ICON-D2 Model Error Changes 2024/25

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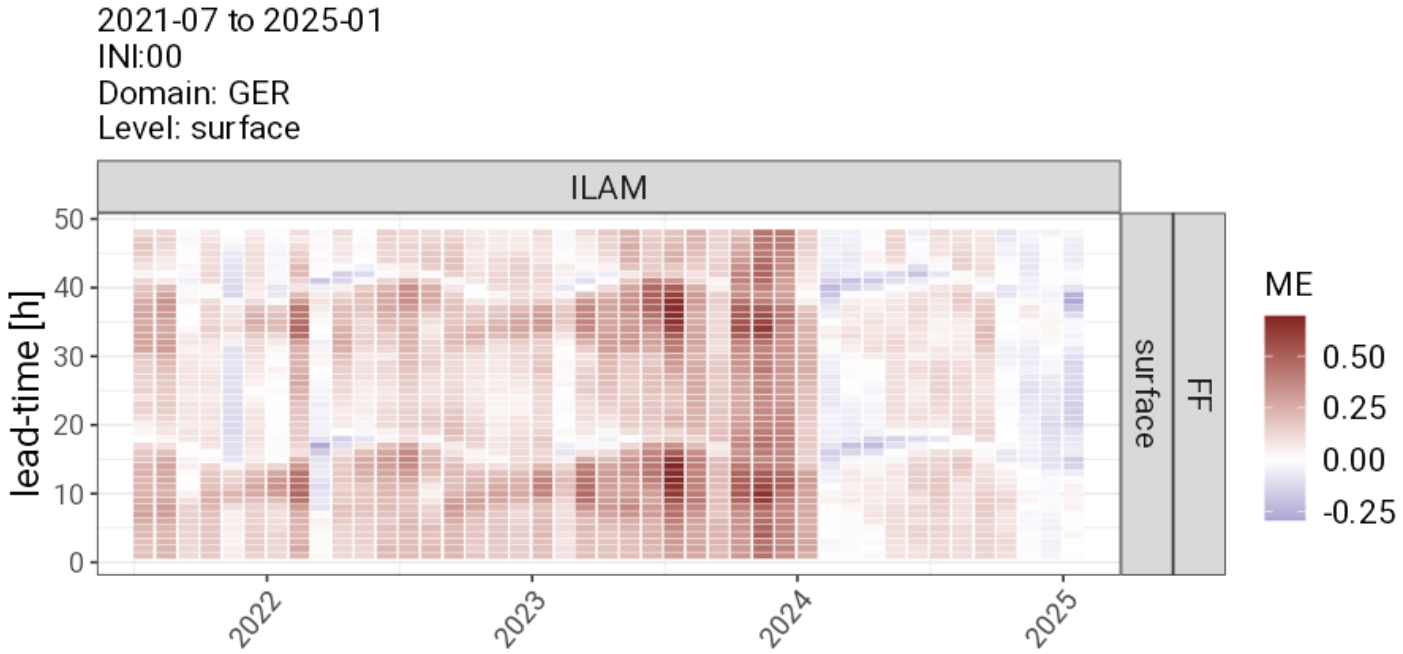
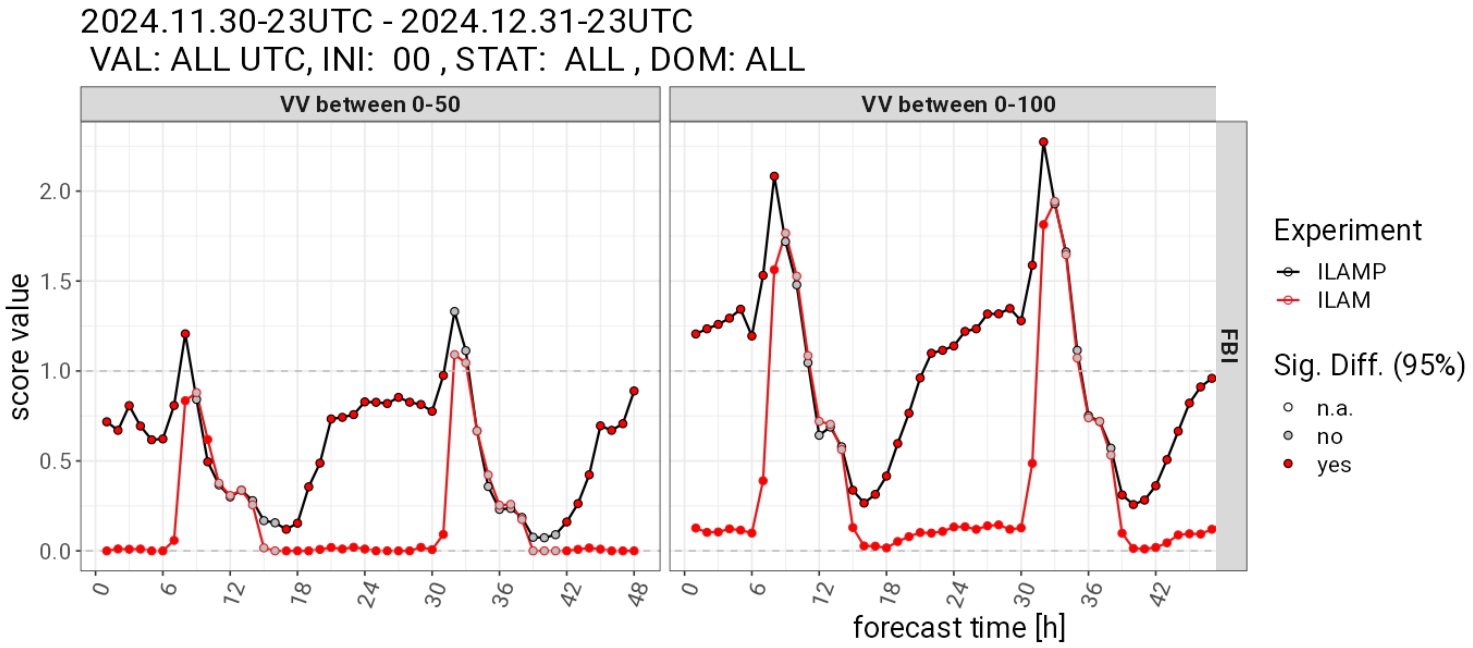
DATE	TITLE
27.11.2024	Operationelles NWV-System: ICON-D2 (-EPS) Extension of adaptive parameter tuning, plus minor tuning changes in parameterizations and numerics. (Gültigkeit ab 04.12.2024)
03.07.2024	Operationelles NWV-System: ICON-D2 (-EPS) Revision of gust parameterization & modifications in radar data assimilation (Gültigkeit ab 09.07.2024)
22.05.2024	Operationelles NWV-System: ICON-D2 (-EPS) Changes in the KENDA data assimilation system (Gültigkeit ab 22.05.2024)
18.04.2024	Operationelles NWV-System: ICON/ICON-D2 Near-surface visibility diagnostic (Gültigkeit ab 23.04.2024)
24.01.2024	Operationelles NWV-System: Extension of 10-m wind assimilation, adaptive surface friction, plus minor changes (Gültigkeit ab 24.01.2024)

