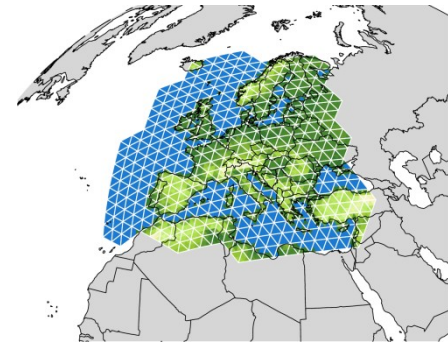


ICON

on its way towards operational convection-permitting NWP



Günther Zängl

COSMO-GM, Rome, 12.09.2019

Outline

- **DWD-internal transition from COSMO-D2 to ICON-D2: status and recent progress**
- **Selected verification results of preparatory test suites**

Data assimilation

- ➔ Online coupling of DACE forward operators to ICON
- ➔ Online coupling of 3D radar forward operator to ICON
- ➔ Tuning adaptation of latent heat nudging
- ➔ Adaptation of SST and snow analysis to ICON-LAM
- ➔ Development of soil moisture relaxation towards ICON-EU

ICON

- ➔ Revision of cloud cover scheme in ICON to improve cloud cover and radiation scores

Workflow infrastructure

- ➔ Implementation of ICON-LAM / KENDA assimilation cycle into BaCy and NUMEX

- ➔ Parallel routine starting in October 2019
- ➔ Convening of migration group
- ➔ Will also serve for providing reforecasts for MOS
- ➔ Replacement of COSMO-D2 by the end of 2020

- ➔ In parallel: development of rapid-update cycle configuration for nowcasting / very short range forecasting

- ➔ Subsequent slides: Verification scores from preliminary parallel suite for August 2019 (starting from interpolated ICON-EU analyses) and selected experiments with full data assimilation cycle

