

# Status of transition to ICON-D2-EPS

WG7 parallel session – ICCARUS 2020

C. Gebhardt

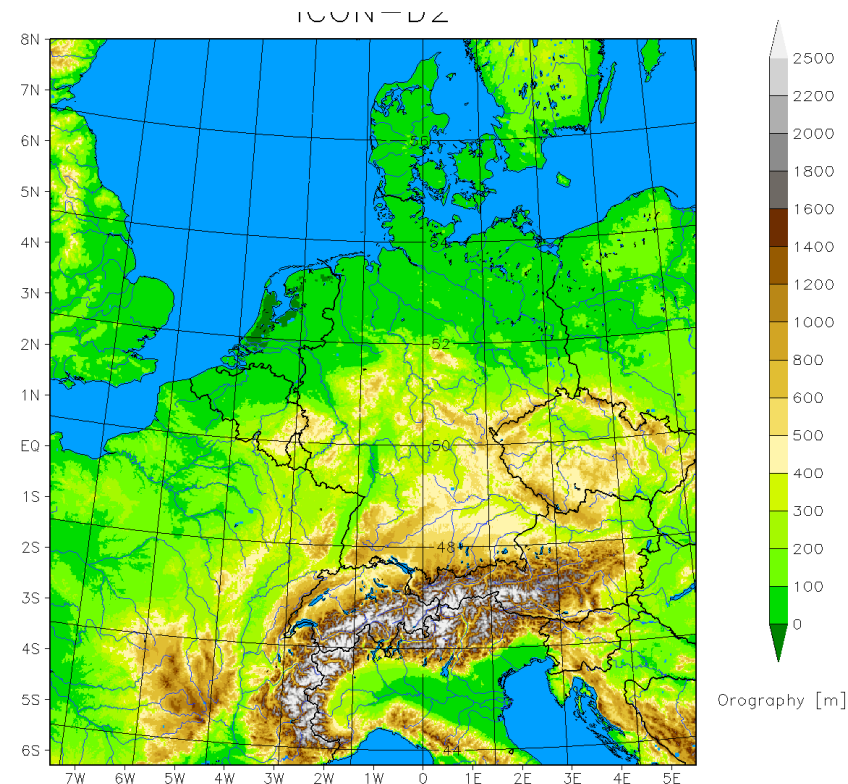
Deutscher Wetterdienst, DWD



## ICON-D2-EPS (under development)

- ~ 2.1 km icosahedral grid
- can be interpolated to the rotated lat-lon grid of COSMO-D2
- 20 members
- 00, 03, 06, 09, 12, 15, 18, 21 UTC
- 27 hours (45 hours for 03 UTC)  
*(planned: 48 hours)*
- perturbation of
  - BC (ICON-EU-EPS ✓)
  - physics (randomized pert. (✓))
  - IC (KENDA ✓ / ✗ / ✓ / ✗)
- pre-operational: October 2019
- operational in Q4 2020

Status at  
COSMO GM 2019



## ICON-D2-EPS (pre-operational)

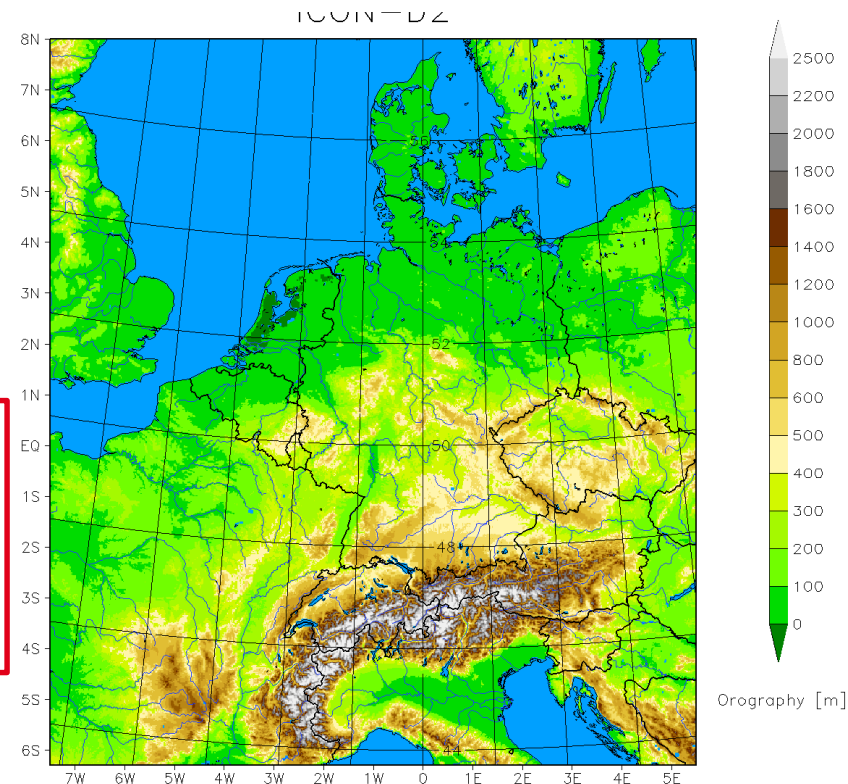
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- **perturbation of**

