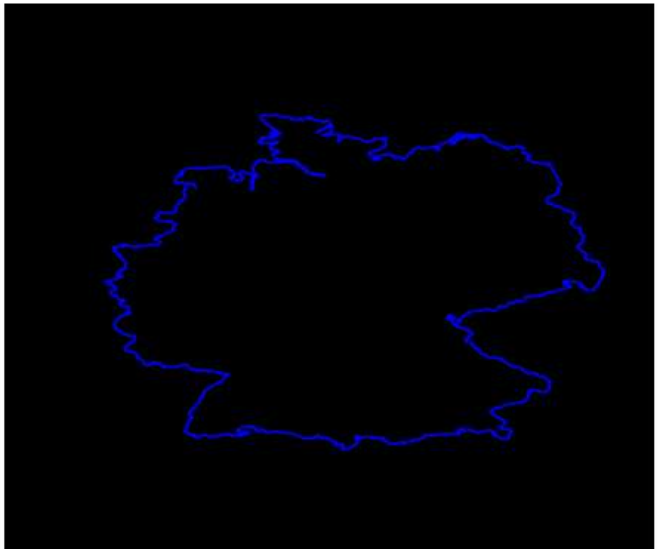
Quality of DWD-parallel suite compared to operational run, precipitation - FSS
ICON boundary conditions from ICON

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



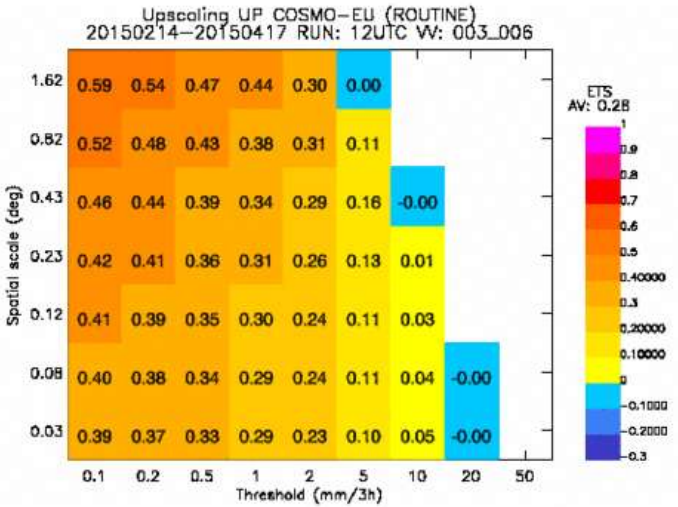


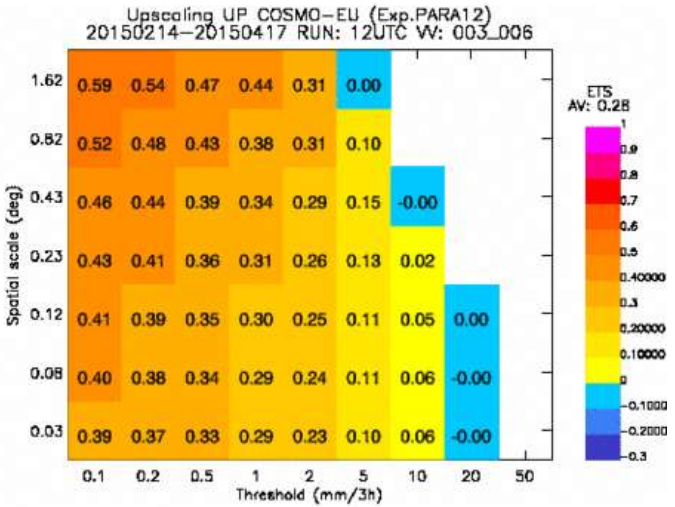


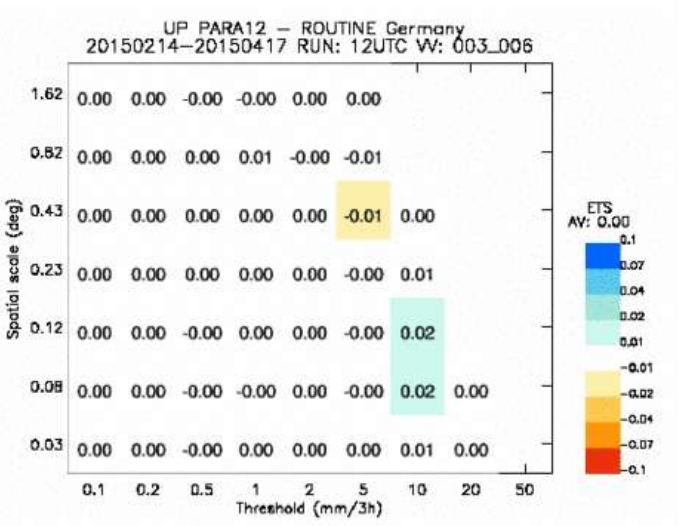


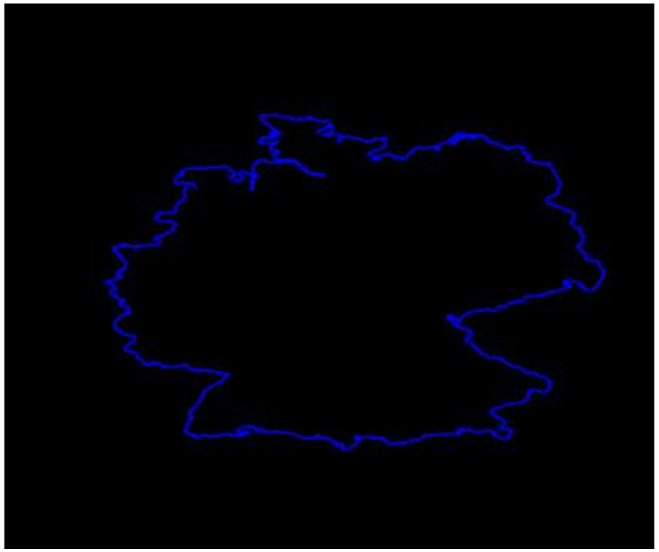
Quality of DWD-parallel suite compared to operational run, precipitation - ETS
ICON boundary conditions from ICON

