

Comparison of ICON- and COSMO-EU forecast quality

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Models - slide got from Felix Fundel

ICON (no nest)

Non-hydrostatic, icosahedral
13.2 km, 90 vertical levels (~75km)
3D Var analysis



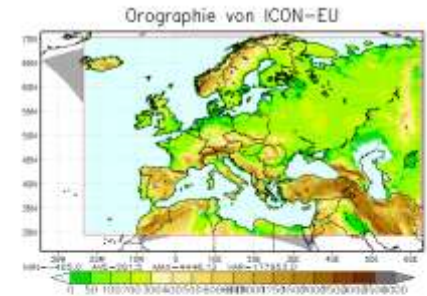
ICON-P1 (incl. EU Nest)

Non-hydrostatic, icosahedral
13.2 km, 90 vertical levels
3D Var analysis
Including the 2-way coupled nest



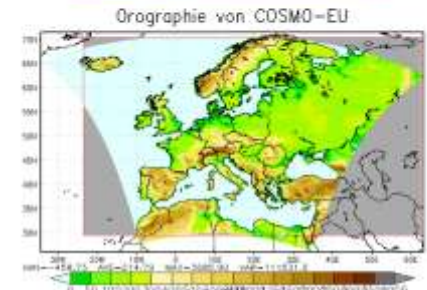
ICON-EU Nest

Non-hydrostatic, icosahedral
6.5 km, 60 vertical levels (~22 km)
Boundaries ICON-P1
Operational July 2015



COSMO-EU

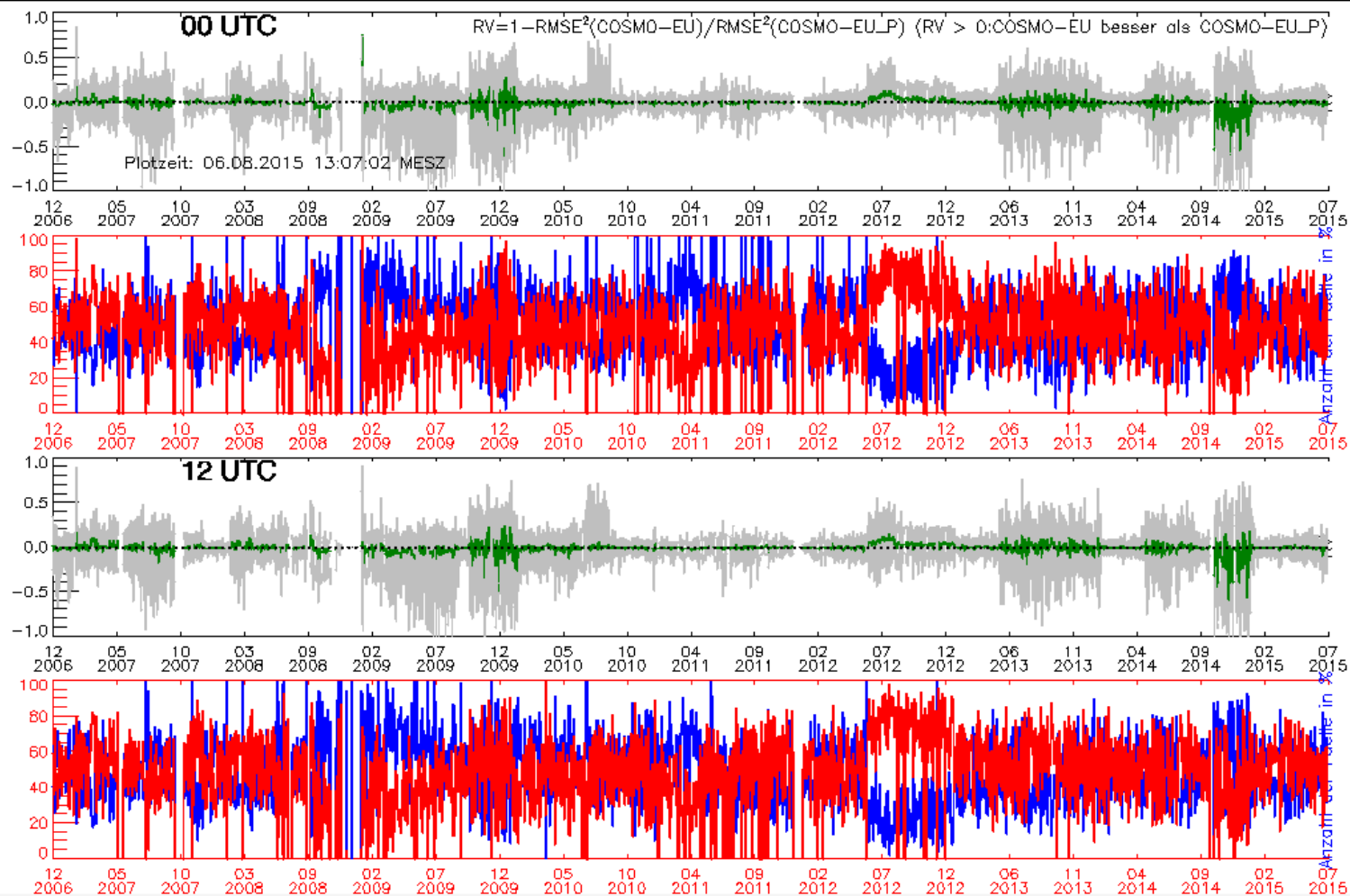
Non-hydrostatic, lat-lon
7 km, 40 vertical levels (~22 km)
Initial & boundaries from ICON
Nudging analysis



- **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

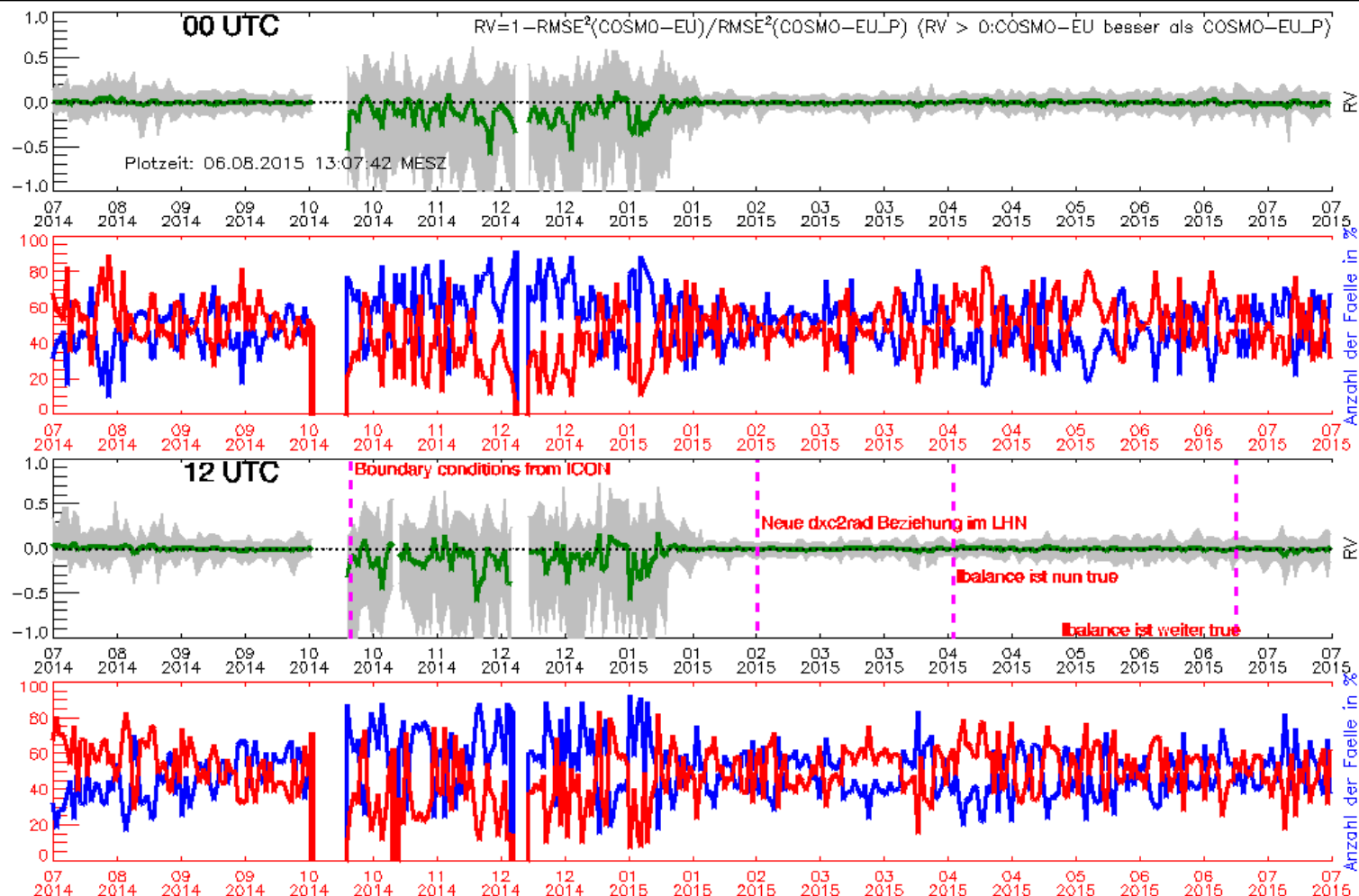


RV-Werte(COSMO-EU vs. COSMO-EU_P) gemittelt ueber alle Elemente und alle Druckniveaus
 Bereich zwischen minimalen und maximalen RV-Werten,
 Zeitraum: 12.12.2006 – 28.07.2015 Anzahl: COSMO-EU besser als COSMO-EU_P COSMO-EU_P besser als COSMO-EU