- BC (ICON-EU-EPS ✓)
- physics (randomized pert. (✓))
- IC (KENDA (✓))

- **operational in Q4 2020 / Q1 2021**

Status at  
**ICCARUS 2020**

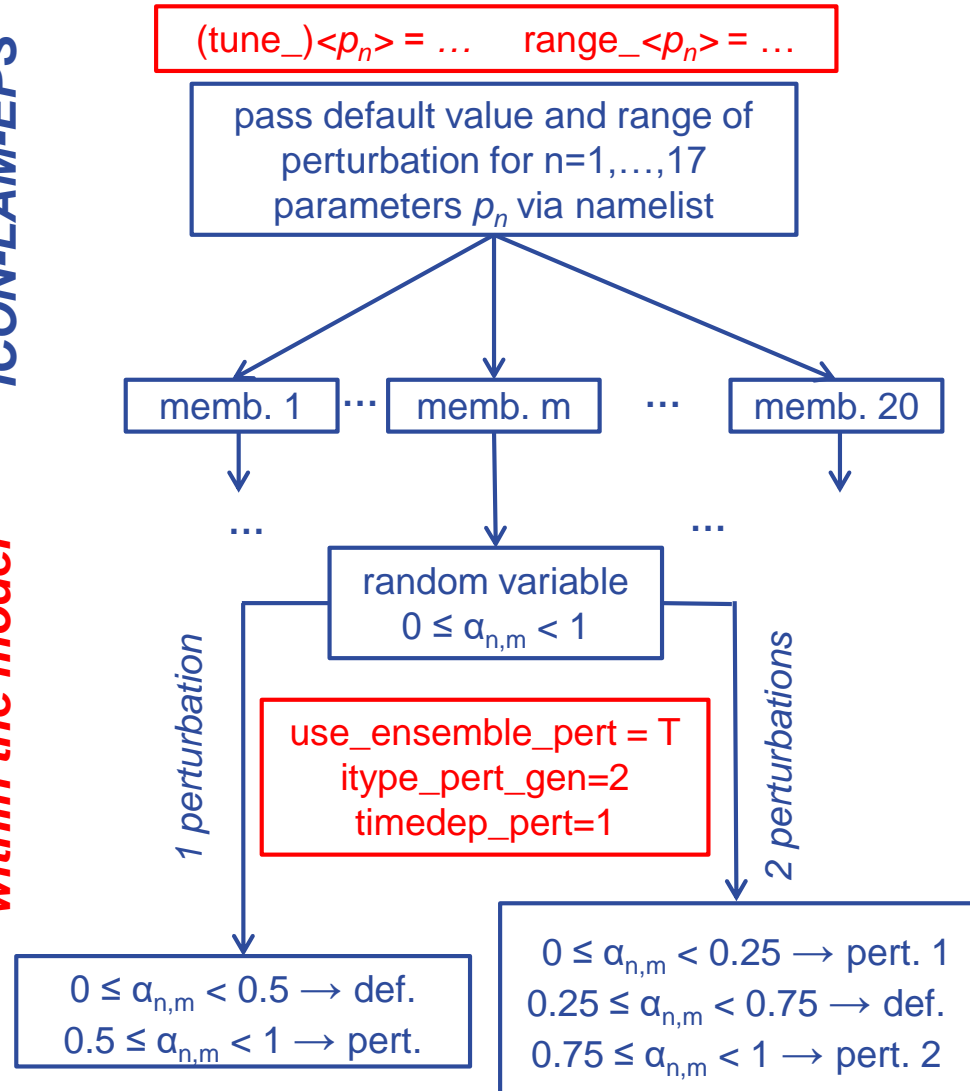


## Scheme for parameter perturbations

- 2-3 different values for each of 17 parameters
- for each parameter separately: **random selection** of members which are perturbed
- selected parameter values stay fixed over the forecast range