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



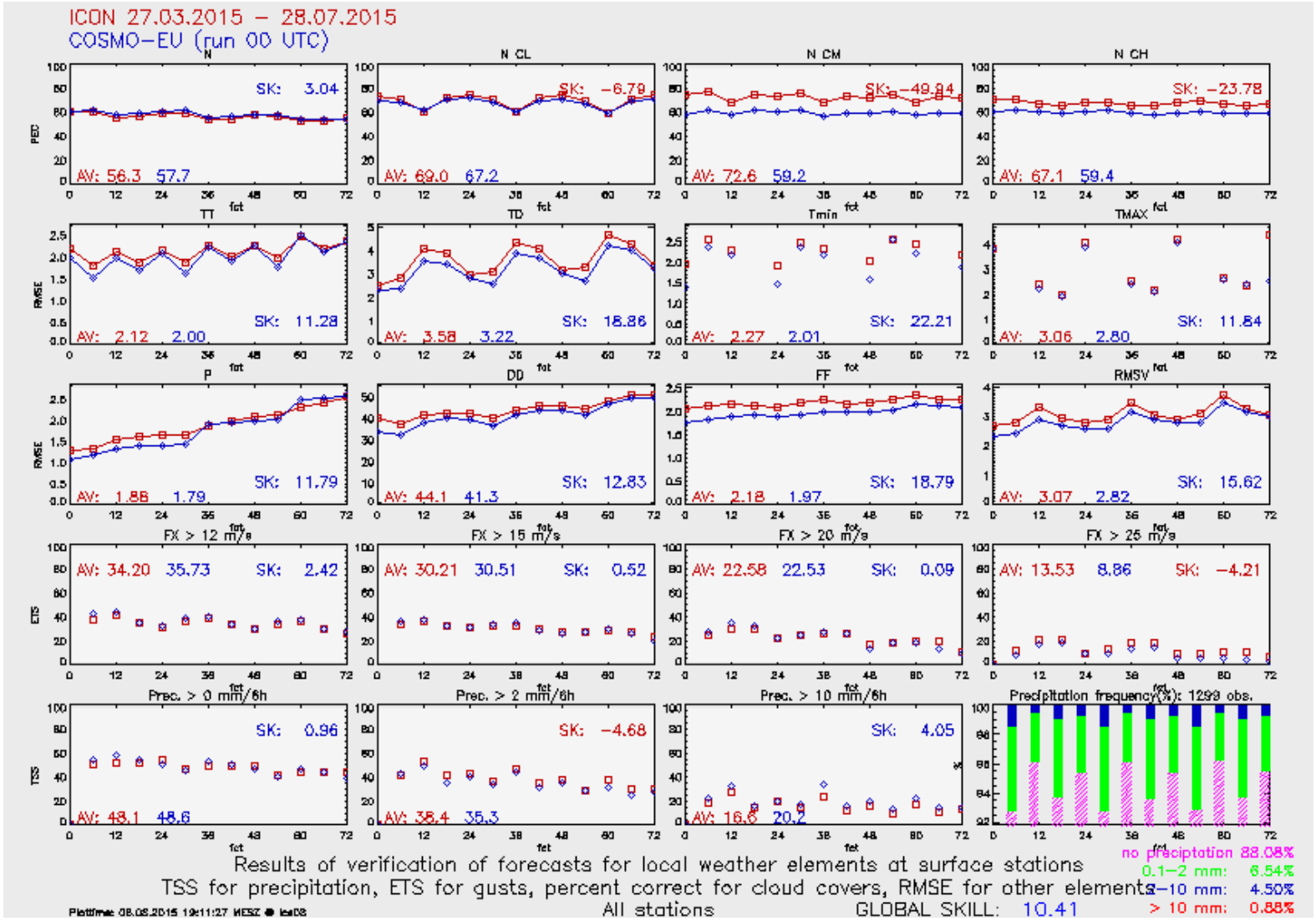






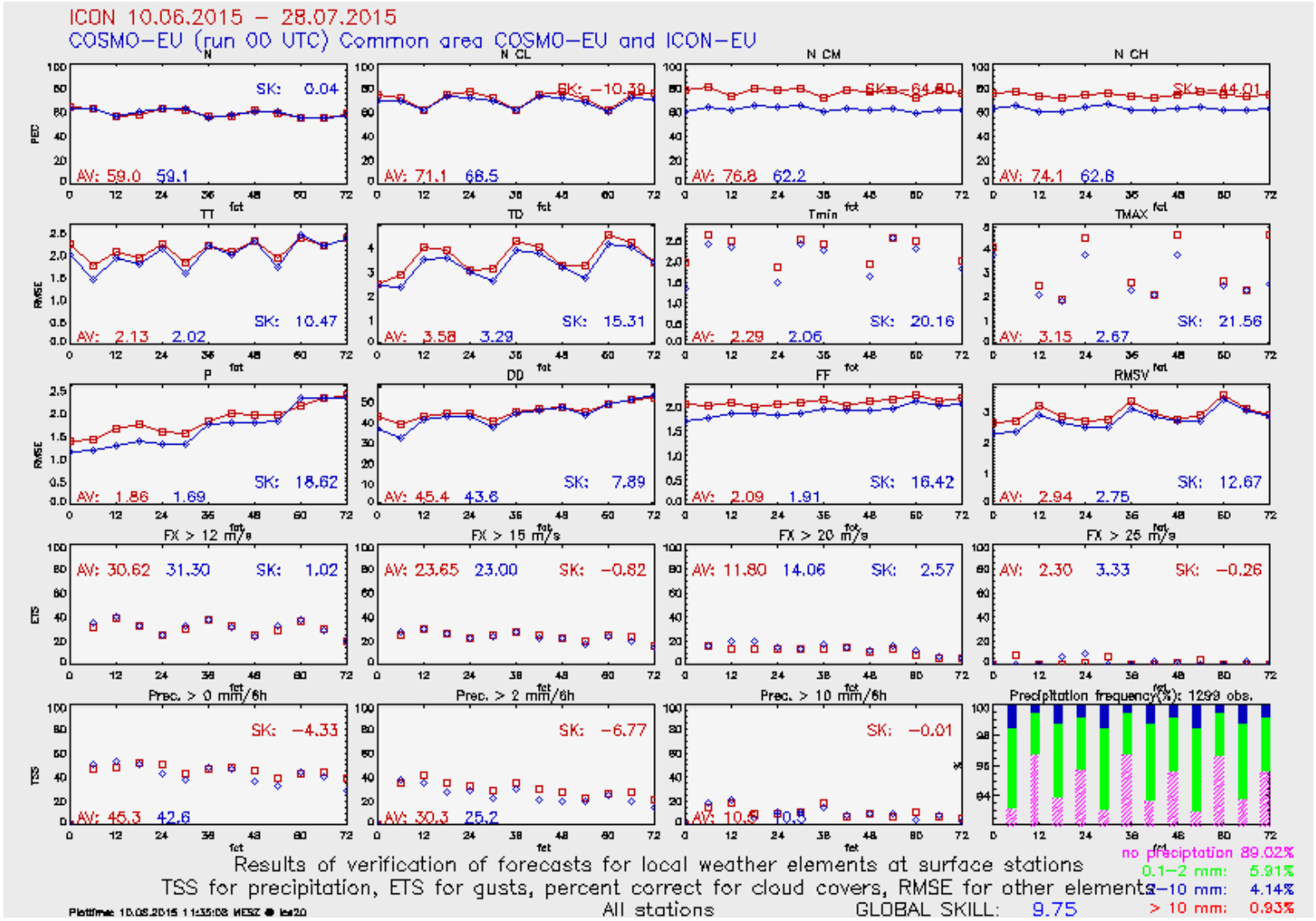
Quality of COSMO-EU compared to ICON (global model), common region of COSMO-EU and ICON-EU, Period since start of ICON-EU