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



RV-Werte(COSMO-EU vs. COSMO-EU_P) gemittelt ueber alle Elemente und alle Druckniveaus
 Bereich zwischen minimalen und maximalen RV-Werten, Änderungen in der Parallelroutine
 Zeitraum: 28.07.2014 – 28.07.2015 Anzahl: COSMO-EU besser als COSMO-EU_P COSMO-EU_P besser als COSMO-EU

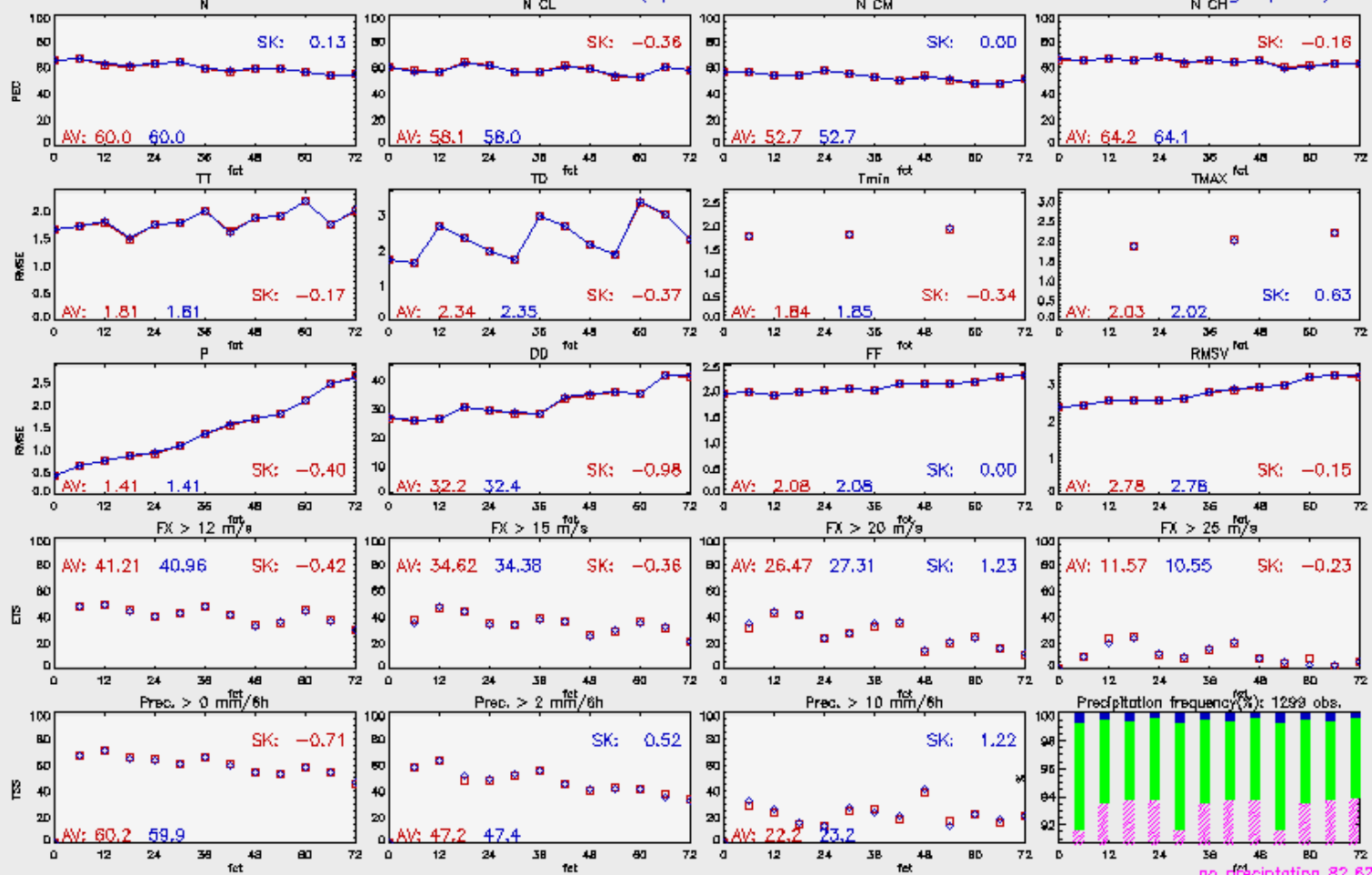


Quality of DWD-parallel suite compared to operational run, surface weather elements

New dx2rad relation in LHN



LM2MO: 14.02.2015 00 UTC – 11.04.2015 00 UTC (exp. run LME_p; Neue dxc2rad Beziehung im LHN)
lm2mo: 14.02.2015 00 UTC – 11.04.2015 00 UTC (ope. run LON; 5.5 – 15.5 LAT; 47. – 56.: nearest gridpoint)



Results of verification of forecasts for local weather elements at surface stations
TSS for precipitation, ETS for gusts, percent correct for cloud covers, RMSE for other elements
All stations GLOBAL SKILL: -0.12

no precipitation 82.62%
0.1–2 mm: 10.69%
3–10 mm: 6.25%
> 10 mm: 0.44%

Plottime: 24.04.2015 08:34:37 MESZ ● 1405

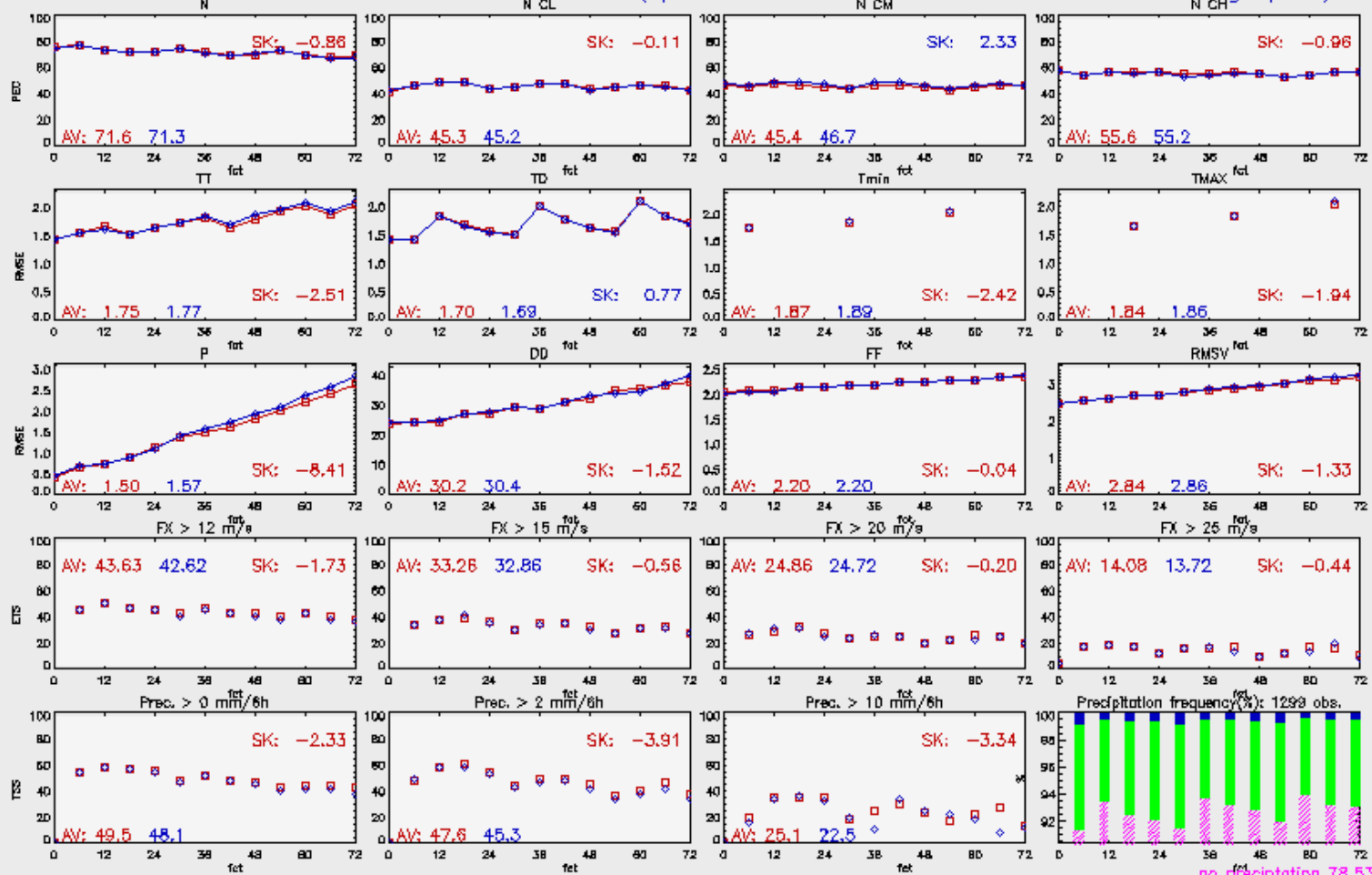


Quality of DWD-parallel suite compared to operational run, surface weather elements