Surface verification scores for August 2019

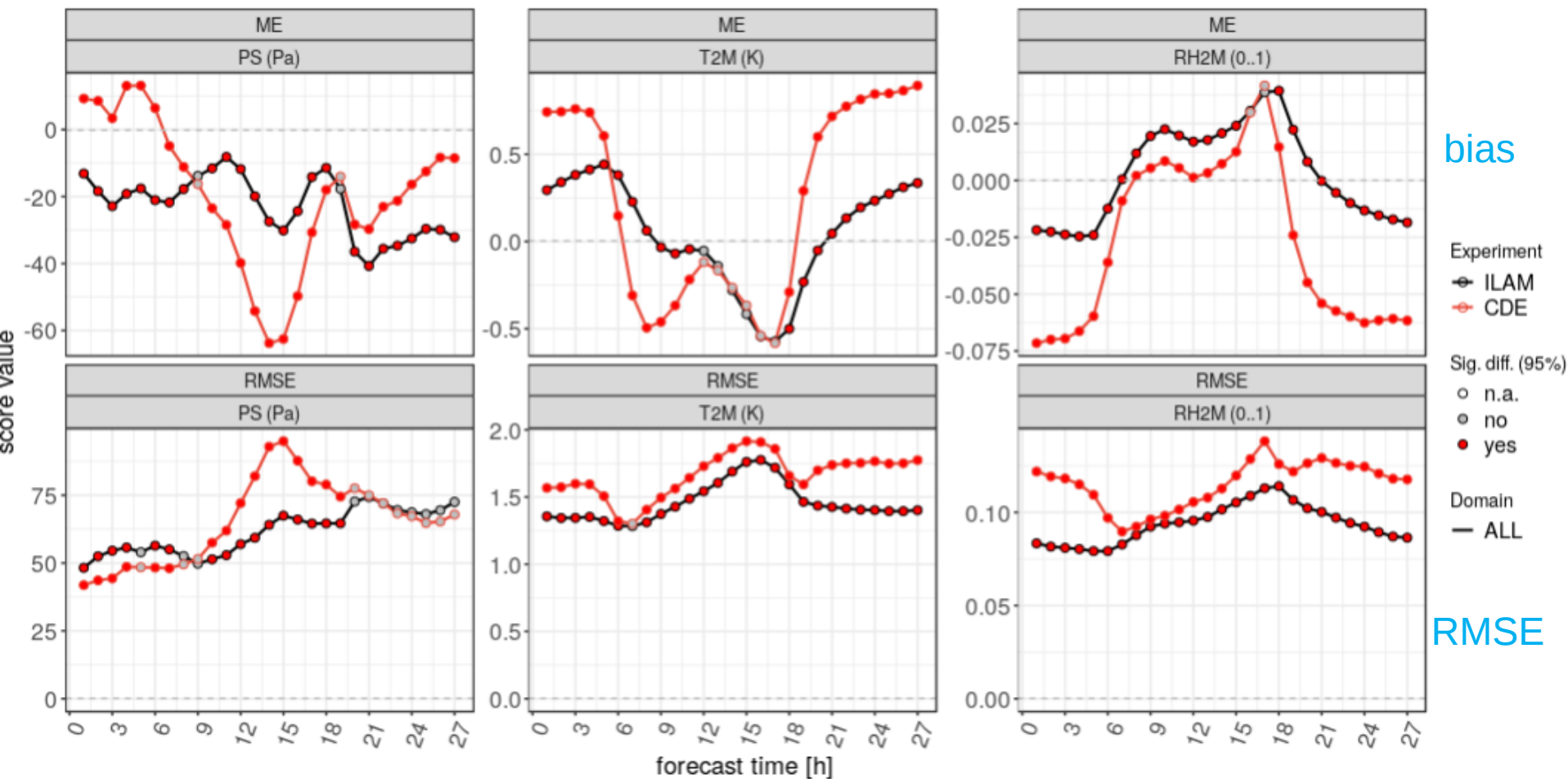
ICON-D2 vs. COSMO-D2

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



2019/07/31-22UTC - 2019/08/31-21UTC

INI: 00 UTC, DOM: ALL, STAT: ALL



surface pressure

2m temperature

2m rel. humidity



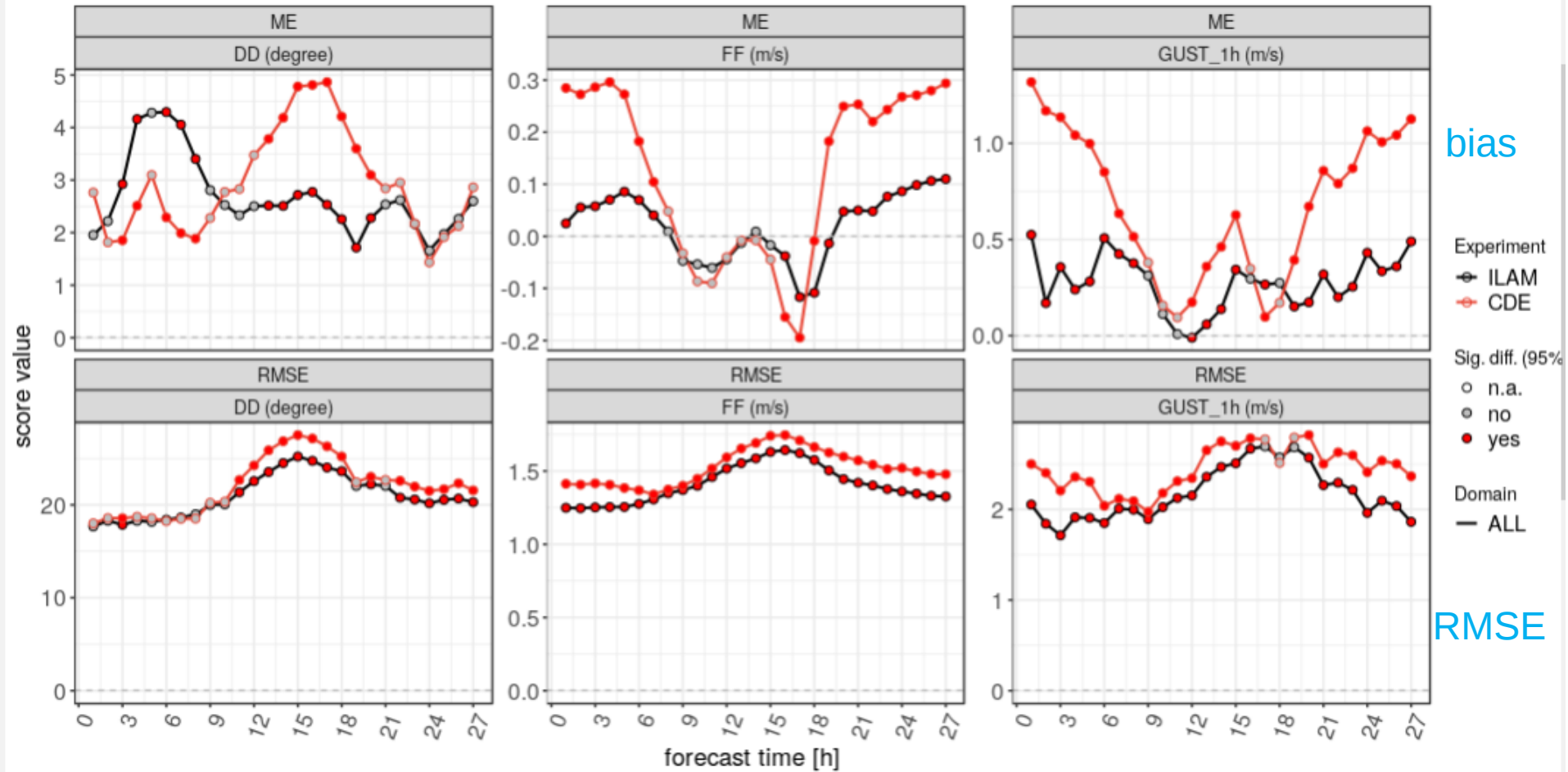
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2019/07/31-22UTC - 2019/08/31-21UTC
INI: 00 UTC, DOM: ALL, STAT: ALL