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



Quality of COSMO-EU compared to ICON (global model), common region of COSMO-EU and ICON-EU, Period since major revision of ICON

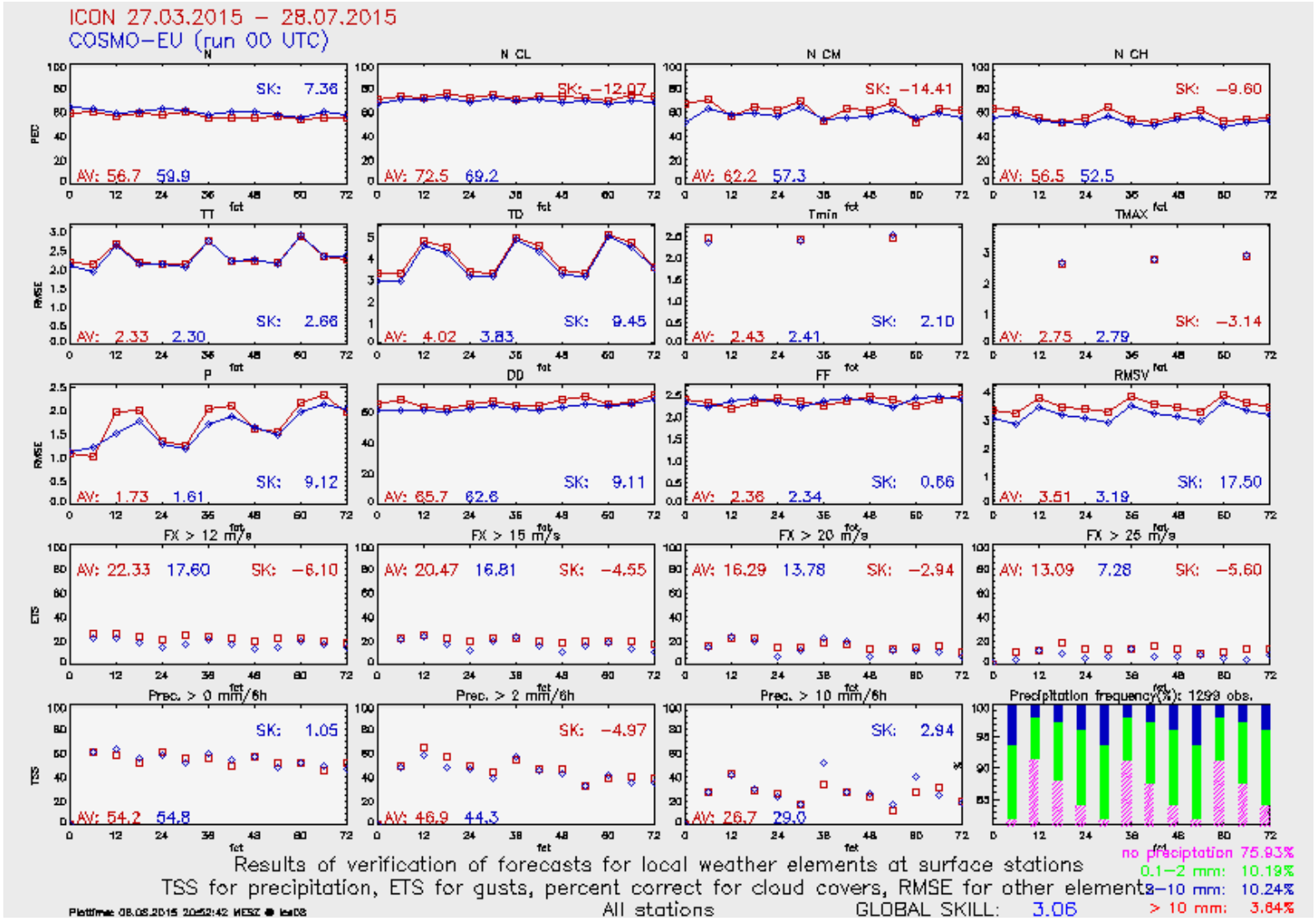
Deutscher Wetterdienst
Wetter und Klima aus einer Hand