ICON boundary conditions from ICON



LM2MO: 21.10.2014 00 UTC – 14.02.2015 00 UTC (exp. run LME_p: Boundary conditions from ICON)
lm2mo: 21.10.2014 00 UTC – 14.02.2015 00 UTC (ope. run LON: 5.5 – 15.5 LAT: 47. – 56.: nearest gridpoint)



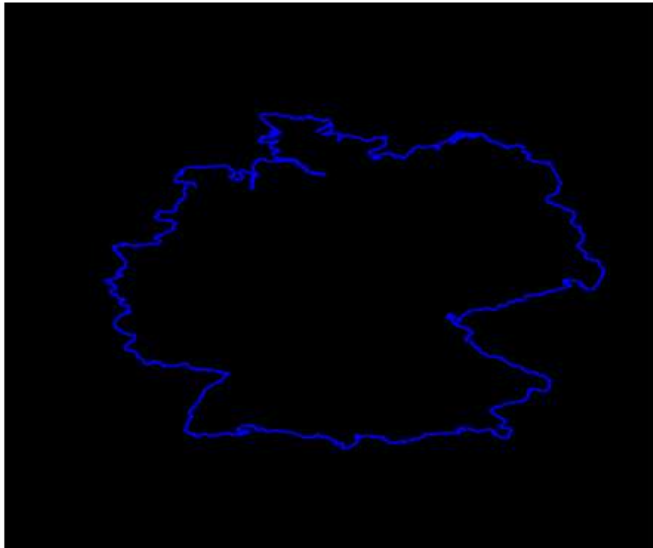
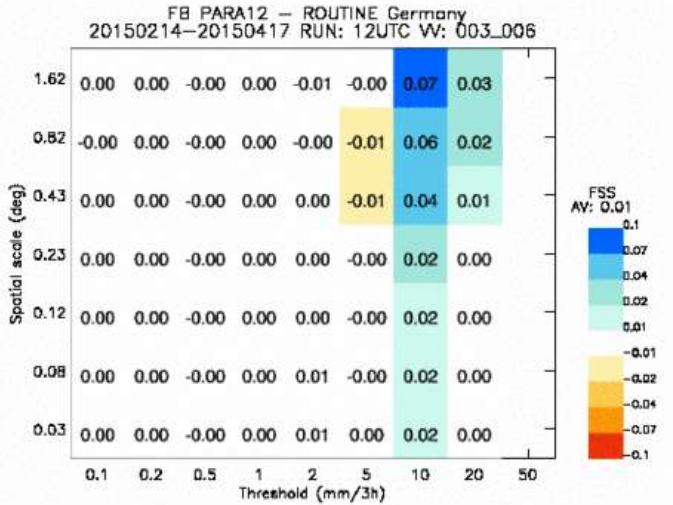
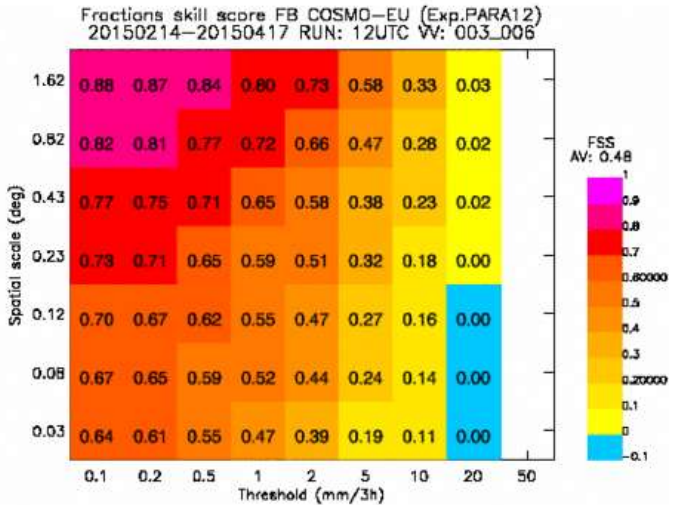
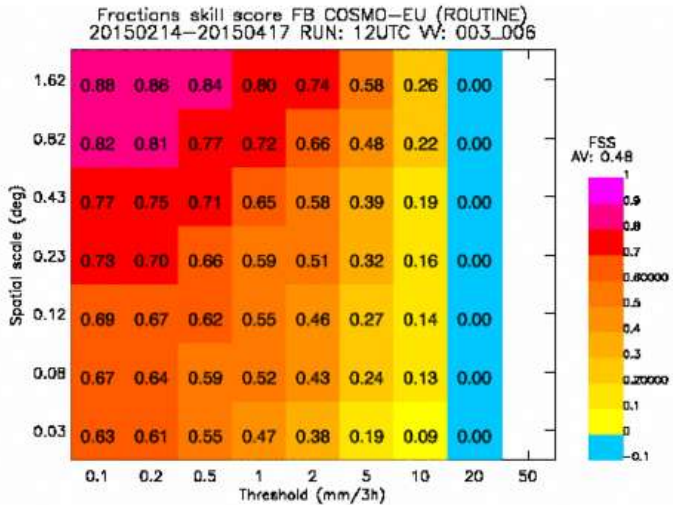
Results of verification of forecasts for local weather elements at surface stations
TSS for precipitation, ETS for gusts, percent correct for cloud covers, RMSE for other elements
All stations GLOBAL SKILL: -2.19

Plottime: 27.02.2015 12:33:51 MEZ © lew38

no precipitation 78.53%
0.1–2 mm: 14.18%
3–10 mm: 6.73%
> 10 mm: 0.54%

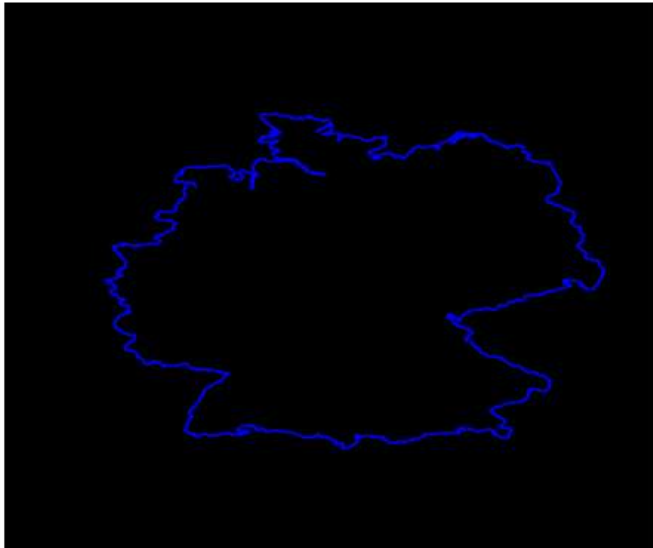
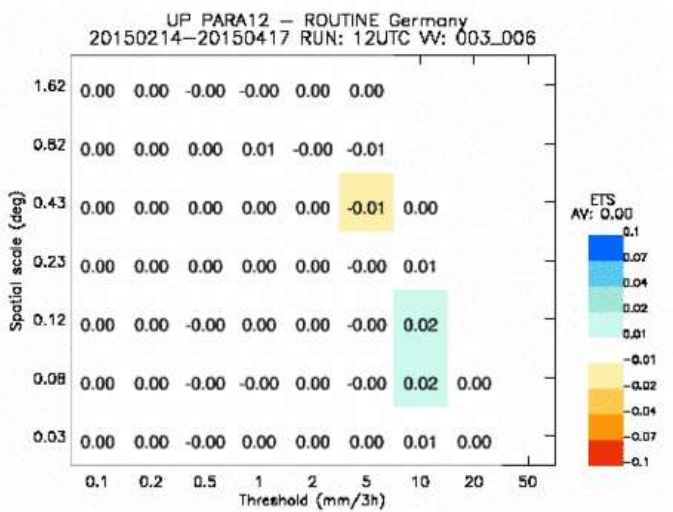
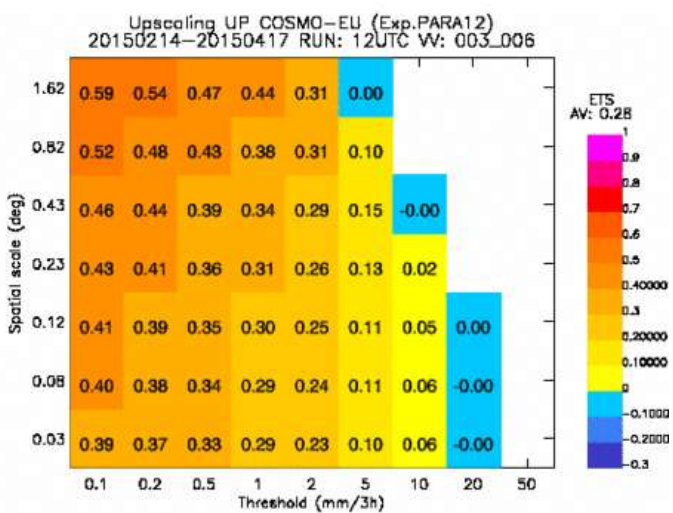
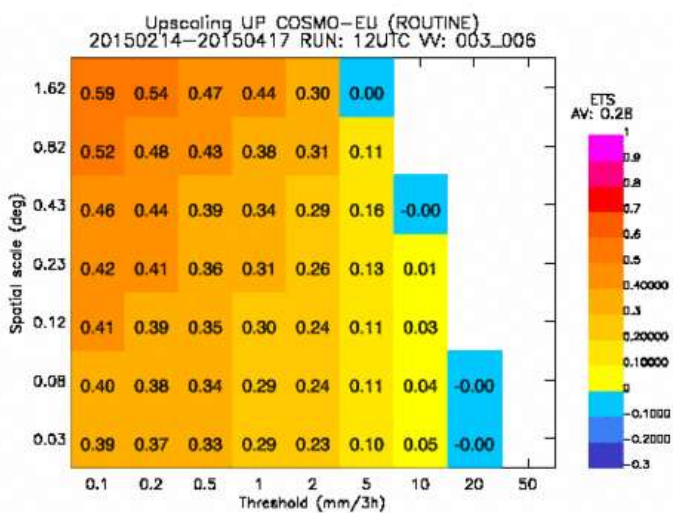