- Assimilation of 10m wind observations from stations below 100 m.a.s.l.
- Adaptive surface friction building upon the 10m wind assimilation
- Retuned SSO scheme



- New parameter introduced in April 24
- Upcoming changes (itune_vis_diag=2) reduce nightly biases



- Assimilation of 9 additional radar sites from France
- Removal of „bias correction“ for high humidity (>96% → 100%) observations
- Correction of the vertical influence of SYNOP obs in LETKF

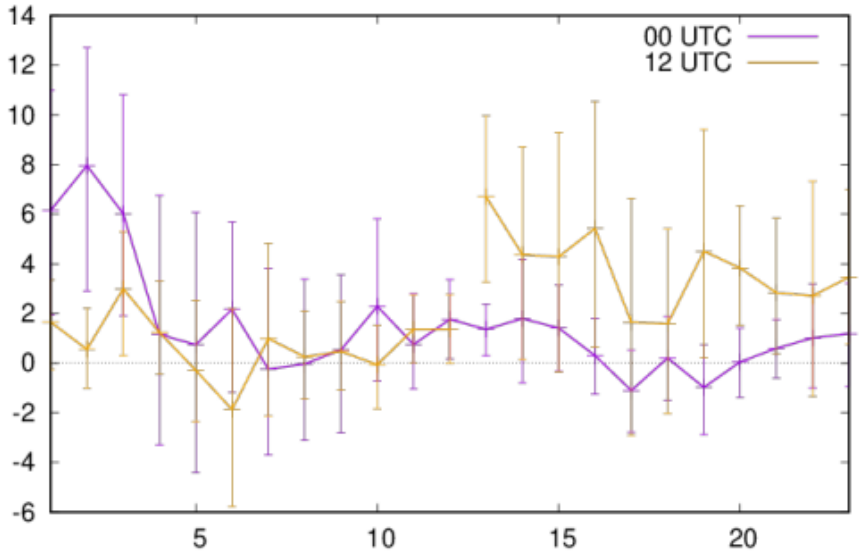