Quality of COSMO-EU compared to ICON (global model), region of Switzerland

Period since start of ICON-EU

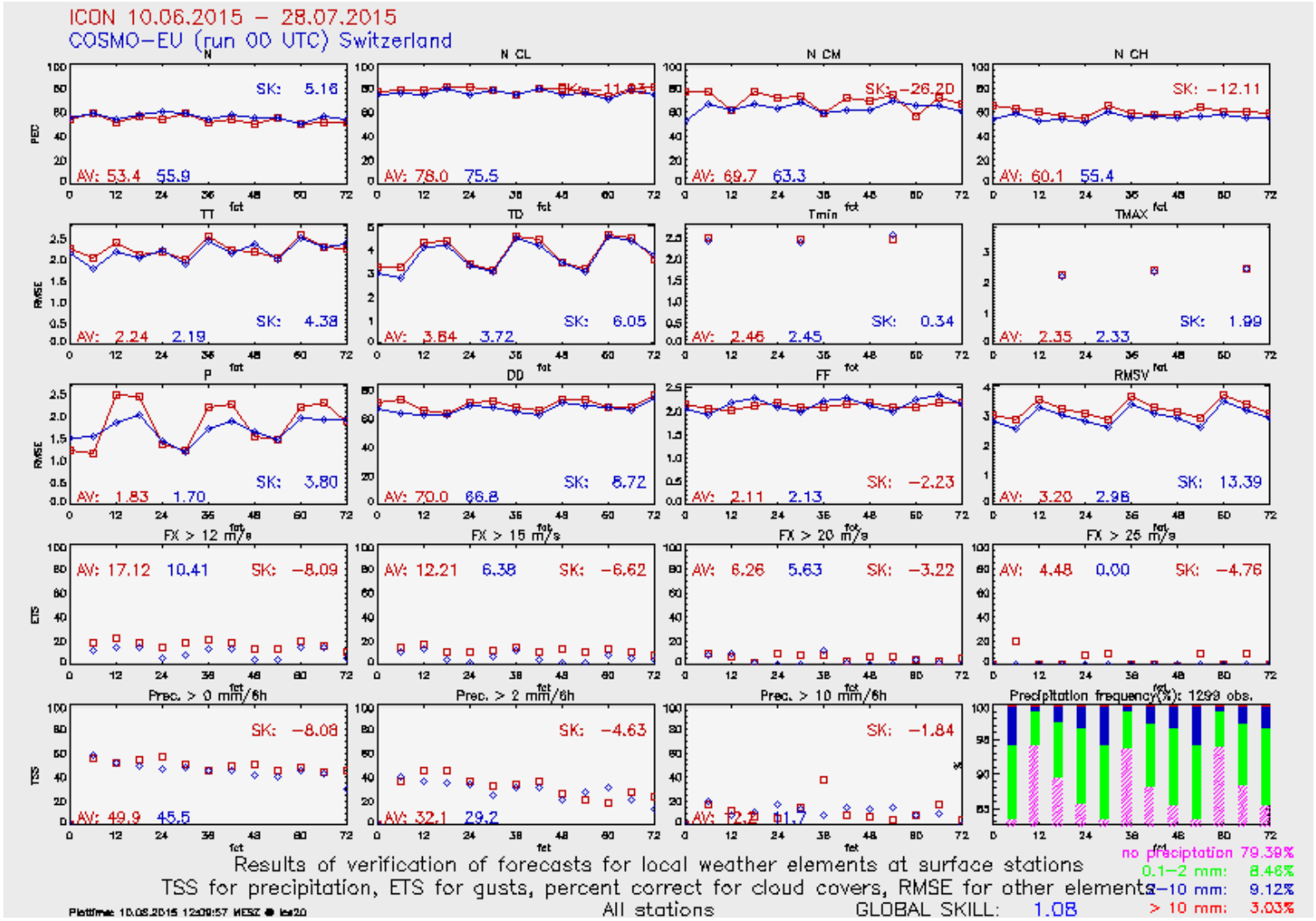
Deutscher Wetterdienst
Wetter und Klima aus einer Hand