Quality of DWD-parallel suite compared to operational run, precipitation - FSS ICON boundary conditions from ICON

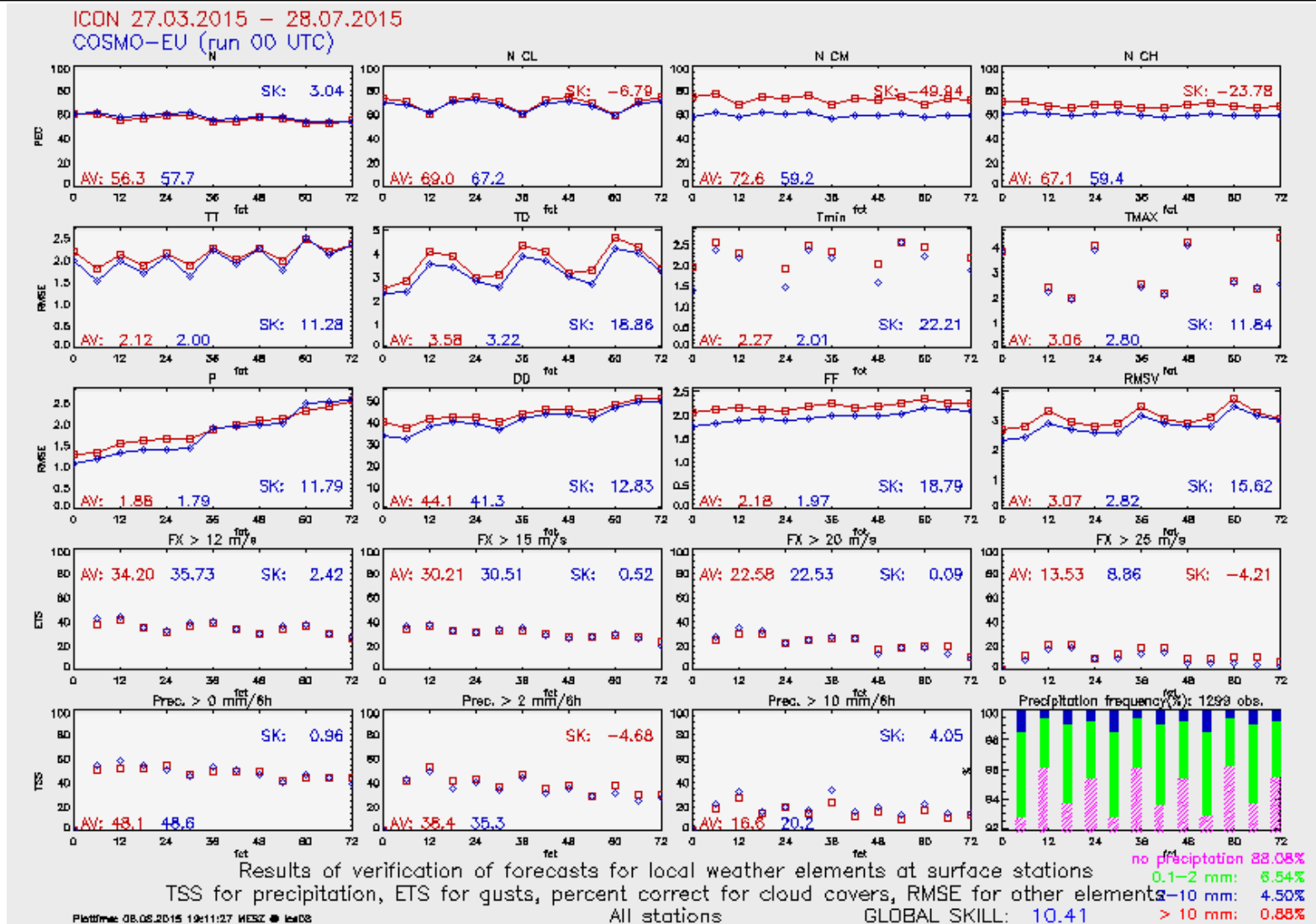


Quality of DWD-parallel suite compared to operational run, precipitation - ETS

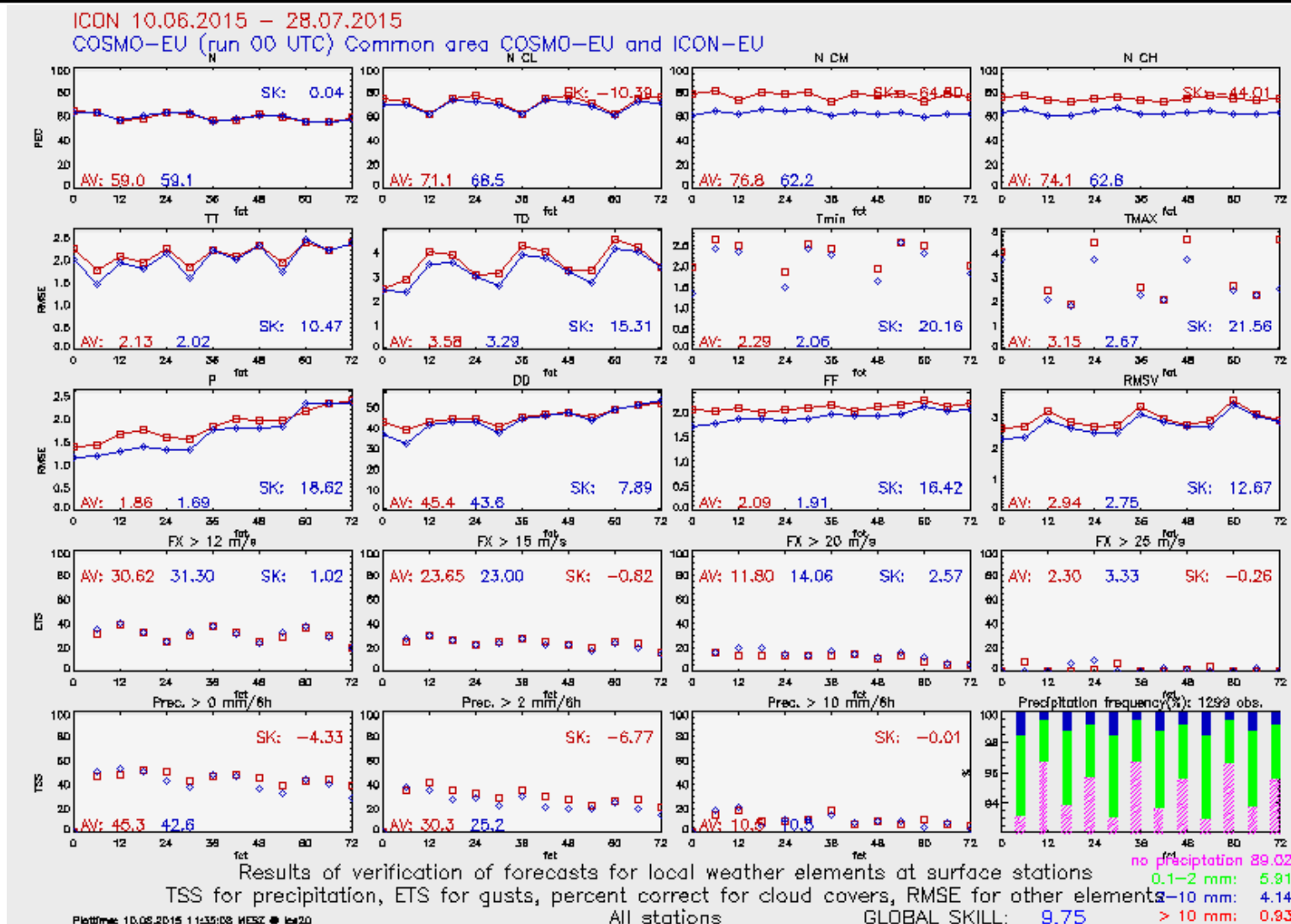
ICON boundary conditions from ICON