ICON-LAM-EPS

within the model



## Verification results for the pre-operational set-up

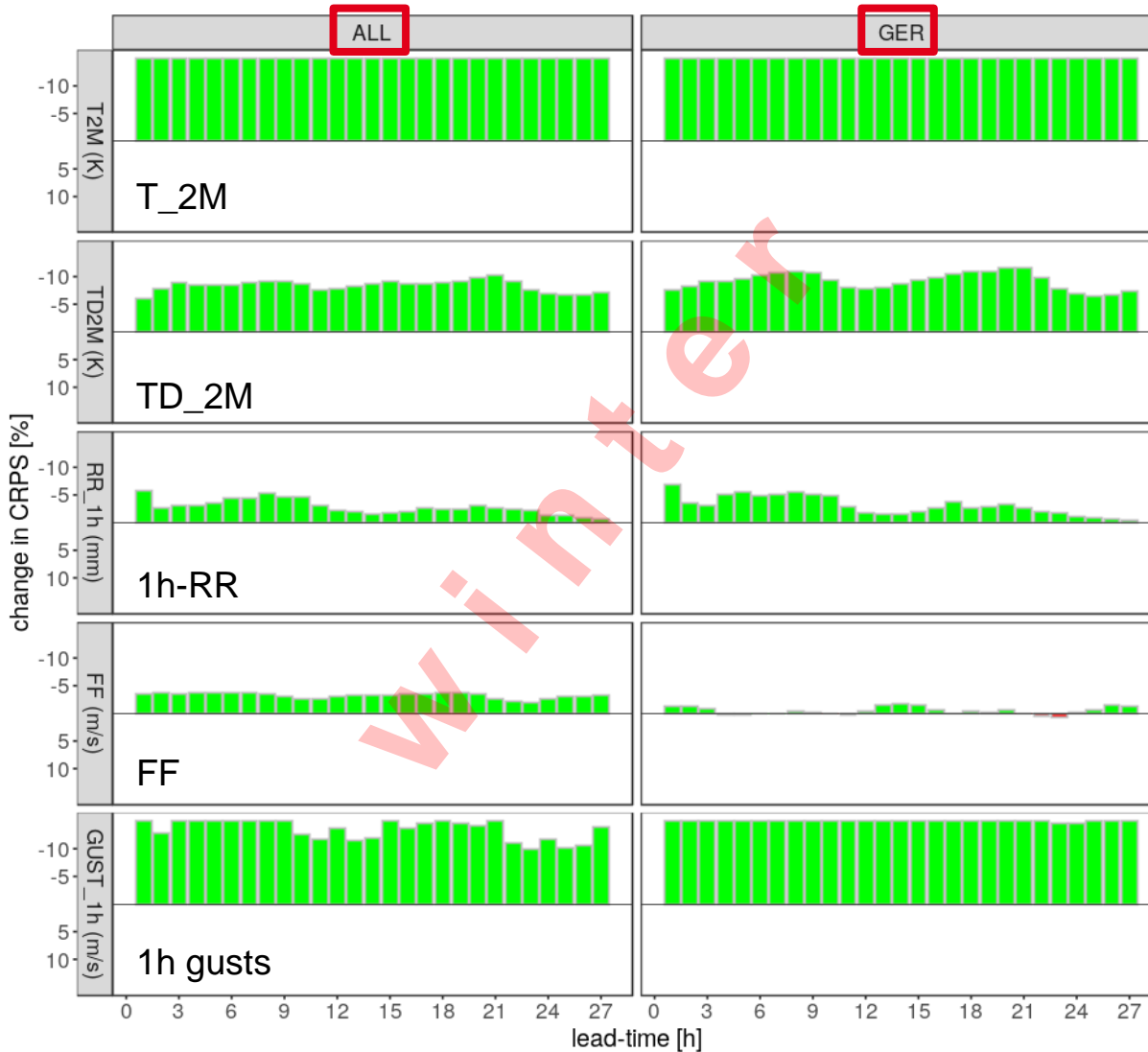
- Winter: December 2019 - February 2020
- Summer: June & July 2019
- 00 and 12 UTC runs
- Compared to operational COSMO-D2-EPS

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Forecasts initialized from 2019/11/30 22UTC - 2020/02/20 09UTC  
Change in CRPS [%]