bias

RMSE

10m wind direction

10m wind speed

10m gust speed



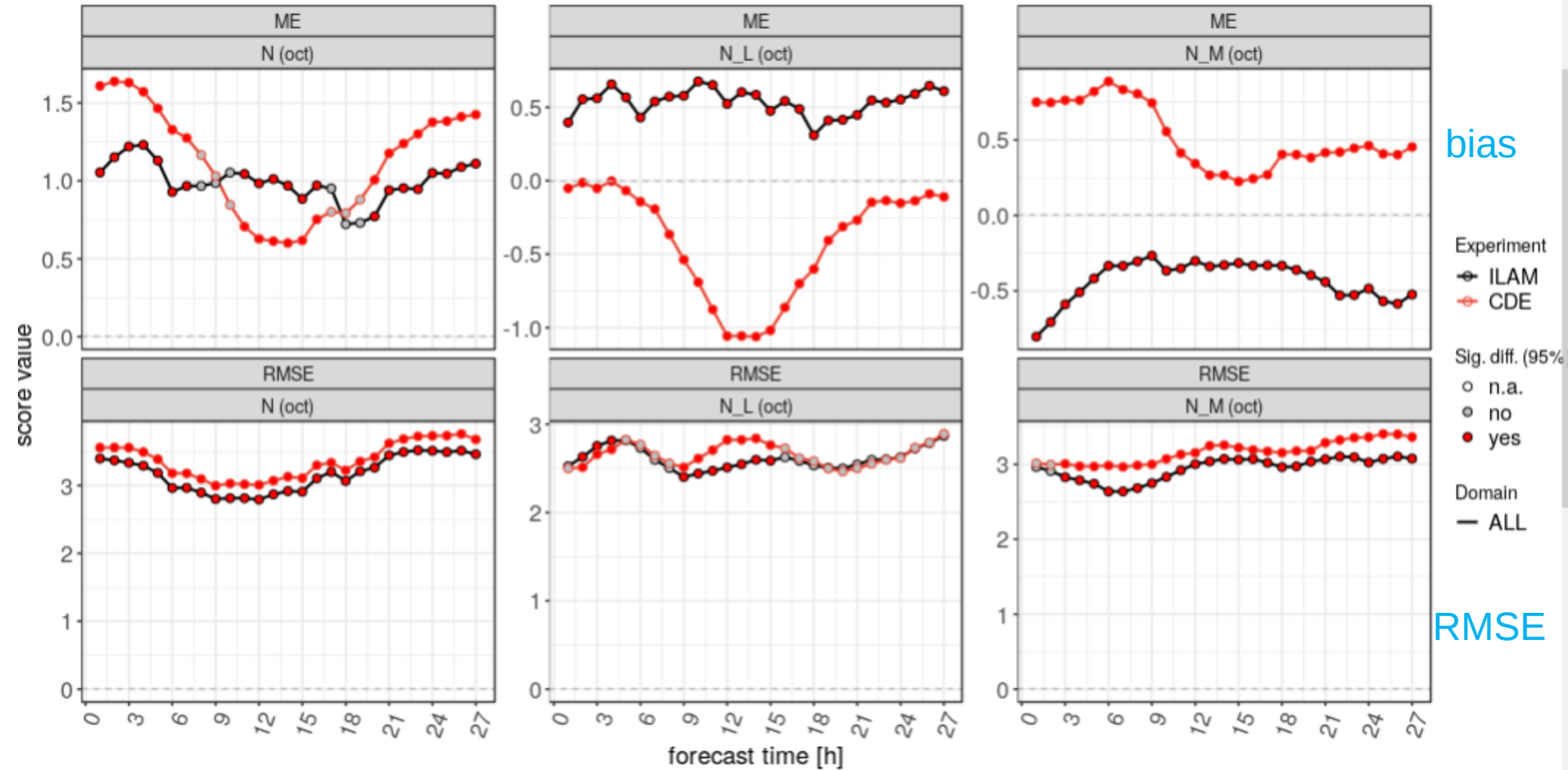
Surface verification scores for August 2019