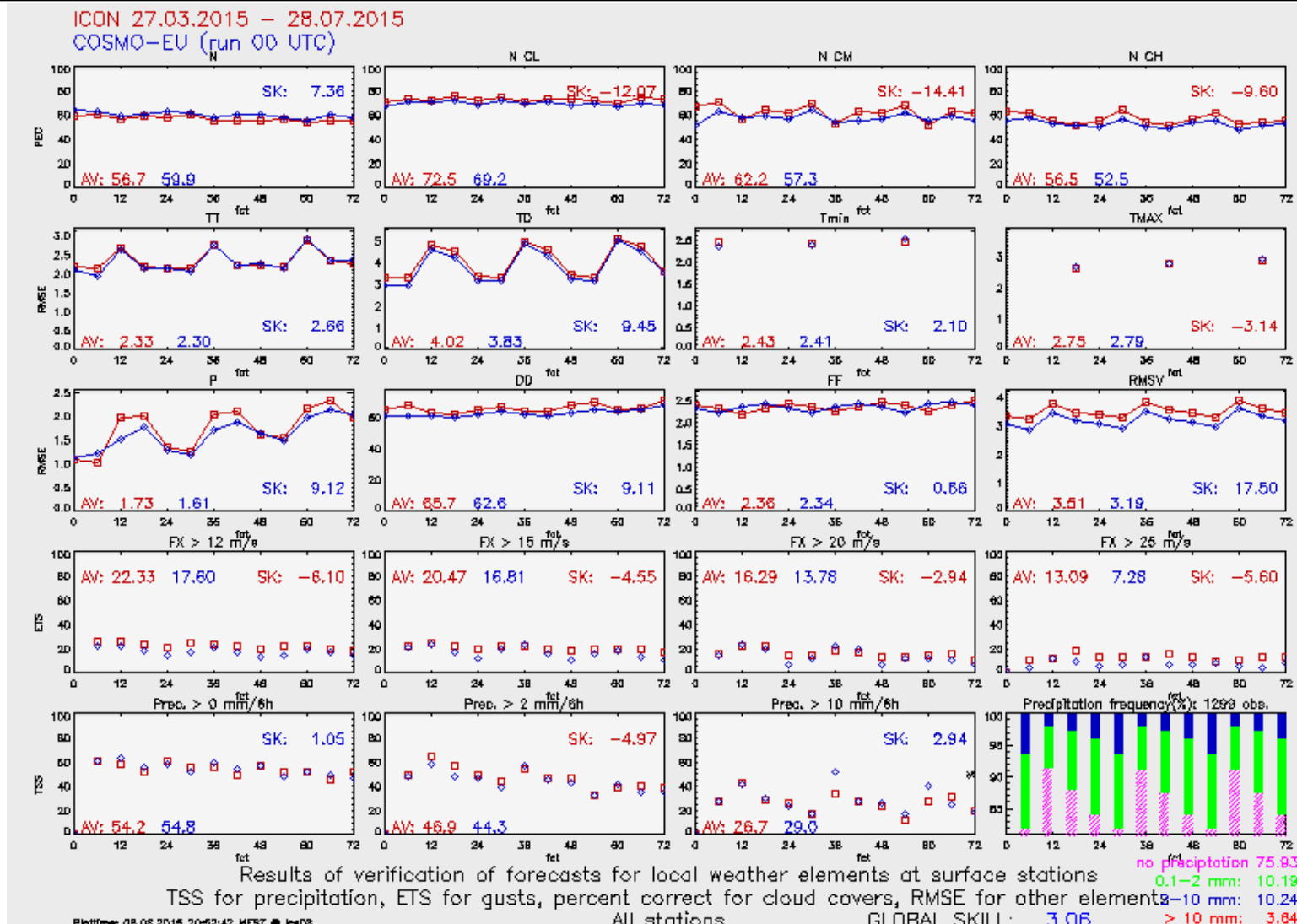
Quality of COSMO-EU compared to ICON (global model), common region of COSMO-EU and ICON-EU, Period since start of ICON-EU



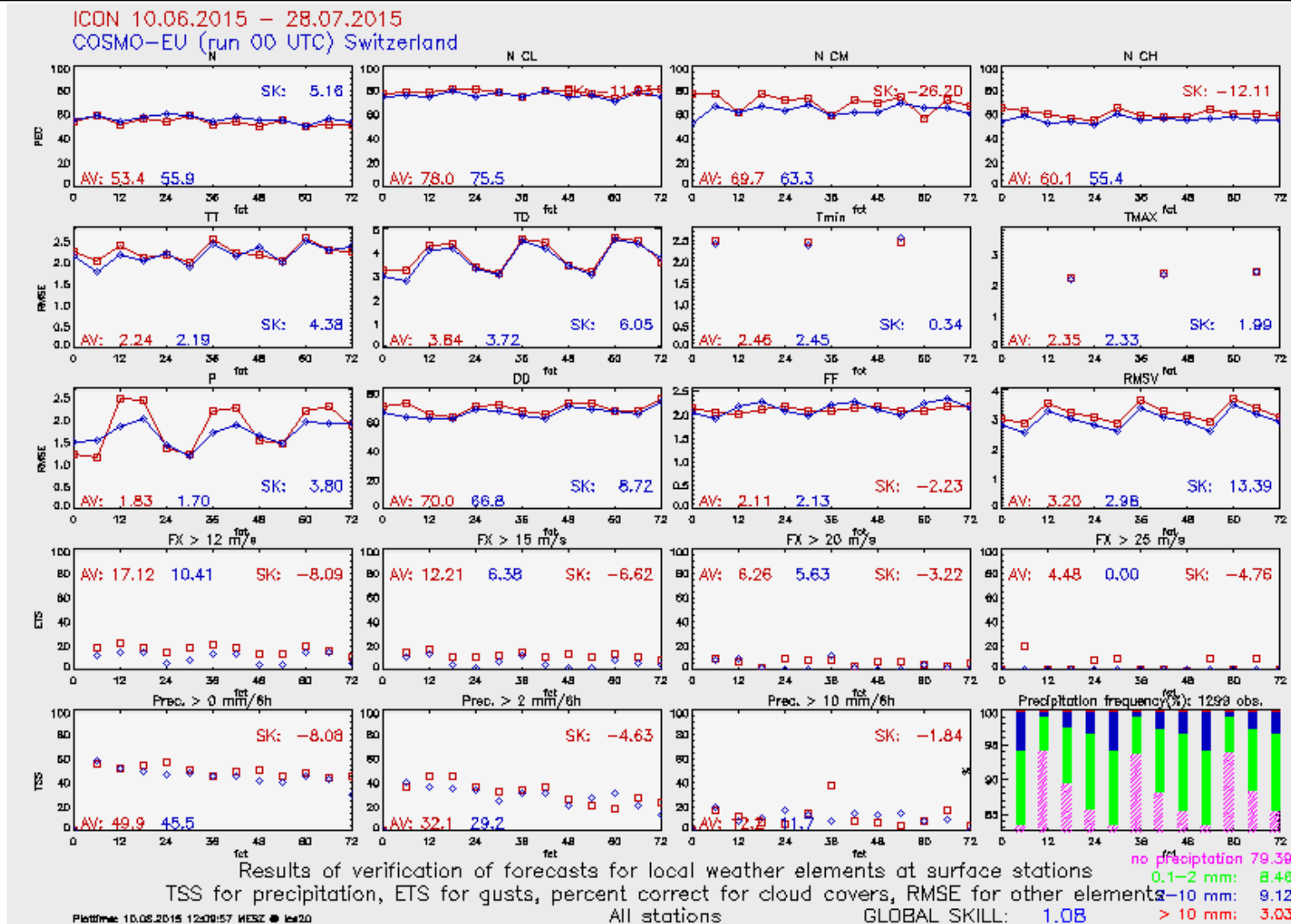
Quality of COSMO-EU compared to ICON (global model), common region of COSMO-EU and ICON-EU, Period since major revision of ICON