■ COSMO better ■ ILAM better



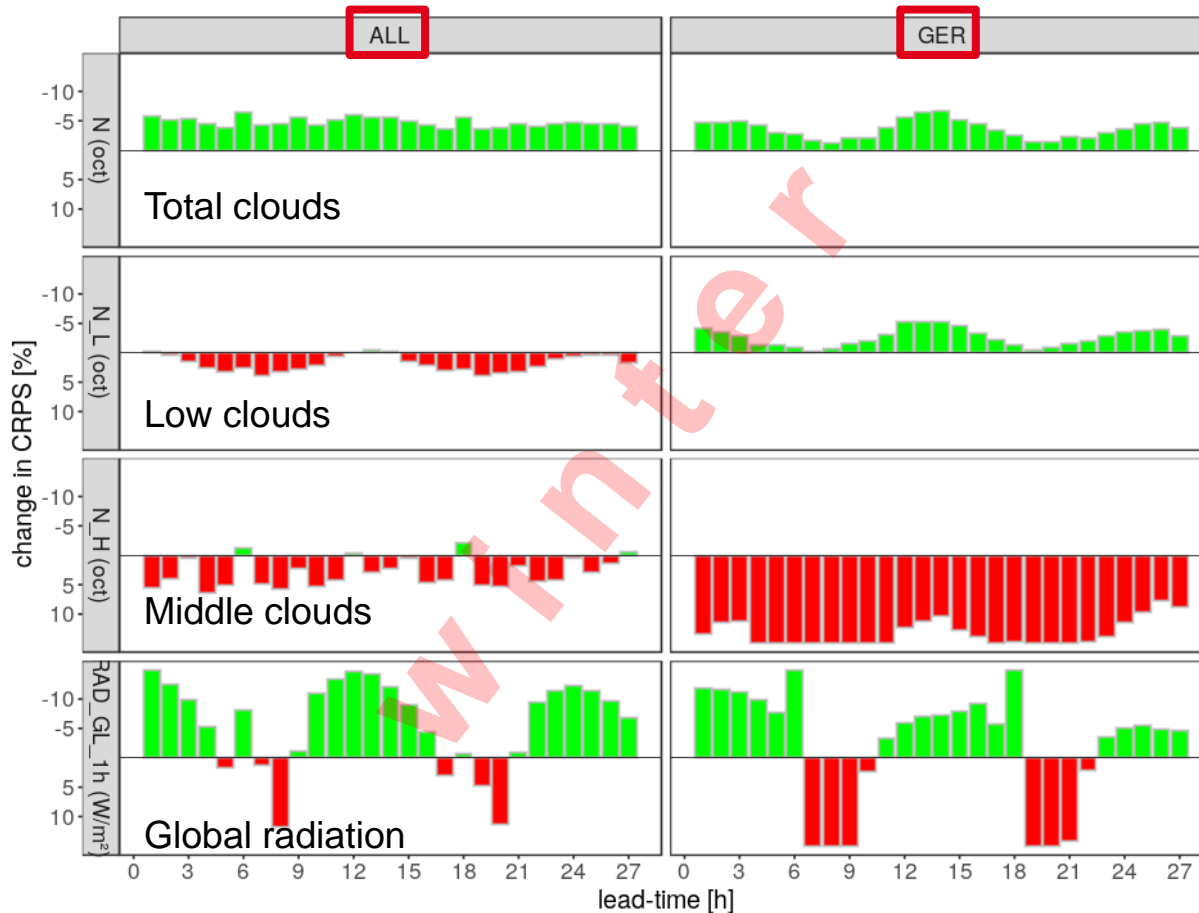
Relative change in CRPS

00, 12 UTC runs

ICON-D2-EPS or  
COSMO-D2-EPS better