Quality of COSMO-EU compared to ICON (global model), region of Switzerland

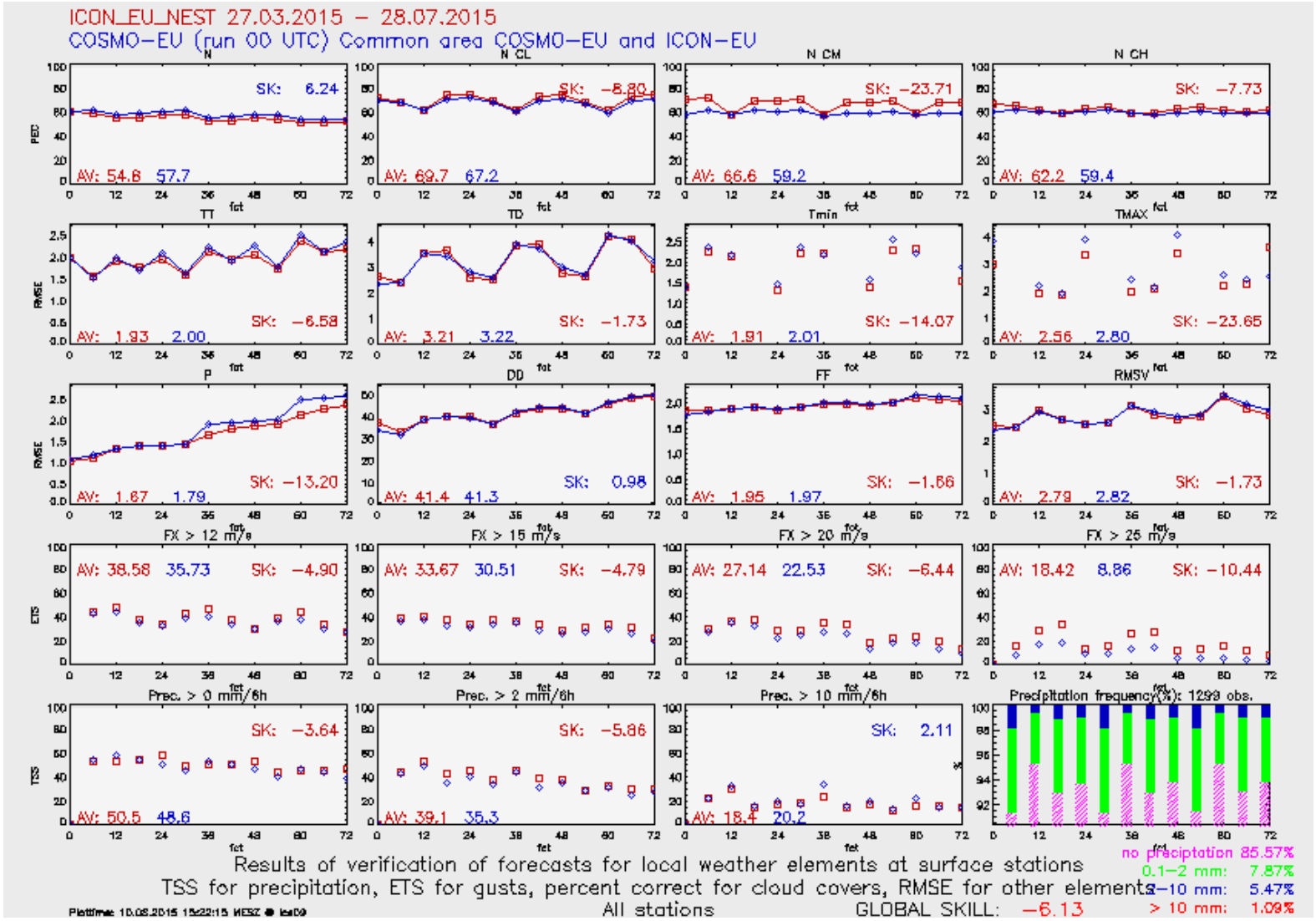
Period since major revision of ICON

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



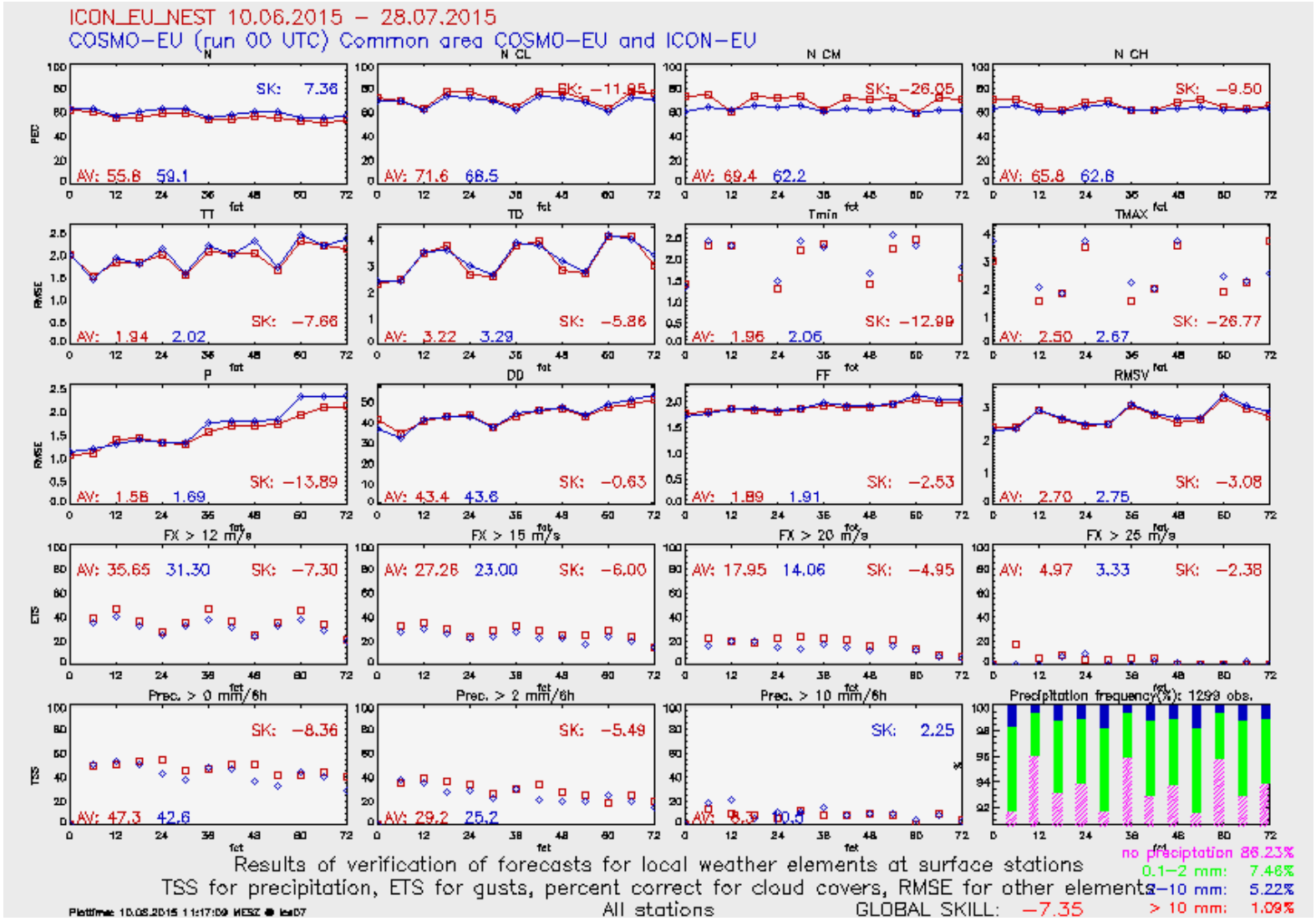
Quality of COSMO-EU compared to ICON-EU, common region of COSMO-EU and ICON-EU, Period since start of ICON-EU

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



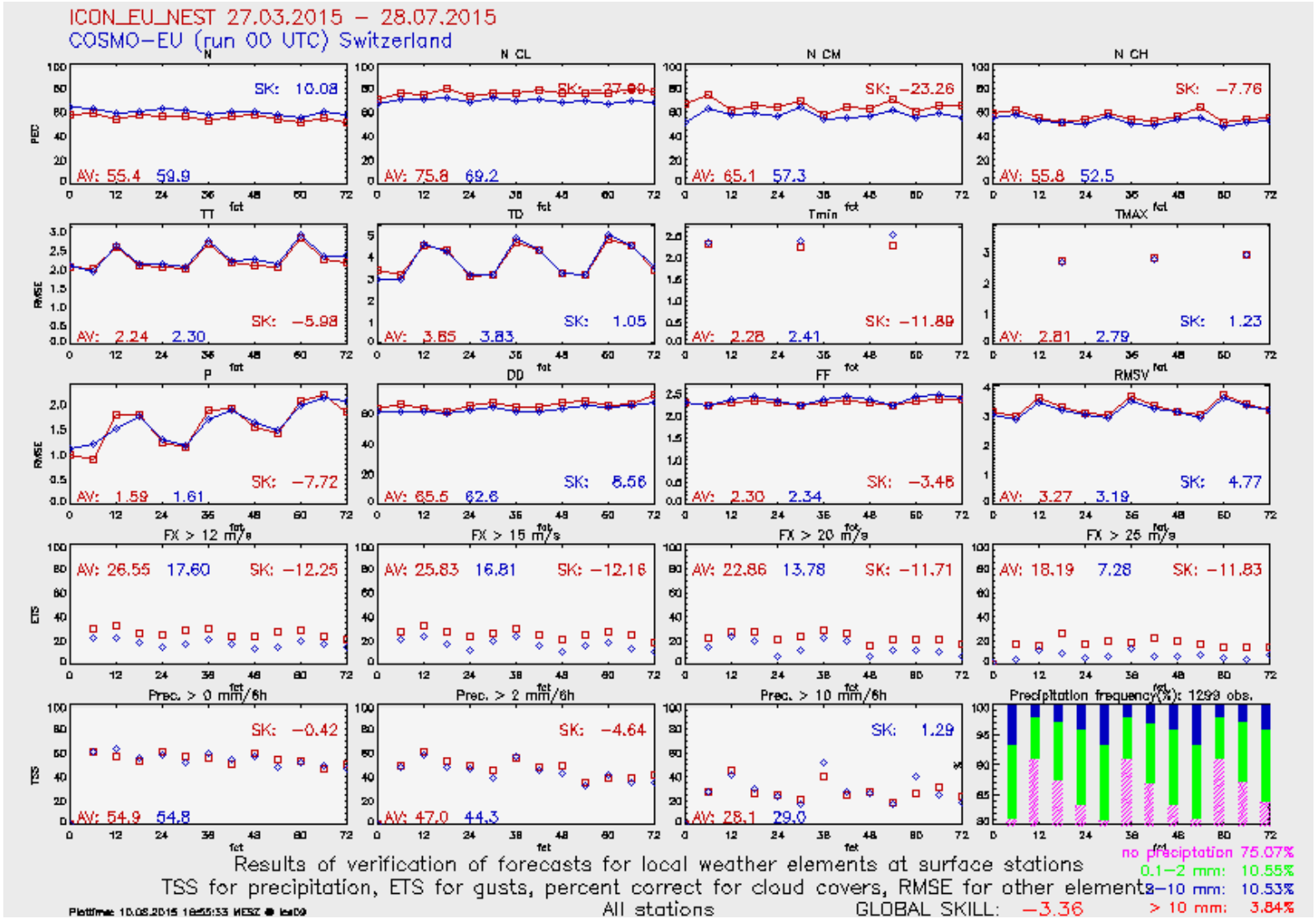
Quality of COSMO-EU compared to ICON-EU, common region of COSMO-EU and ICON-EU, Period since major revision of ICON