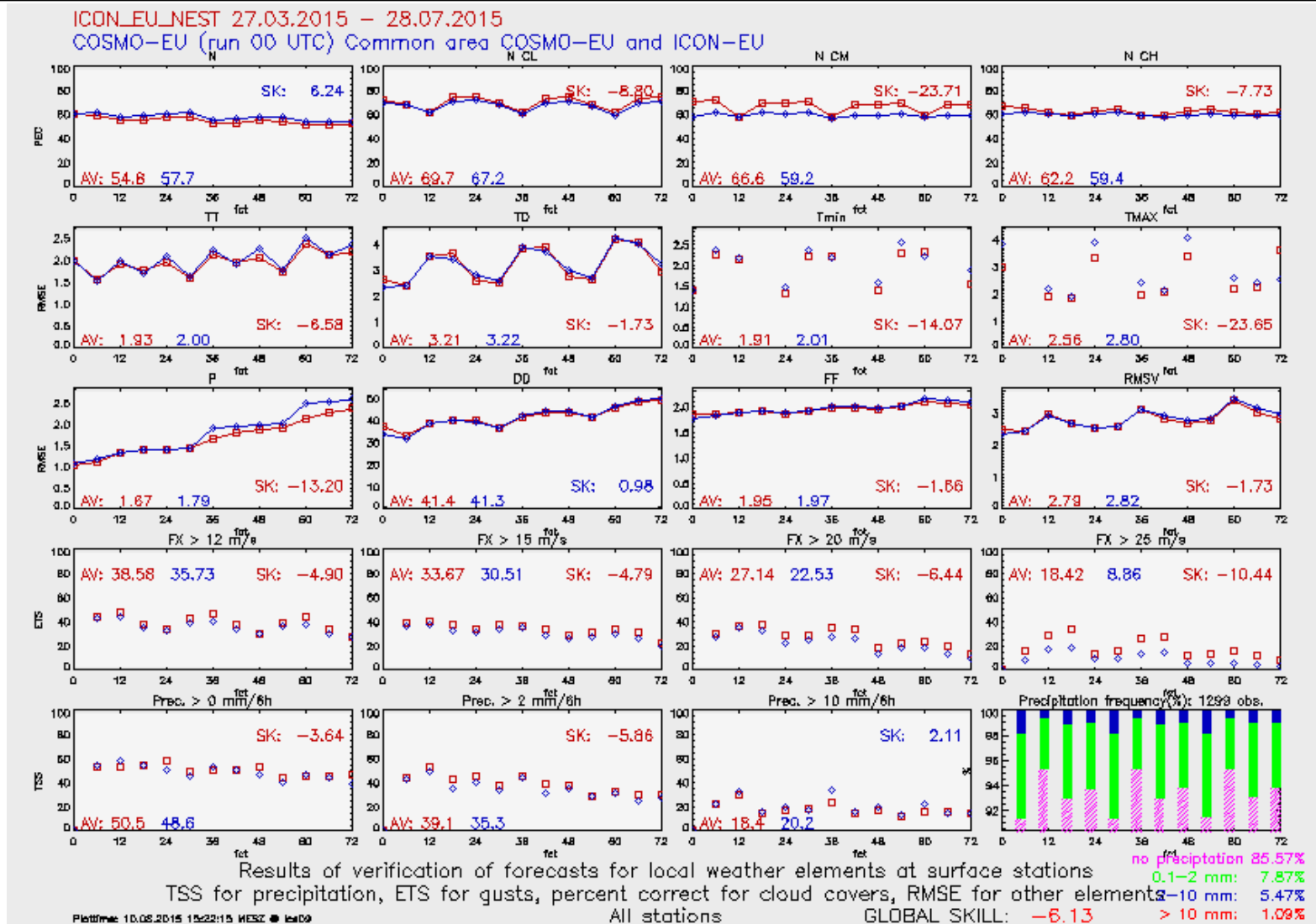
Quality of COSMO-EU compared to ICON (global model), region of Switzerland Period since start of ICON-EU



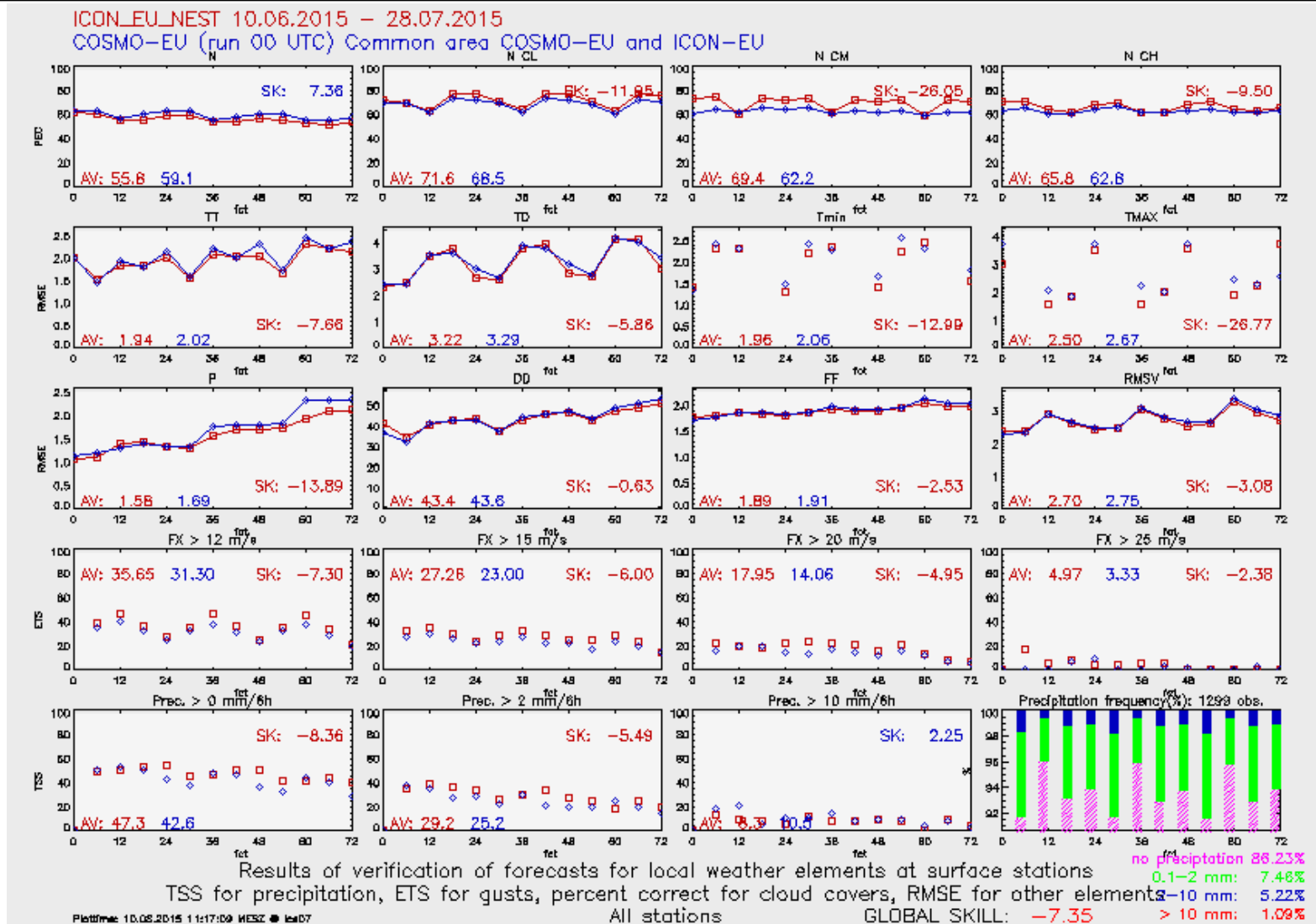
Quality of COSMO-EU compared to ICON (global model), region of Switzerland Period since major revision of ICON



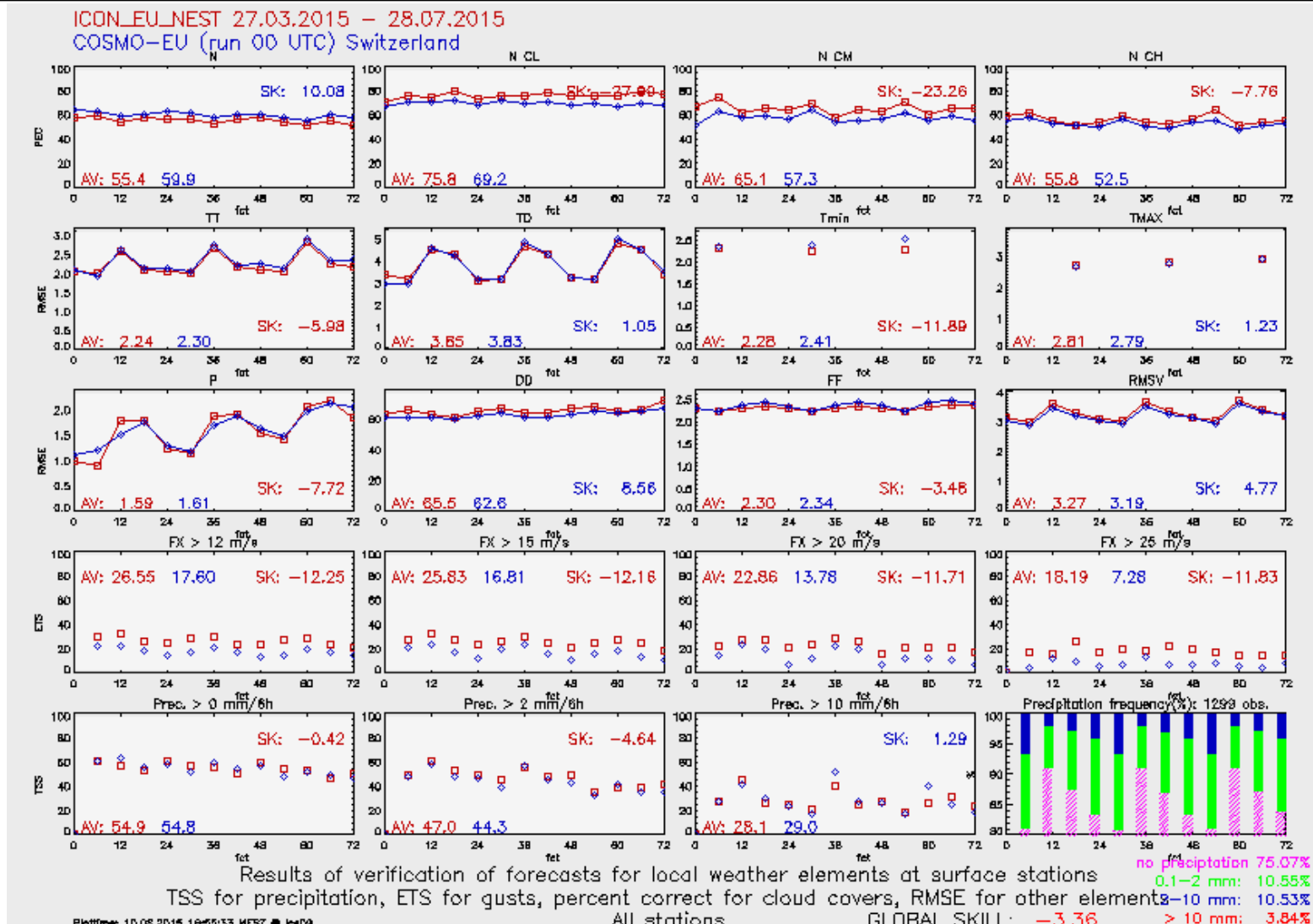
Quality of COSMO-EU compared to ICON-EU, common region of COSMO-EU and ICON-EU, Period since start of ICON-EU