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Relative change in CRPS

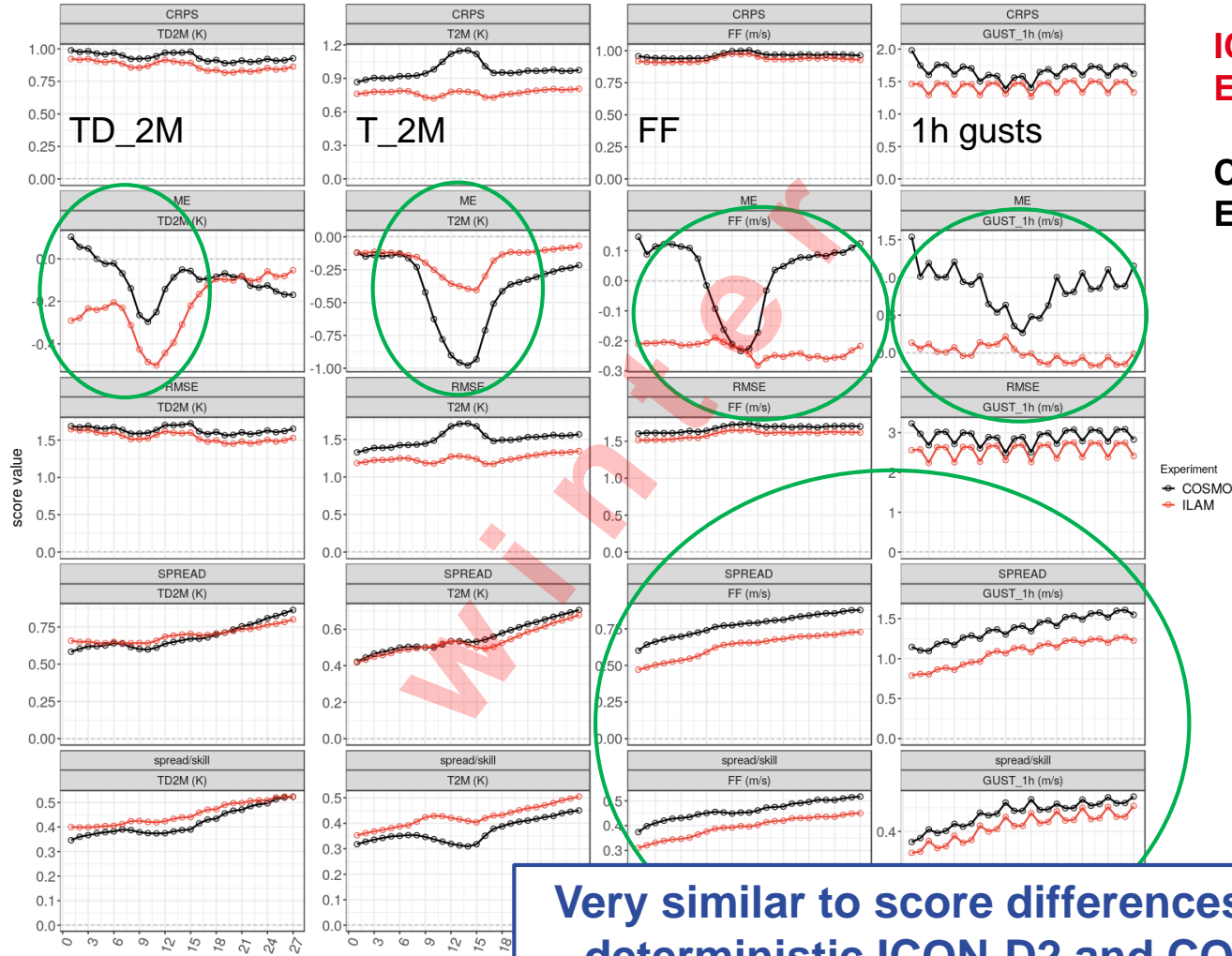
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00 UTC