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



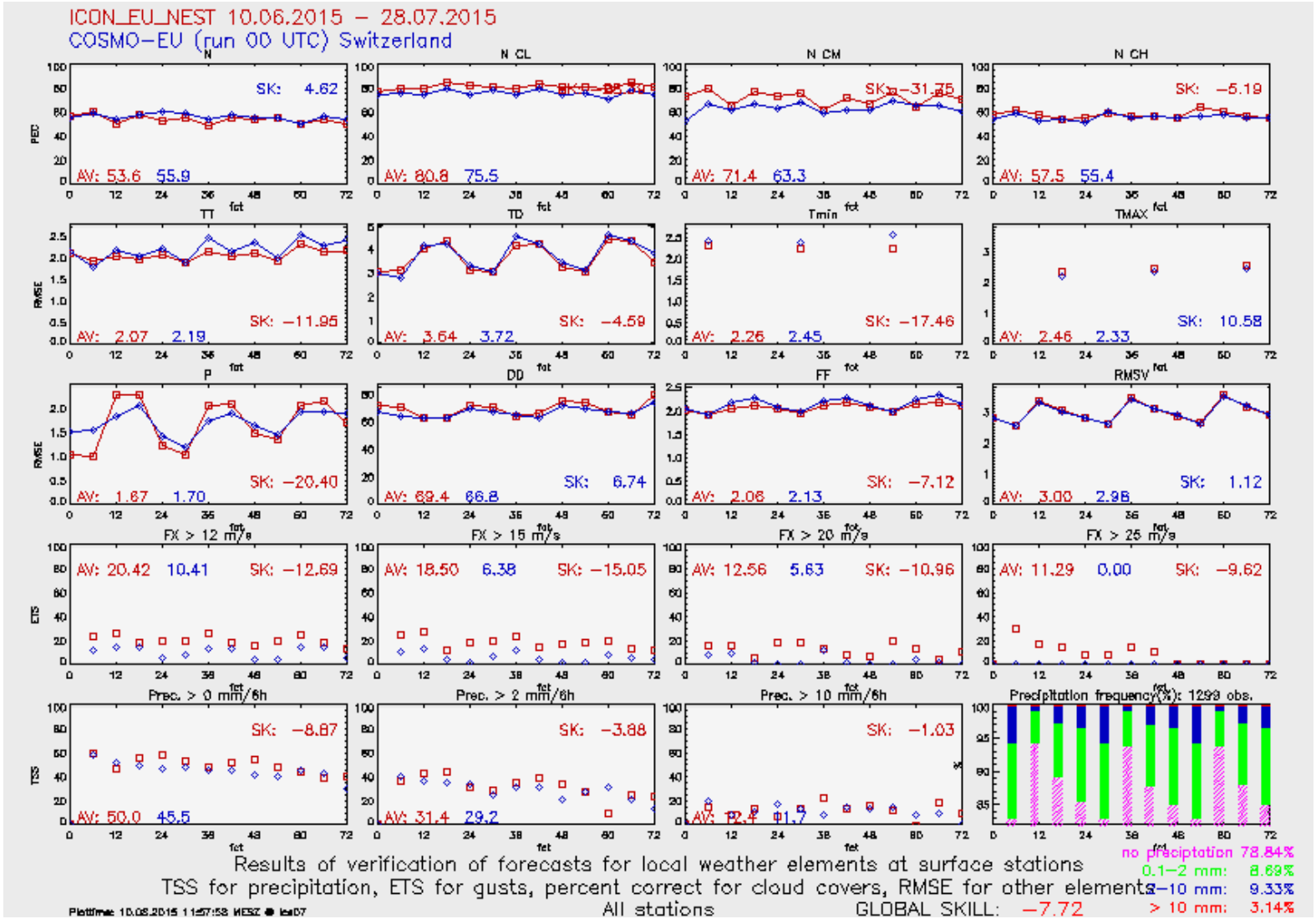
Quality of COSMO-EU compared to ICON-EU, region of Switzerland, Period since start of ICON-EU