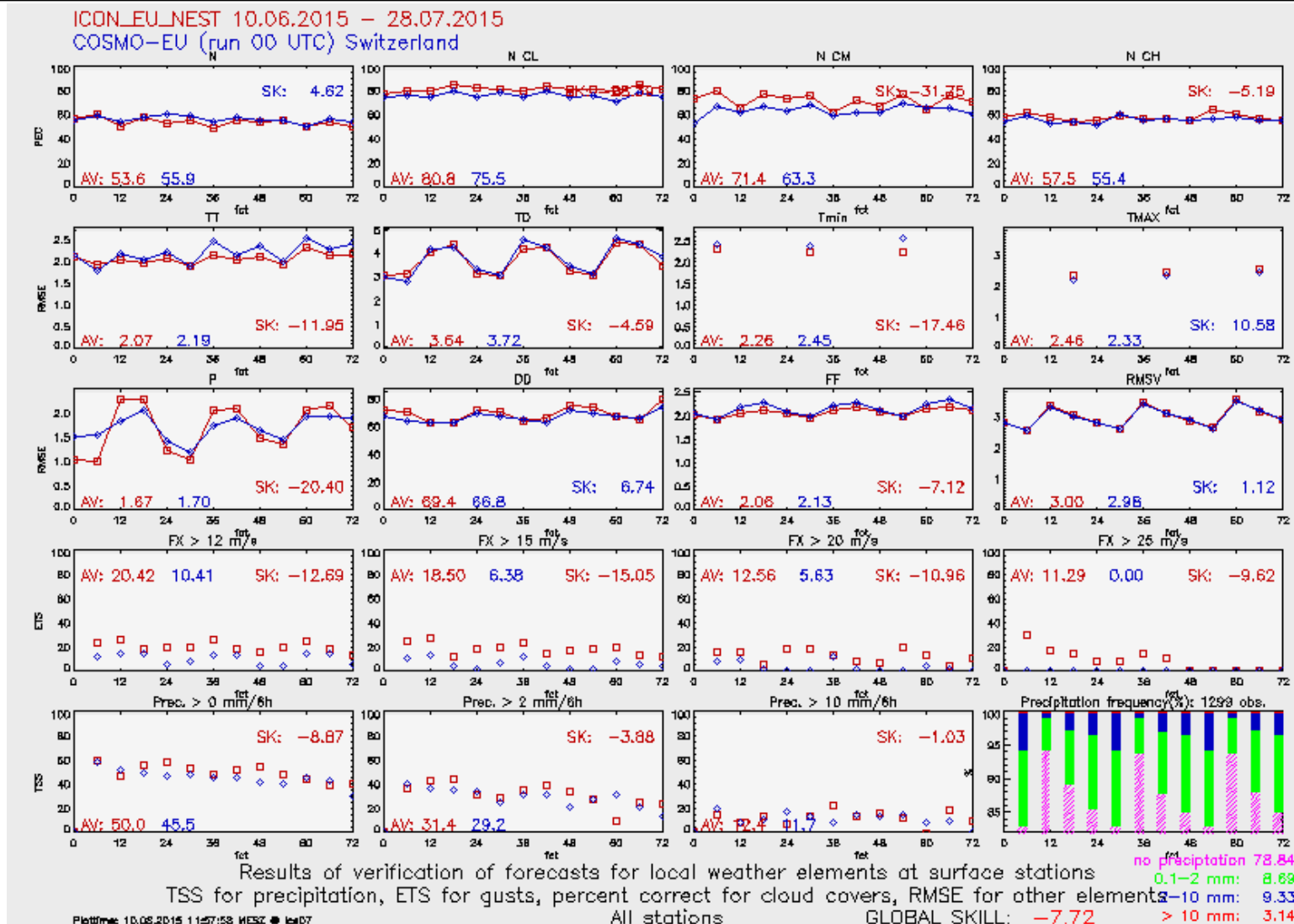
Quality of COSMO-EU compared to ICON-EU, common region of COSMO-EU and ICON-EU, Period since major revision of ICON



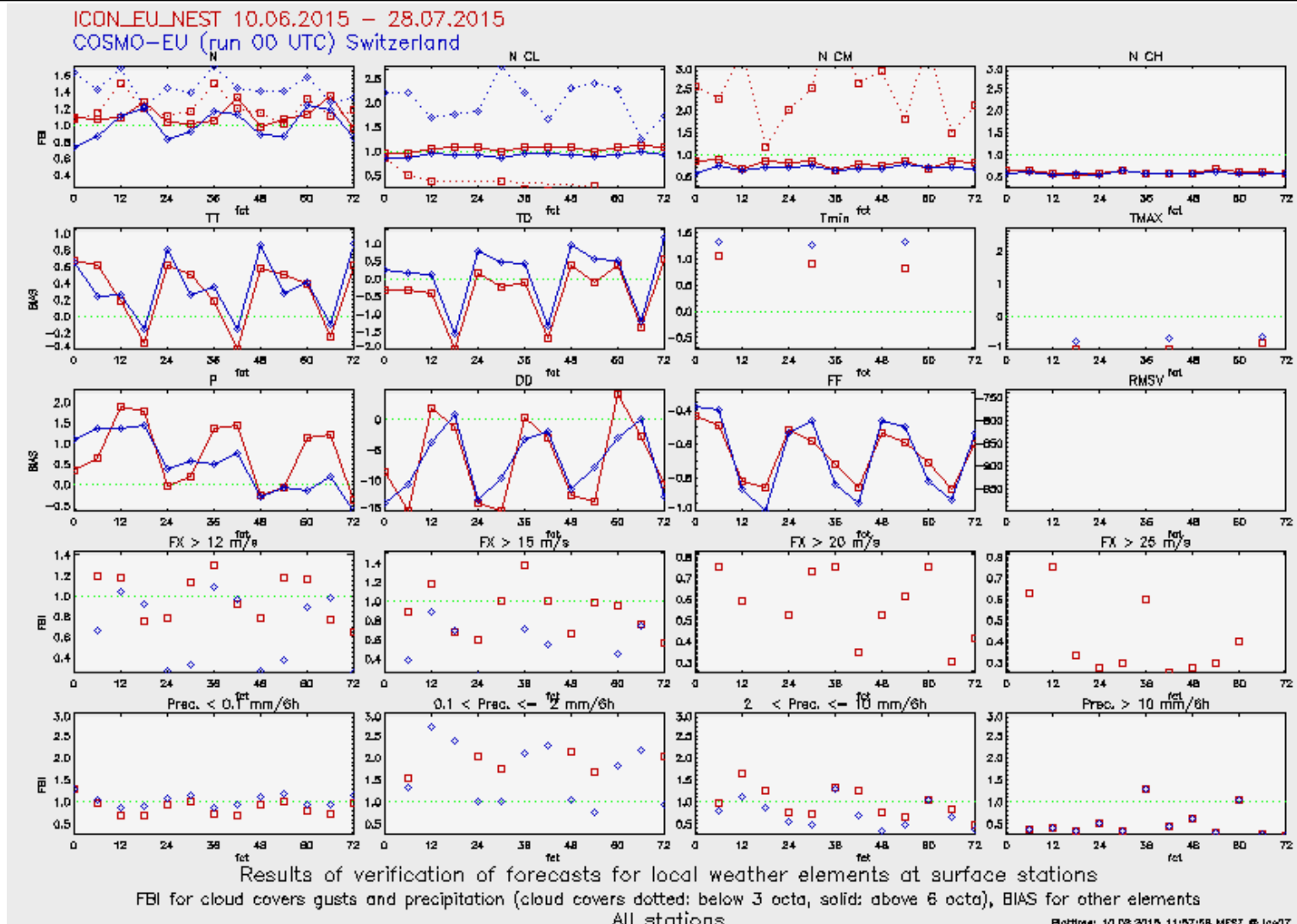
Quality of COSMO-EU compared to ICON-EU, region of Switzerland, Period since start of ICON-EU