Fig. 1: Relative improvement in FSS (calculated within a spatial neighborhood of 11 grid points, i.e. about 25 km) for a threshold of 1 mm/h precipitation rate within the south western part of ICON-D2 domain and for two model start times 00 UTC (purple line) and 12 UTC (brown line) as a function of time of day (for lead times up to 23 forecast hours). Vertical lines indicate 90% confidence intervals computed by a bootstrapping method. The Verification is done for a period of 27 days in June 2023.

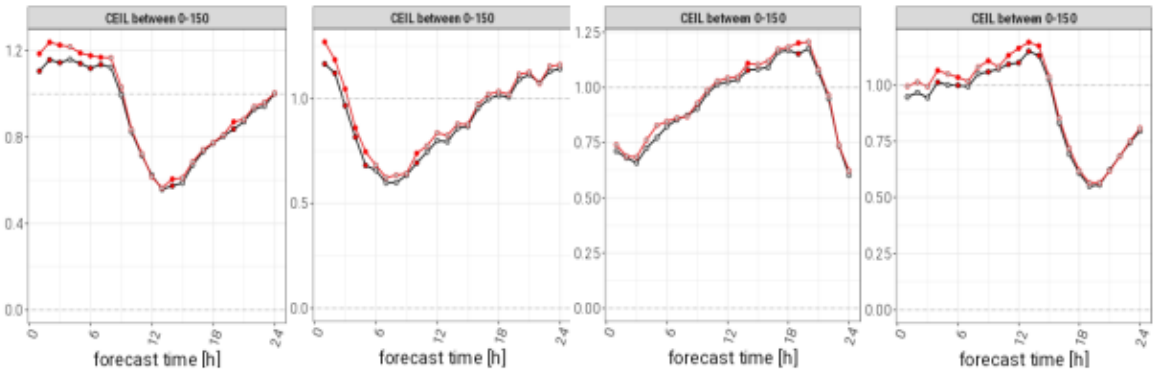
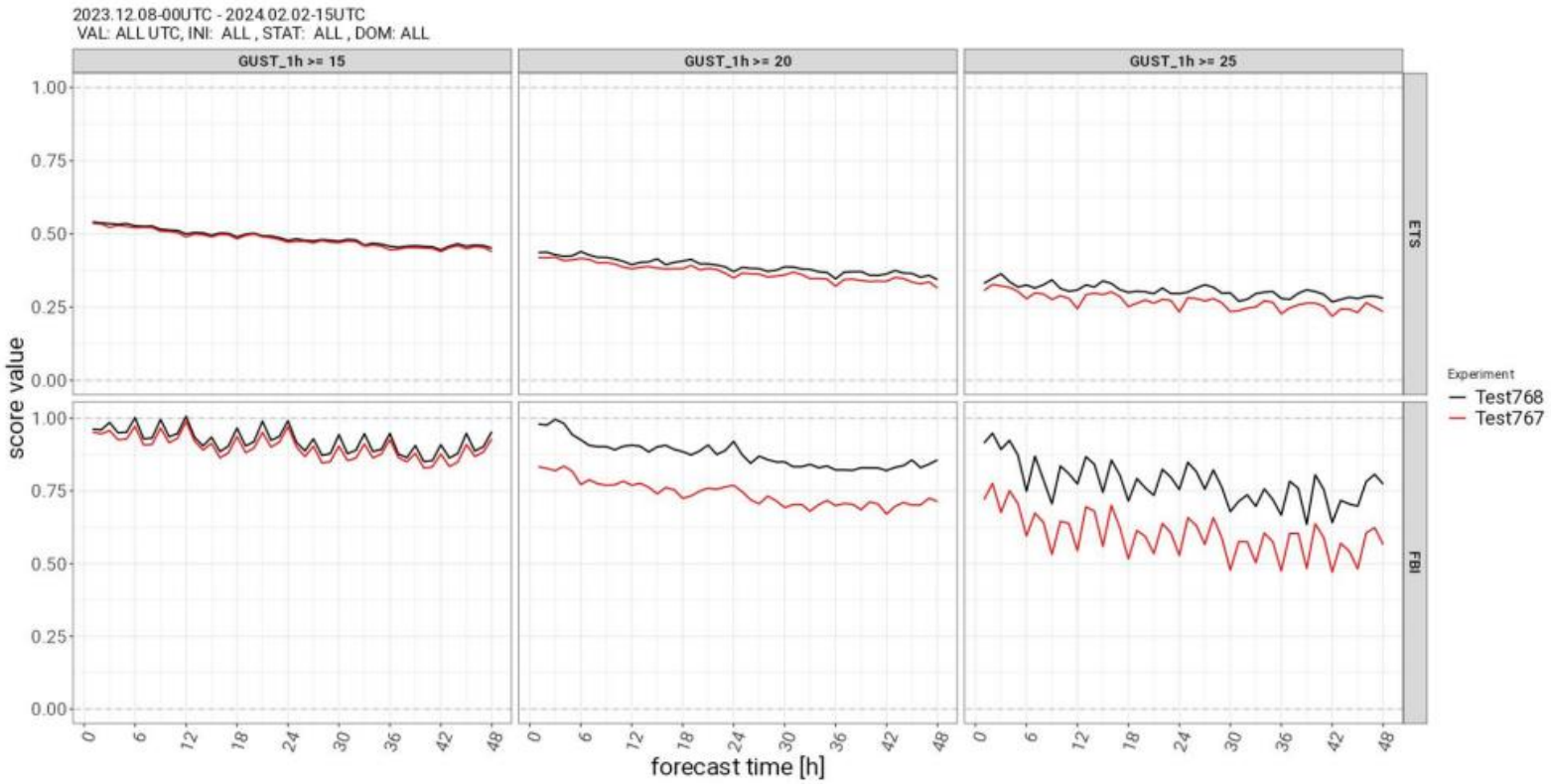