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2019/07/31-22UTC - 2019/08/31-21UTC
INI: 00 UTC, DOM: ALL, STAT: ALL



Surface verification scores for August 2019

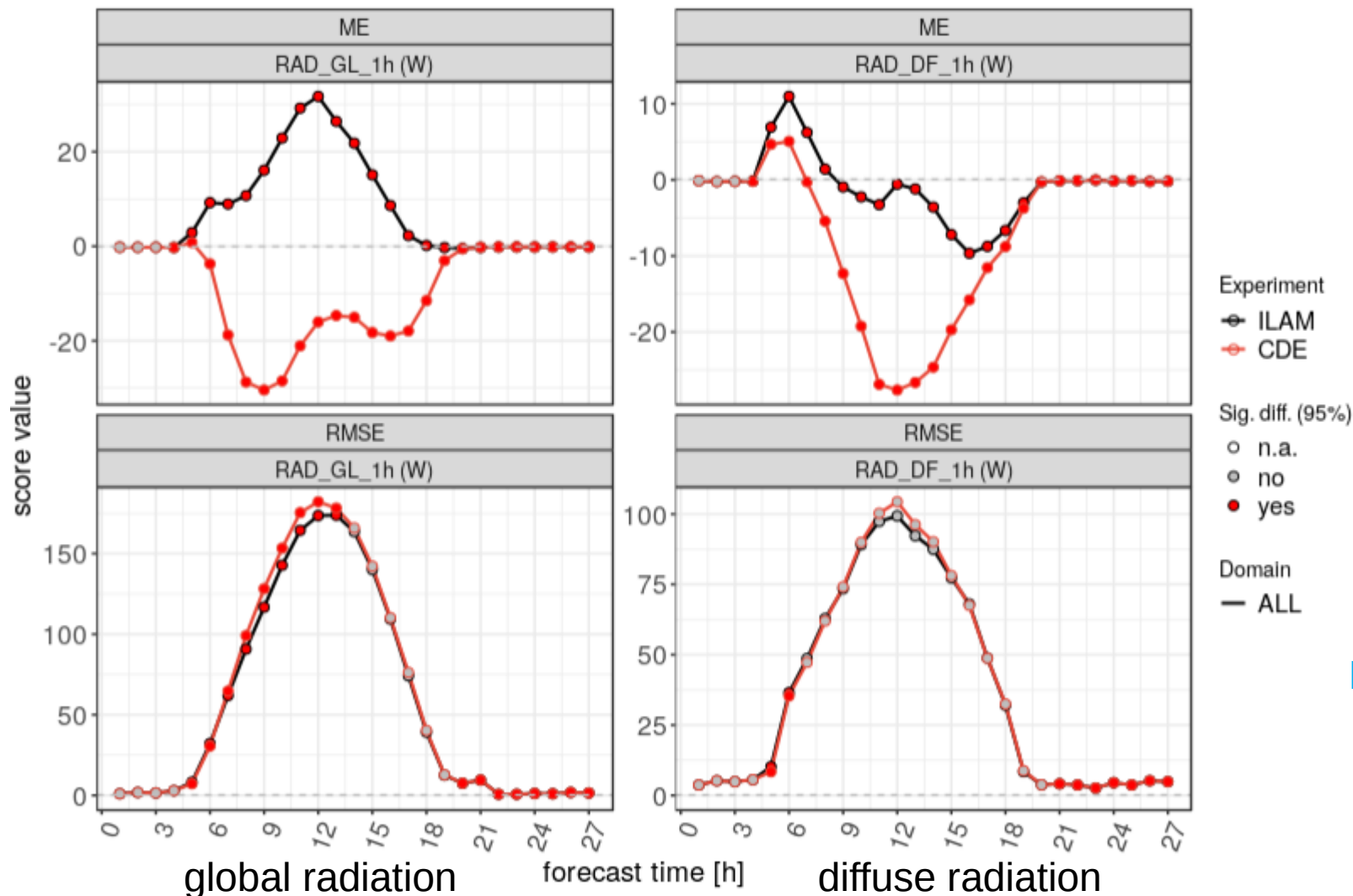
ICON-D2 vs. COSMO-D2

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2019/07/31-22UTC - 2019/08/31-21UTC