2019/11/30 22UTC - 2020/02/20 09UTC  
INI: 00 UTC, DOM: ALL



ICON-D2  
EPS

COSMO-D2  
EPS

CRPS

Bias

RMSE

Spread

Spread/  
Skill

Very similar to score differences between  
deterministic ICON-D2 and COSMO-D2



00 UTC

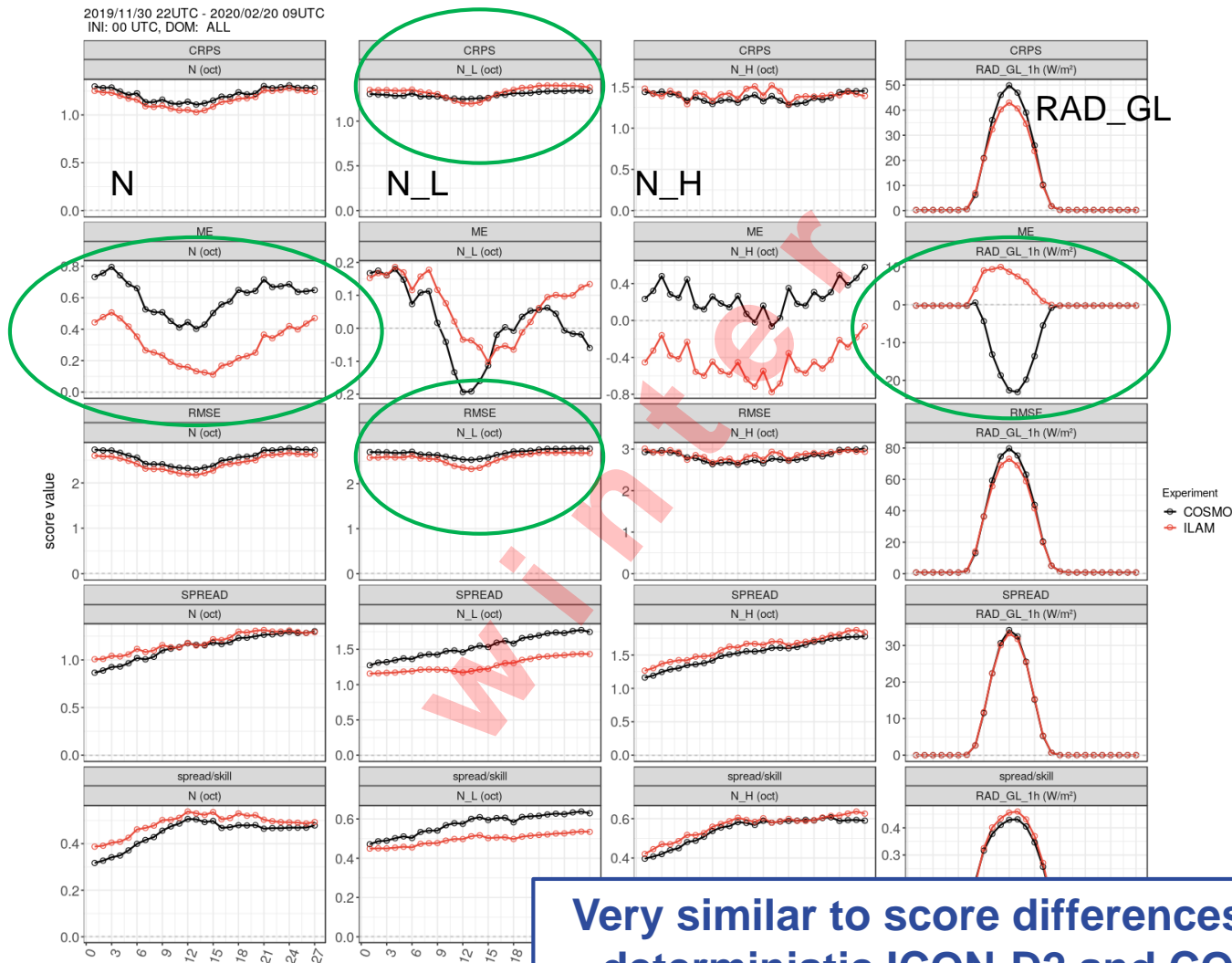
CRPS

Bias

RMSE

Spread

Spread/  
Skill



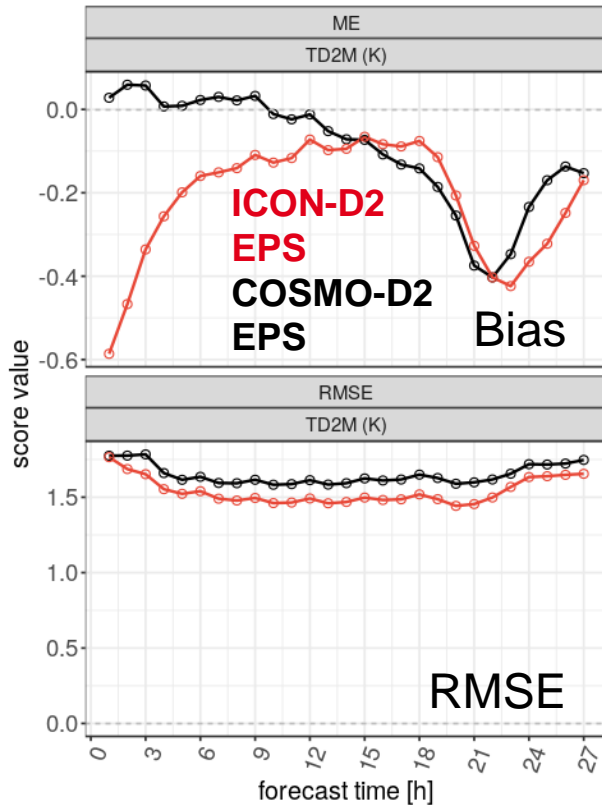
ICON-D2  
EPS

COSMO-D2  
EPS

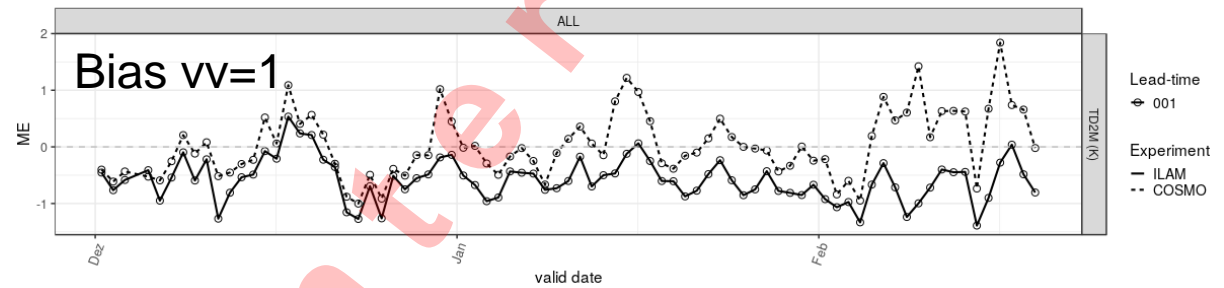
Very similar to score differences between deterministic ICON-D2 and COSMO-D2