Fig.2: Frequency bias (FBI) of occurrences of cloud ceiling below 150 m above ground at the surface stations in Germany, for the winter period 20 Jan. – 09 Feb. 2023. Red line: old operational version; black line: new version without bias correction; red color filling of circles indicates statistically significant differences at the 95% confidence level. Panels from left to right are for 00-, 06-, 12-, 18-UTC forecast runs, respectively.



- 10min avg instead of instantanuous 10m wind as input for gust parameterization
- Improved ETS and FBI of gust forecasts

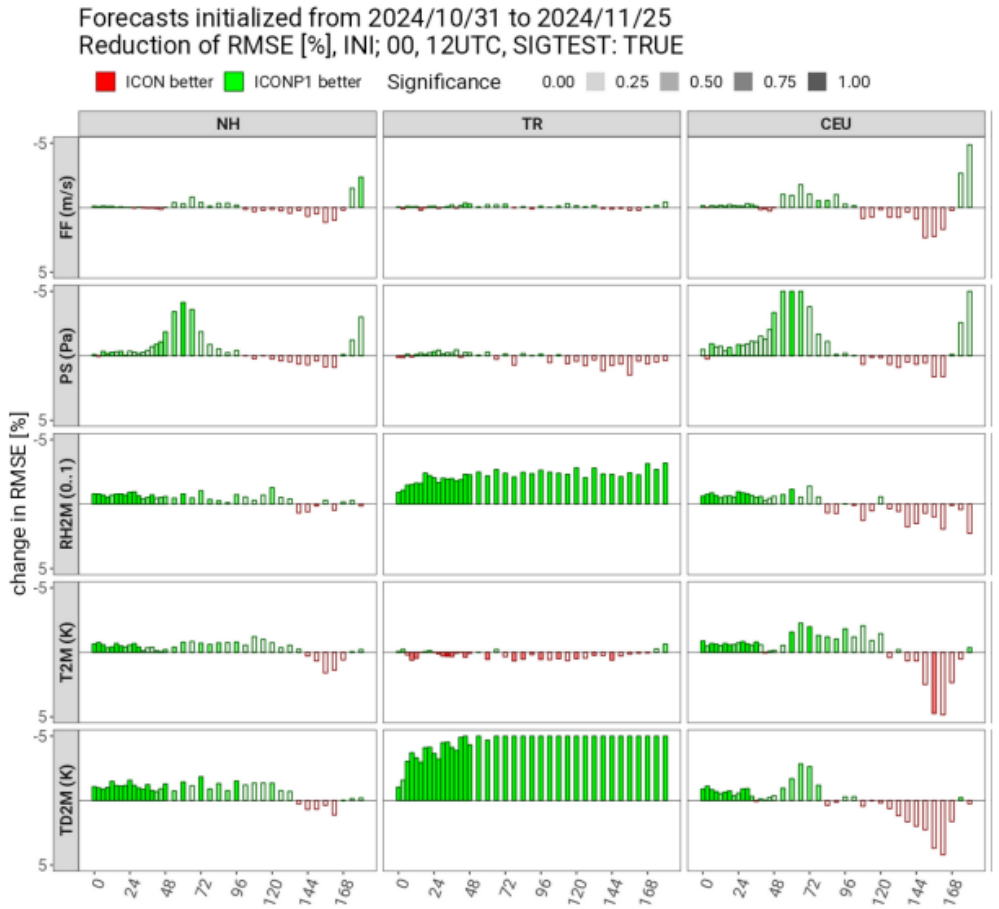
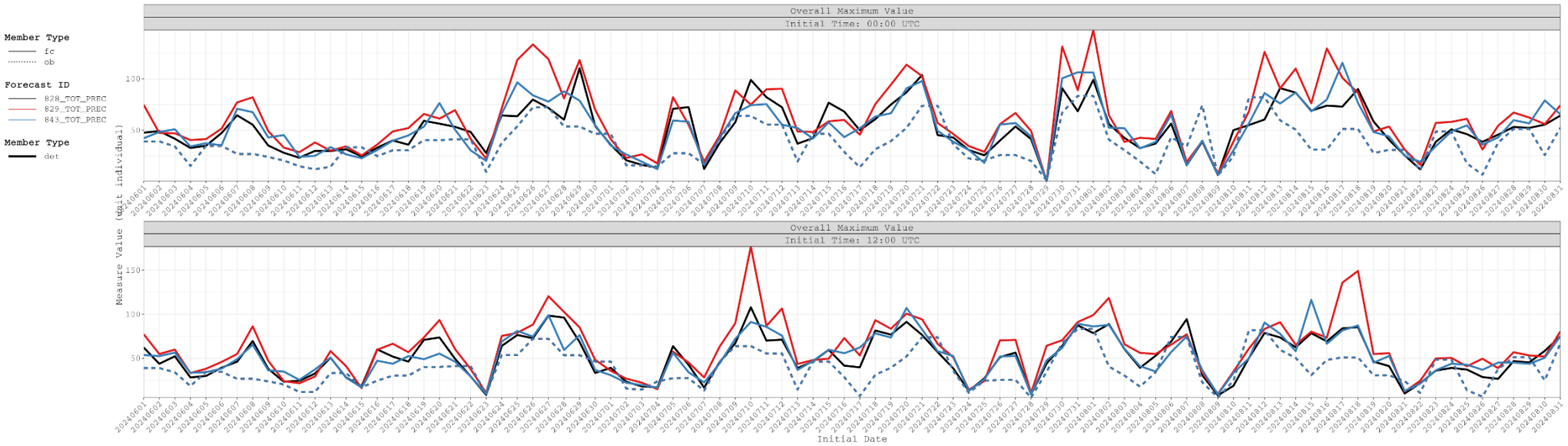


Fig.1: Reduction of RMS error of 10-m wind speed (FF), surface pressure (PS), 2-m relative humidity (RH2M), 2-m temperature (T2M) and 2-m dew point (TD2M) due to the changes described above. Regions are northern hemisphere (NH), tropics (TR) and Europe (CEU).

- Introduced in ICON-Global and ICON-D2
- Main effects in global model
- Nearly neutral for ICON-D2, only slightly lower T2M bias

ICON-D2 Modified 1-moment graupe scheme and saturation adjustment

- ICON-D2 over-estimates intensity of high precipitation
- Number of adjustmens (tune_supsat_limfac, lvariable_rain_n0, tune_zcsg, ithermo_water, tune_sgsclifac) and reduced grayzone deep convection are in discussion right now



- Reduction of temperature biases in urban areas