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



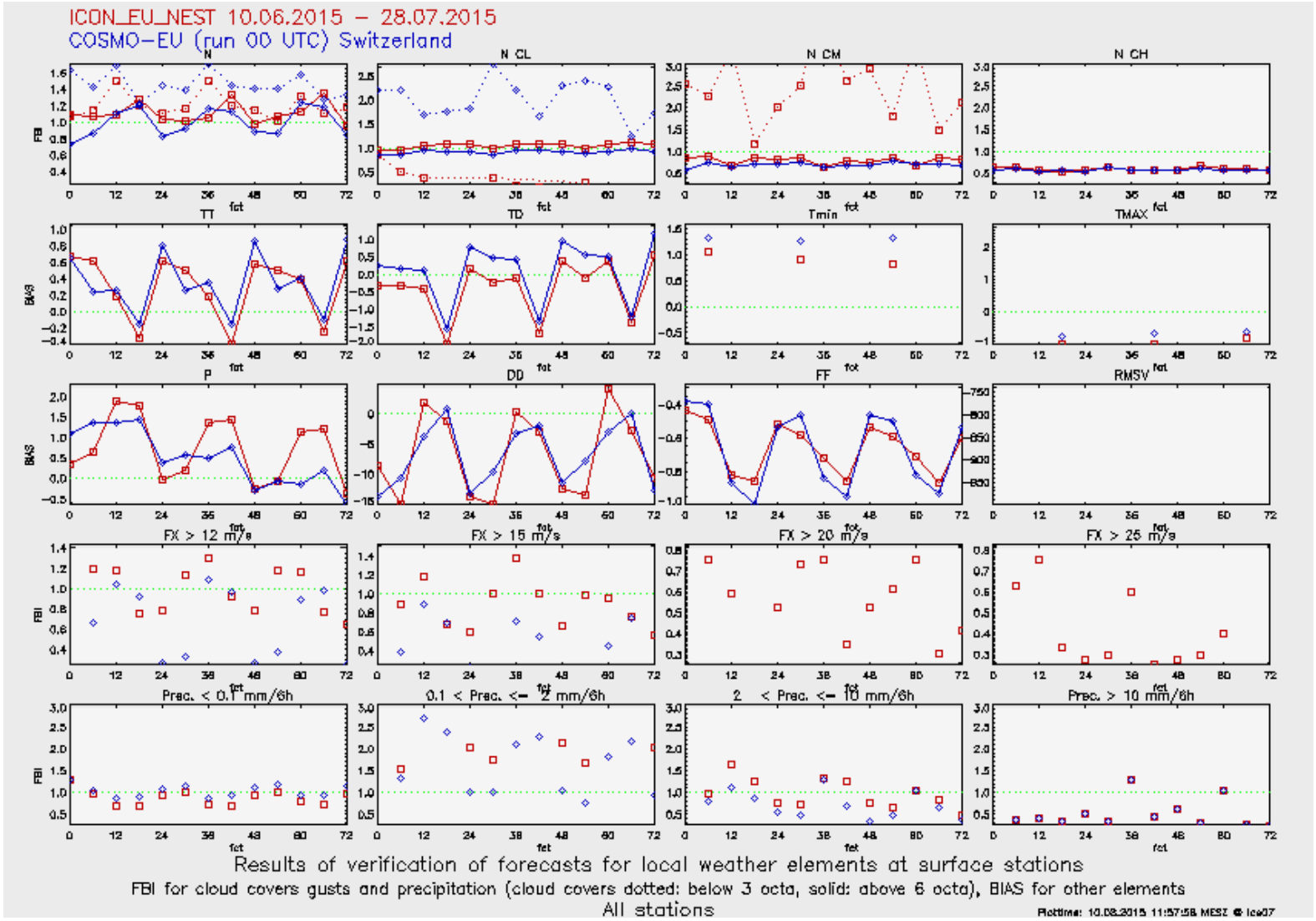
Quality of COSMO-EU compared to ICON-EU, region of Switzerland,
Period since major revision of ICON

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



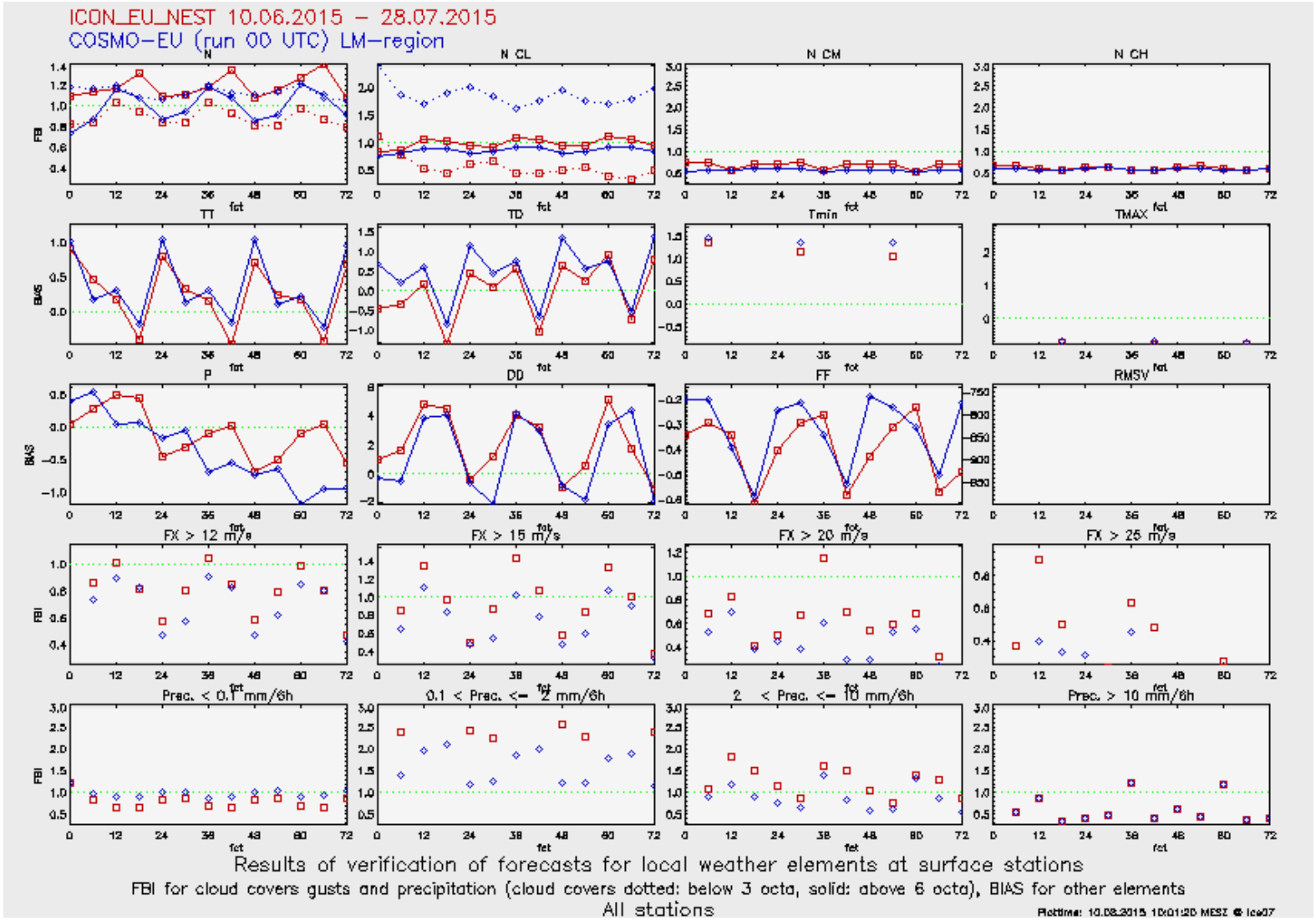
BIAS of COSMO-EU forecasts compared to ICON-EU, region of Switzerland, Period since major revision of ICON