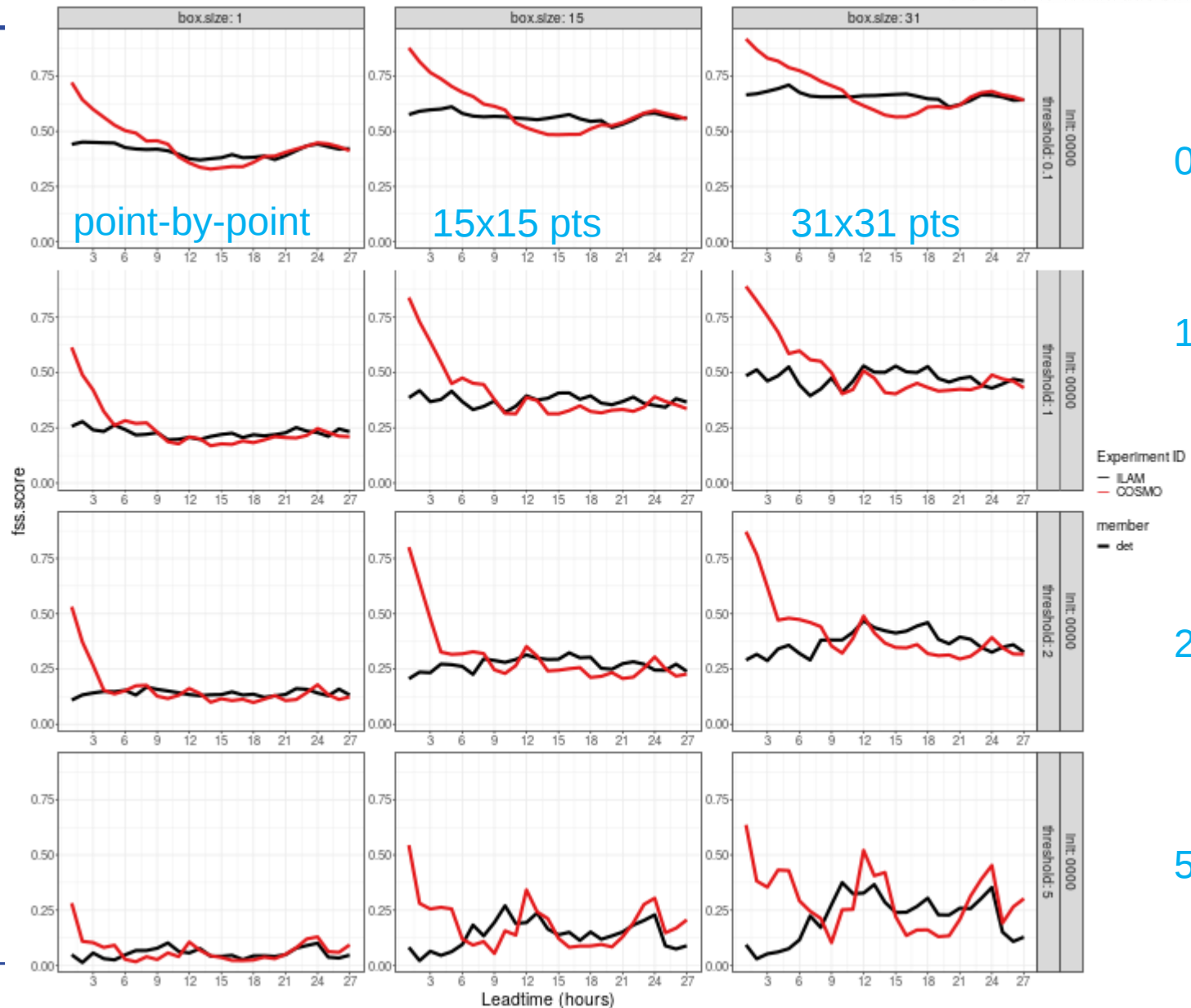
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Radar verification for August 2019, FSS, 00-UTC runs