# 12 UTC TD\_2M

2019/11/30 22UTC - 2020/02/20 09UTC  
INI: 12 UTC, DOM: ALL



2019.11.30-22UTC - 2020.02.20-09UTC  
INI: 12, STAT: ALL

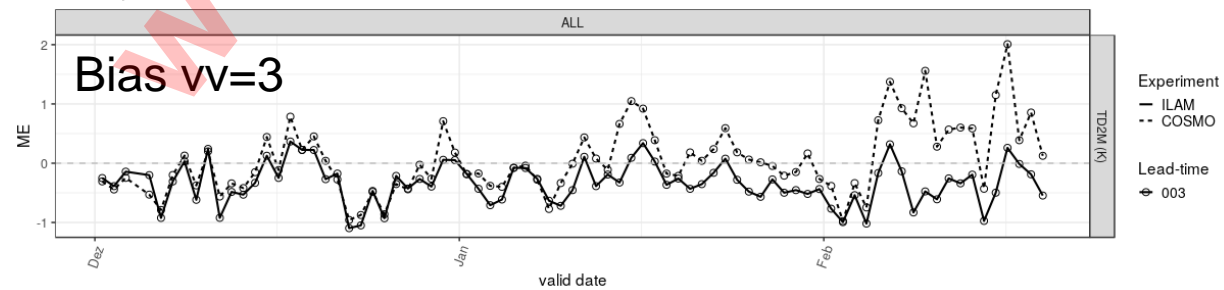


Experiment  
— COSMO  
— ILAM

— ICON-D2-EPS

- - COSMO-D2-EPS

2019.11.30-22UTC - 2020.02.20-09UTC  
INI: 12, STAT: ALL

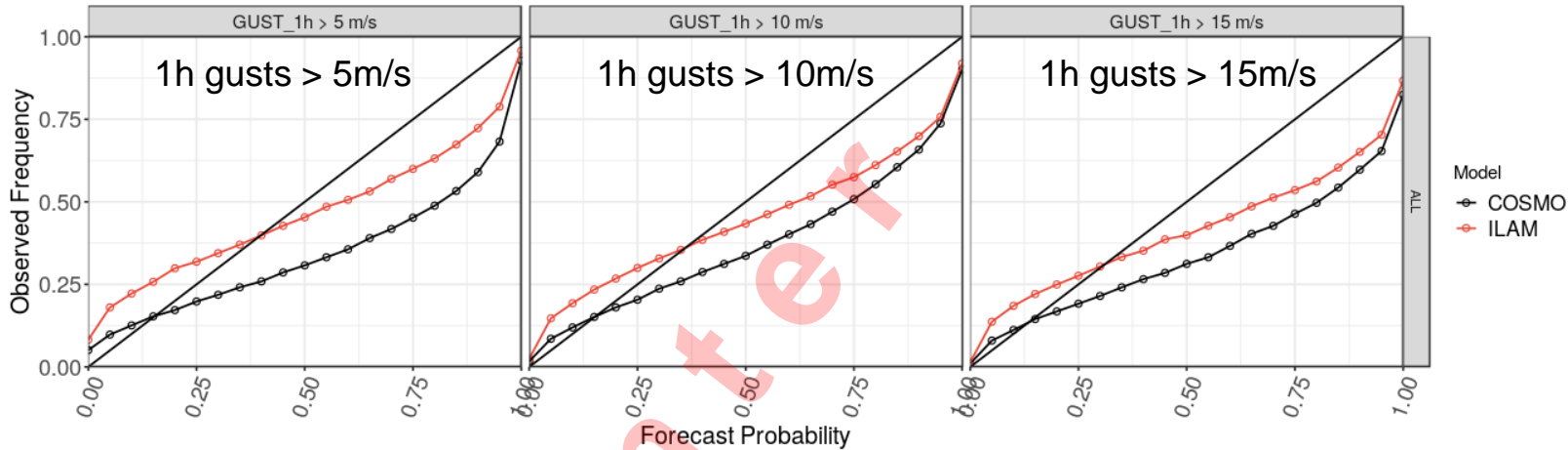


# Reliability diagram

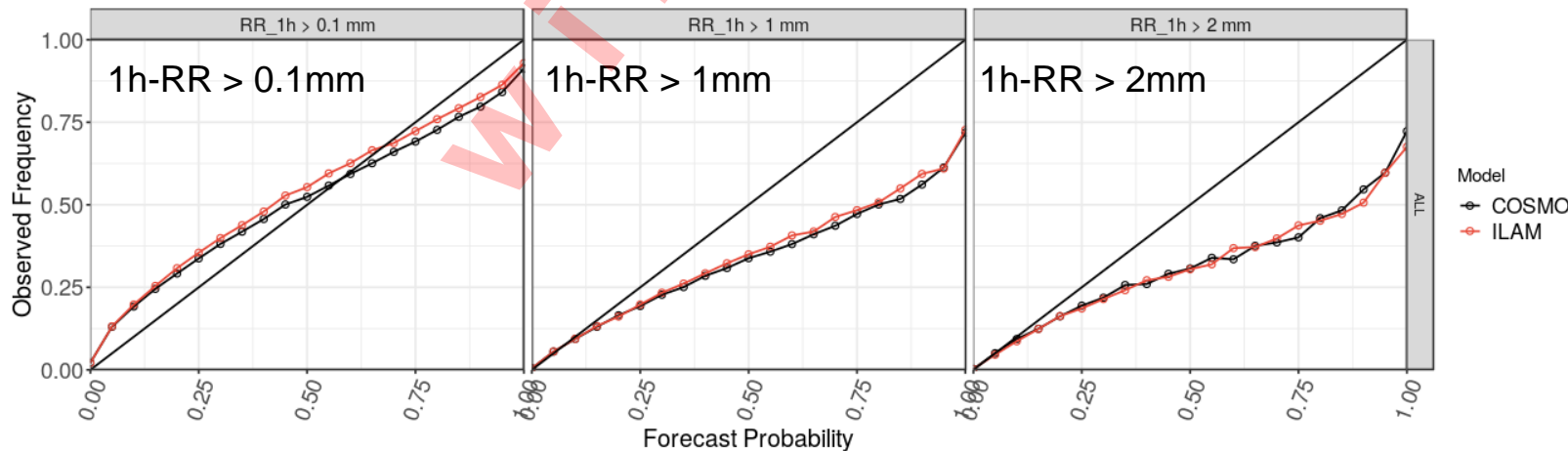
00 & 12 UTC  
vv = 1 – 27h

ICON-D2  