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



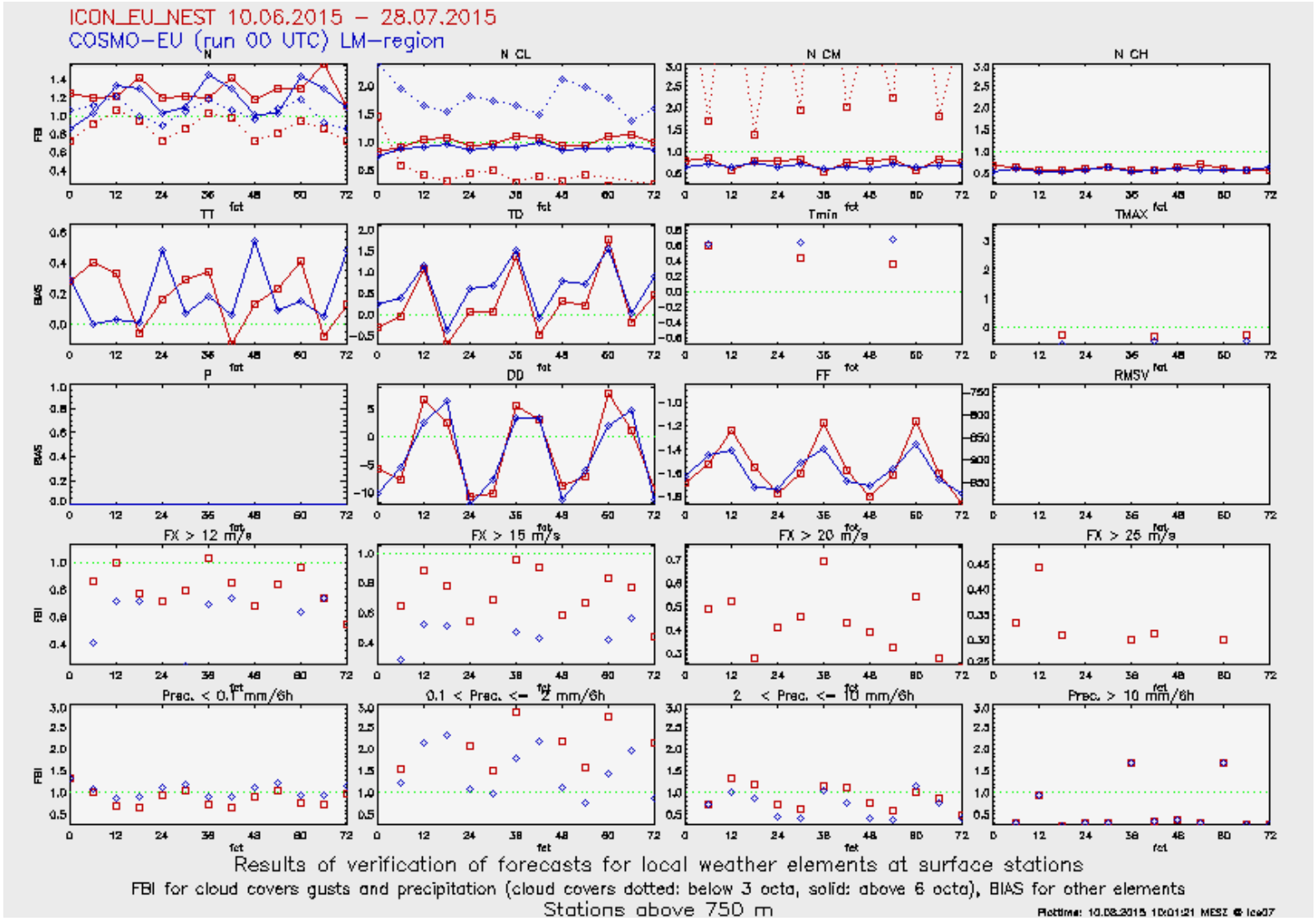
BIAS of COSMO-EU forecasts compared to ICON-EU, region of LM,
Period since major revision of ICON

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



BIAS of COSMO-EU forecasts compared to ICON-EU, region of LM – stations above 750 m, Period since major revision of ICON

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



Summary

Deutscher Wetterdienst
Wetter und Klima aus einer Hand
DWD

- **The influence of boundary conditions from ICON to the forecast quality of COSMO-EU**
  - ***It is clearly shown that the change of boundary conditons from GME to ICON lead to better forecast results for COSMO-EU concerning elements in the upper atmosphere.***
  - ***Forecast quality for surface weather elements is also influenced positively with a larger effect compared with other changes.***
- **Comparison of forecast quality for COSMO-EU with ICON global**
  - ***Comparison of forecast quality for surface weather elements show that COSMO-EU is able to beat global version of ICON for most elements (Thank Goodness!).***
- **Comparison of forecast quality for COSMO-EU with ICON-EU**
  - ***ICON-EU is able to beat COSMO-EU with different degrees depending on the region of interest.***
  - ***A special advantage of ICON-EU against COSMO-EU is the more effective tuning for gusts forecasts.***

Database of the new verification system

Deutscher Wetterdienst
Wetter und Klima aus einer Hand
DWD

Datbase

- NetCDF Feedback Files from Data Assimilation
- Observations (SYNOP/TEMP/SATOB/SCATT/…) and modelequivalent from analysis and forecasts
- Additional information like time stamp, level, quality flags, observation error etc. which is useful for verification.

Advantages

- No extensive data preparation (done by assimilation)
- Consistency of assignment of observation and forecast DA – verification
- Wsmall disk space comared to full model
- Very rapid calculation of verification results (probably: online)
- Consistent treatment of different experiments

Limitations

- Not useful for verifikation in horizontal spaces (analysis, object based)
- Relatively large effort when uising new data

Thank you for your attention!