ICON-D2 vs. COSMO-D2

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



0.1 mm/h

1 mm/h

2 mm/h

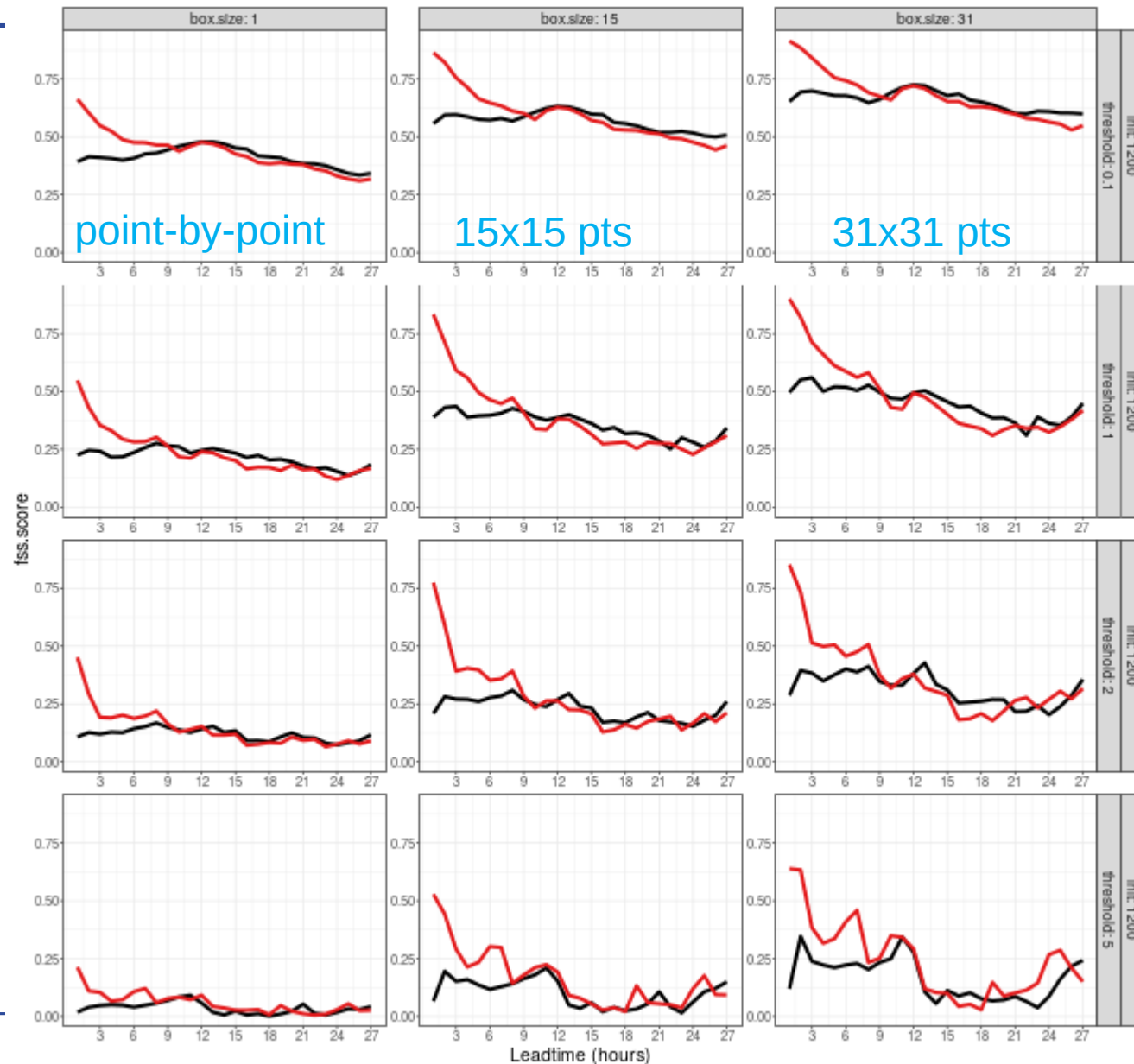
5 mm/h



Radar verification for August 2019, FSS, 12-UTC runs

ICON-D2 vs. COSMO-D2