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



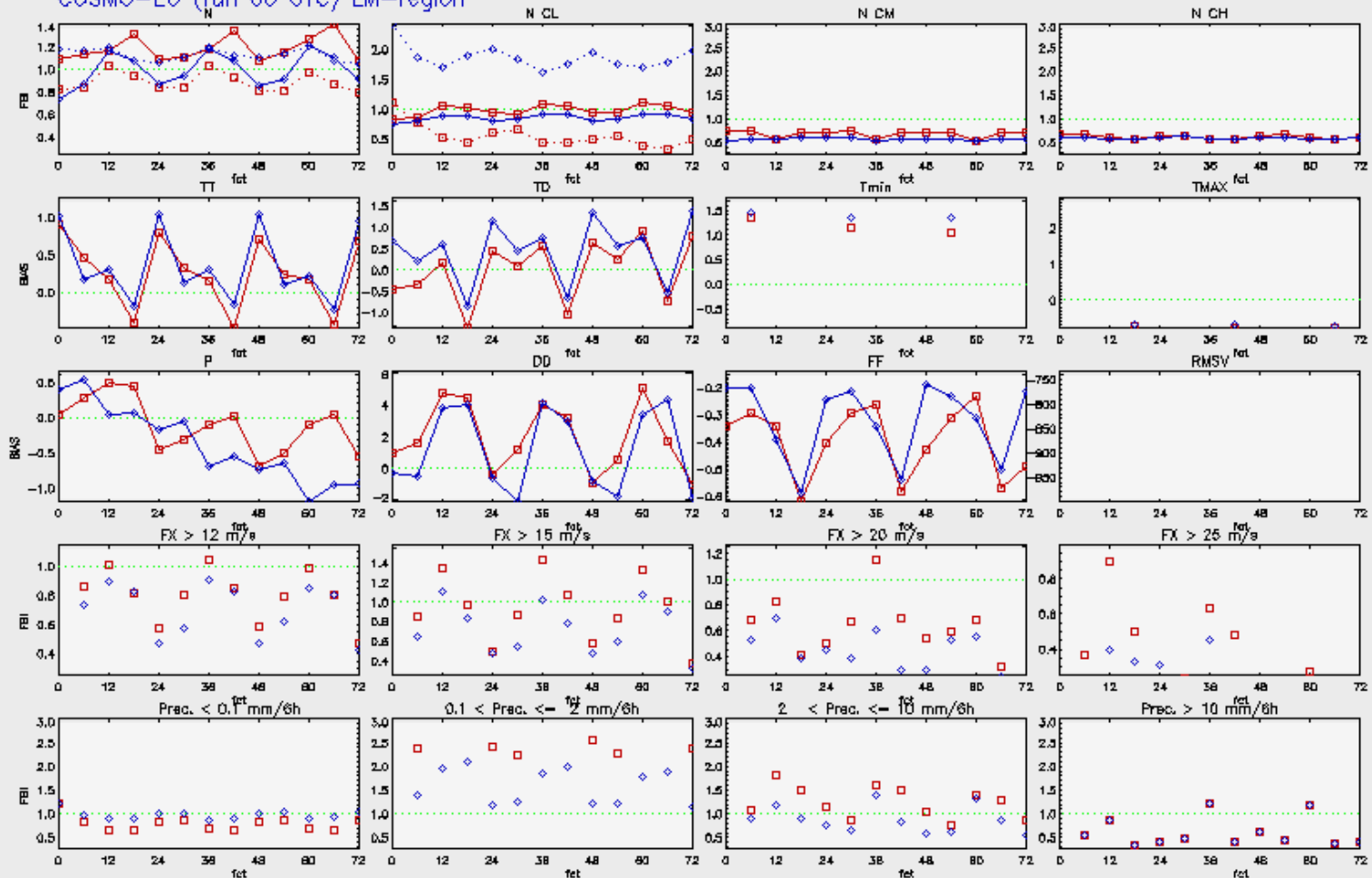
BIAS of COSMO-EU forecasts compared to ICON-EU, region of Switzerland, Period since major revision of ICON



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



ICON_EU_NEST 10.06.2015 – 28.07.2015
COSMO-EU (run 00 UTC) LM-region



Results of verification of forecasts for local weather elements at surface stations

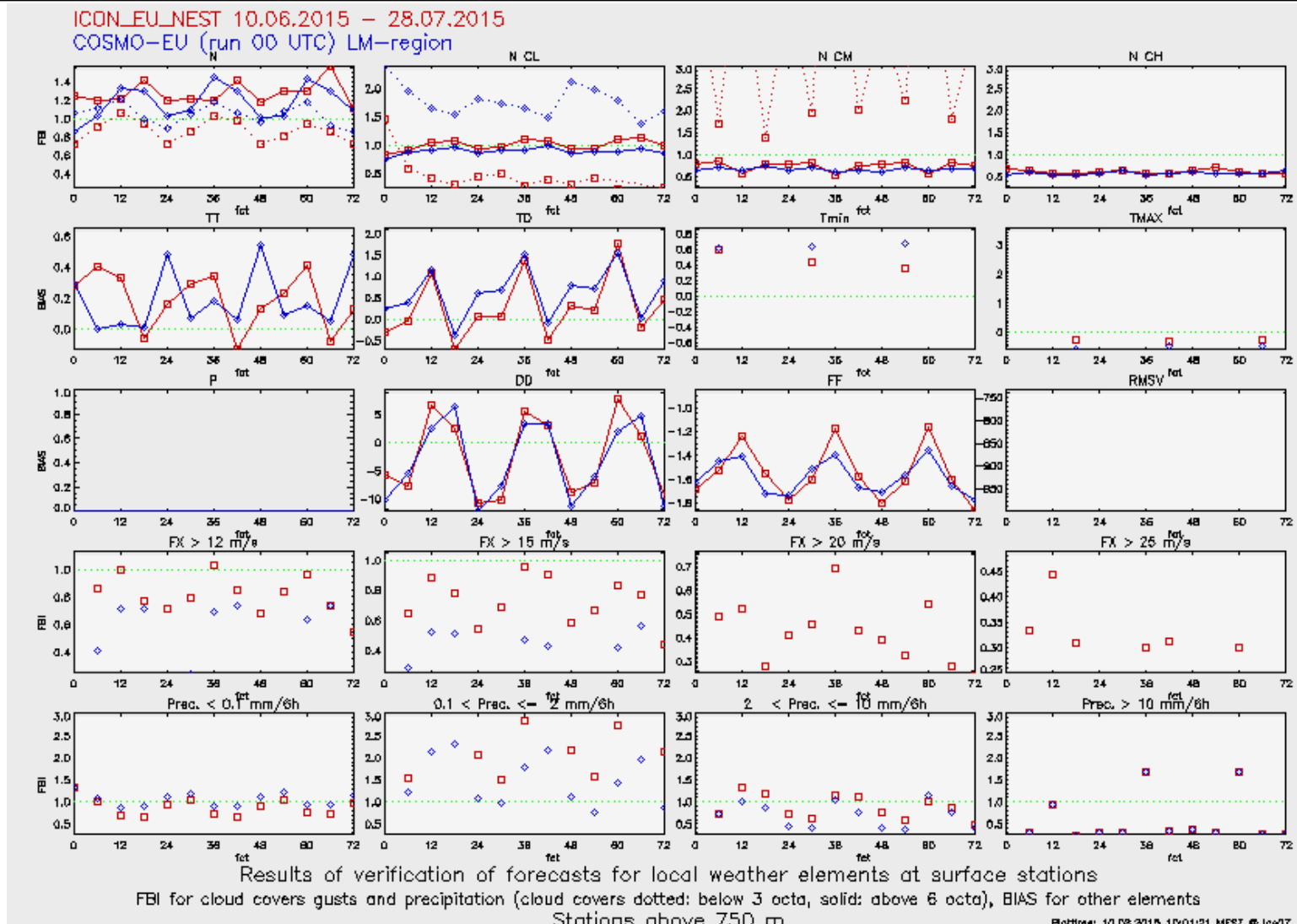
FBI for cloud covers gusts and precipitation (cloud covers dotted: below 3 octa, solid: above 6 octa), BIAS for other elements

All stations

Plottime: 10.08.2015 10:01:20 MESZ © Ico07



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



- **The influence of boundary conditions from ICON to the forecast quality of COSMO-EU**
 - *It is clearly shown that the change of boundary conditions 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

Database

- NetCDF Feedback Files from Data Assimilation
- Observations (SYNOP/TEMP/SATOB/SCATT/...) and modequivalent 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!