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



0.1 mm/h

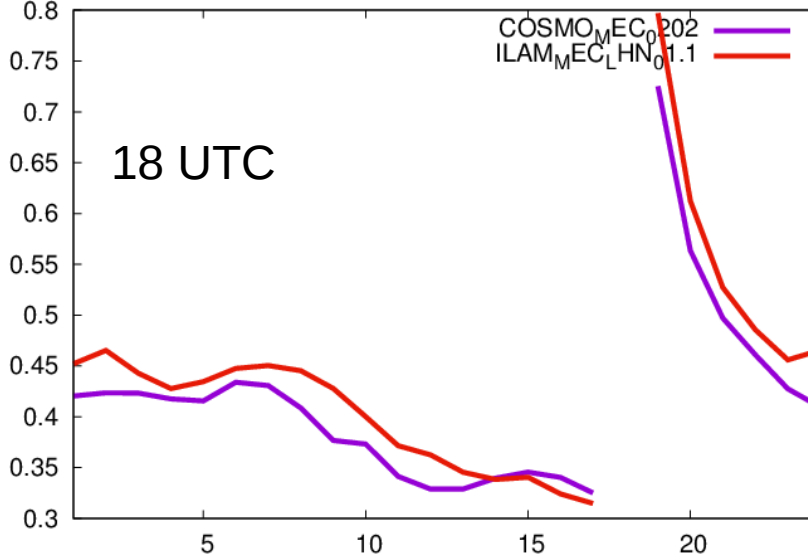
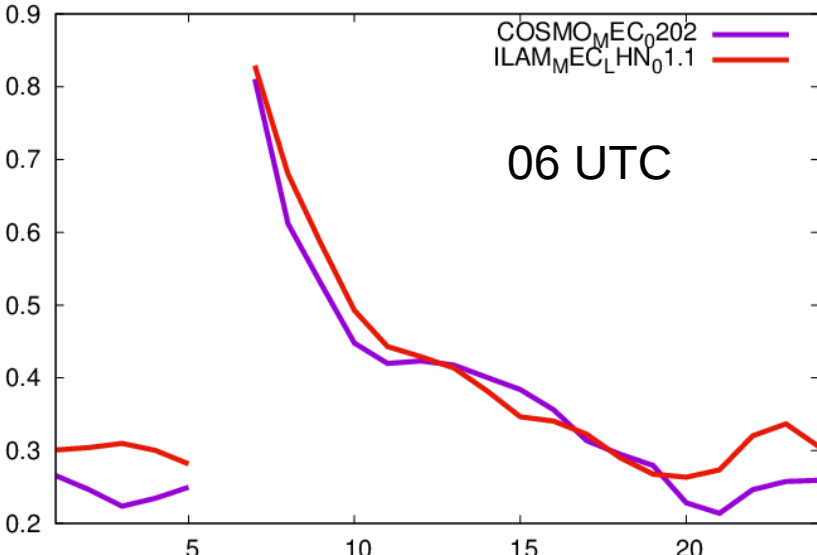
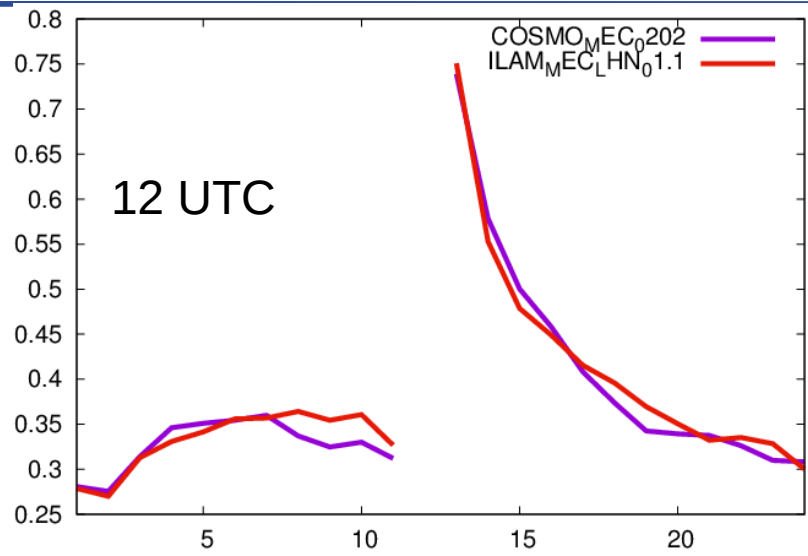
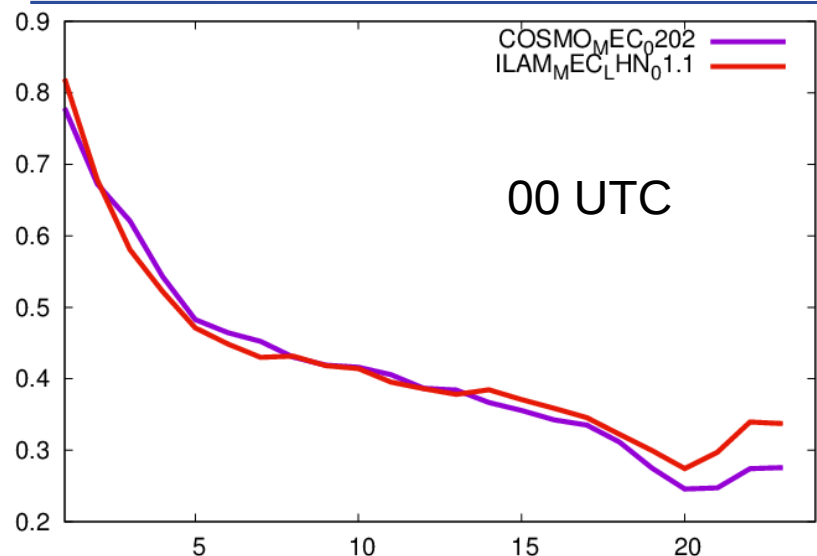
1 mm/h

2 mm/h

5 mm/h

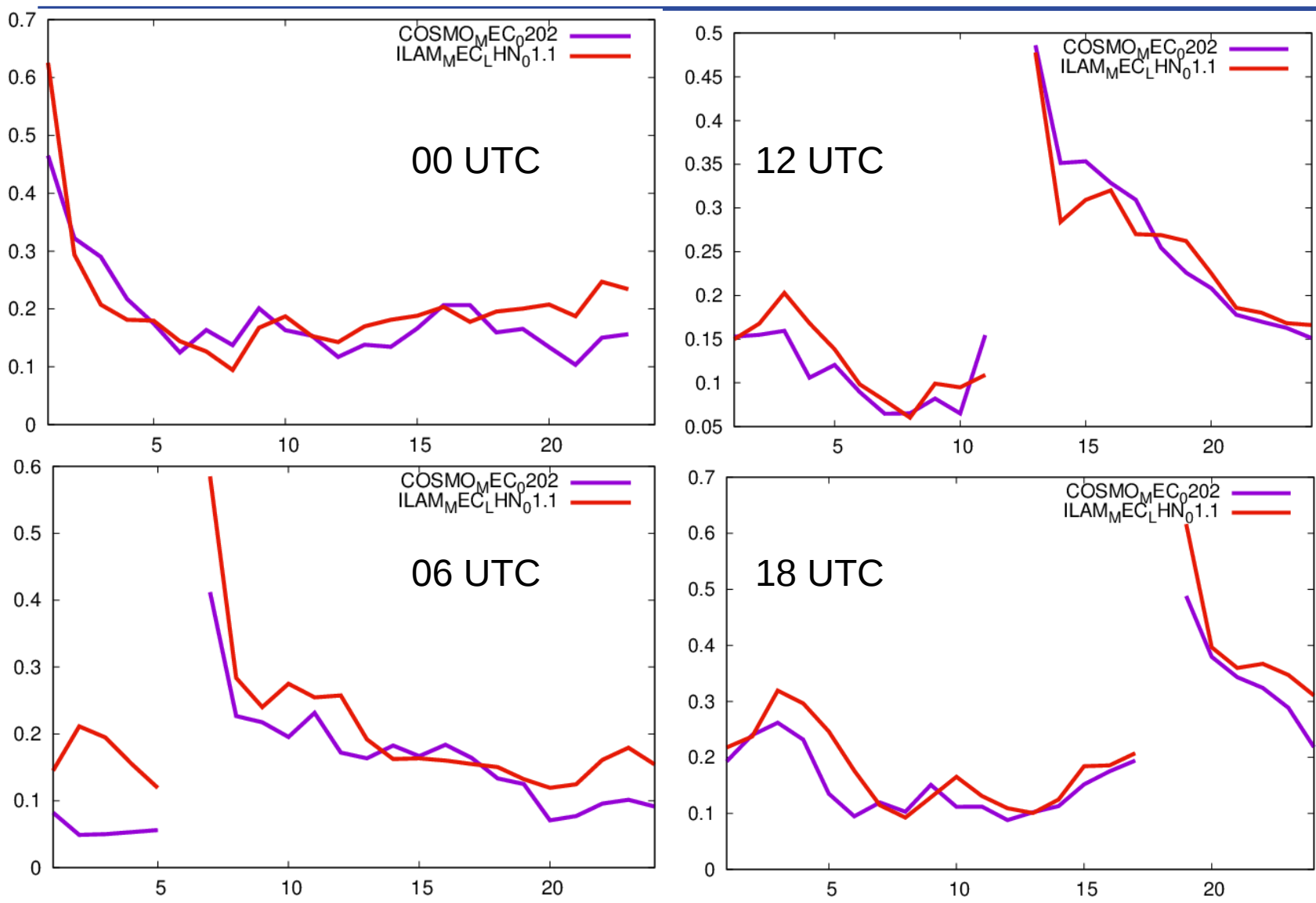


Radar verification for experiments with full DA incl. LHN, May/June 2016, **ICON-D2** vs. **COSMO-D2**



FSS at 11x11 grid points, 1 mm/h

Radar verification for experiments with full DA incl. LHN, May/June 2016, **ICON-D2** vs. **COSMO-D2**



FSS at 11x11 grid points, 5 mm/h



- ➔ In accordance with earlier test periods, huge improvements are seen for T2M, RH2M and PS, and moderate improvements for 10-m winds and cloud cover
- ➔ Precipitation shows a 6h – 9h spinup phase for cold starts from ICON-EU, which is absent in experiments with full data assimilation

Important goals for further development

- ➔ Usage of more modern / higher resolved external parameter data
- ➔ Parameterization development: e.g. TOFD scheme, mixed-layer ocean, canopy-layer for TERRA, plus transfer of ongoing COSMO PP/PT outcomes to ICON where possible (e.g. TERRA-URB, multi-layer snow scheme from PP SAINT, ...); upgrade from RRTM to ECRad