EPS  
COSMO-D2  
EPS

2019/11/30 22UTC - 2020/02/20 09UTC  
INI: ALL UTC, DOM: ALL



2019/11/30 22UTC - 2020/02/20 09UTC  
INI: ALL UTC, DOM: ALL



# Brier skill score Brier decomposition

00 & 12 UTC

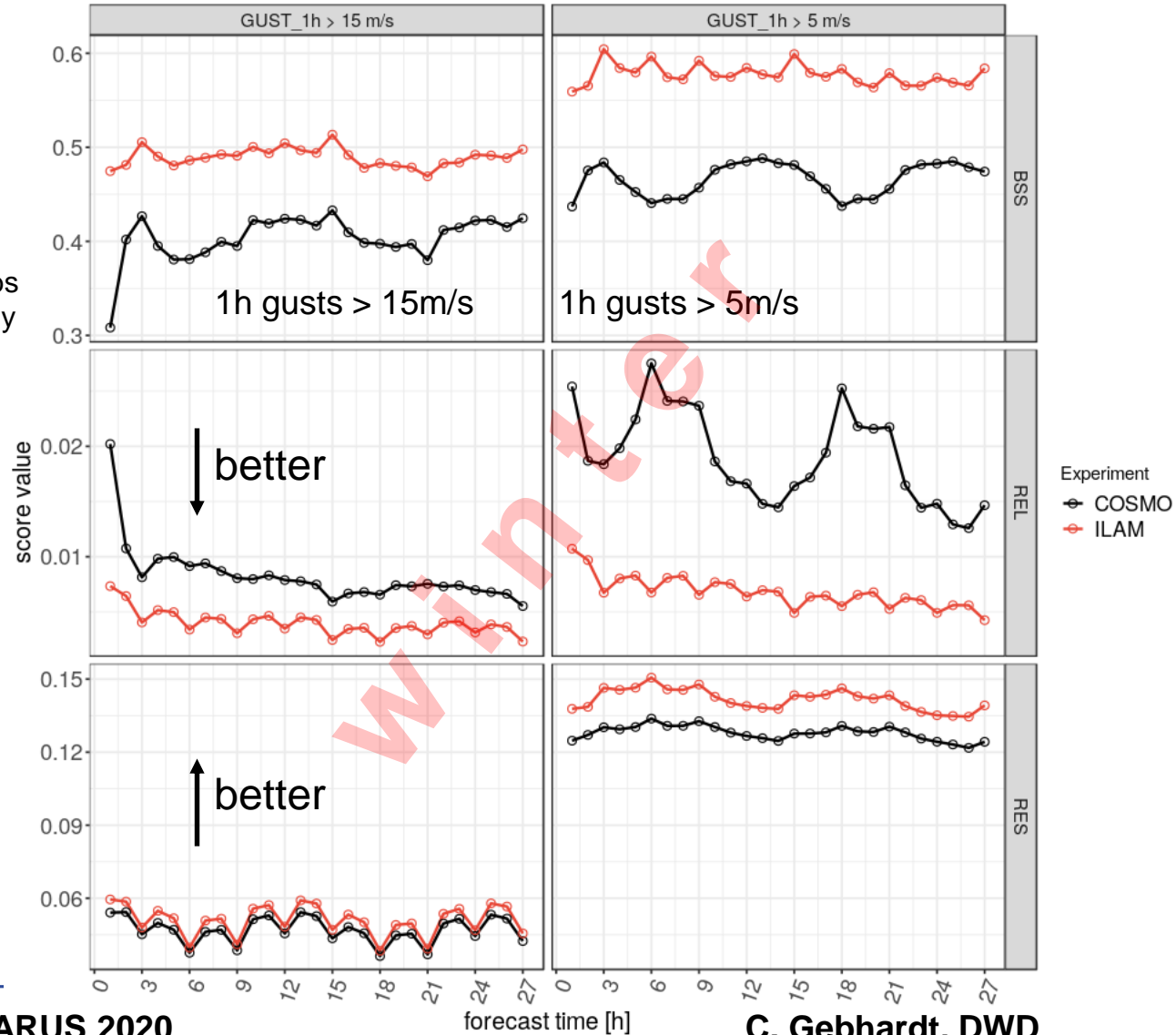
ICON-D2  
EPS  
COSMO-D2  
EPS

reliability  
component

resolution  
component

Brier  
Skill  
Score  
against obs  
climatology

2019/11/30 22UTC - 2020/02/20 09UTC  
INI: ALL UTC, DOM: ALL

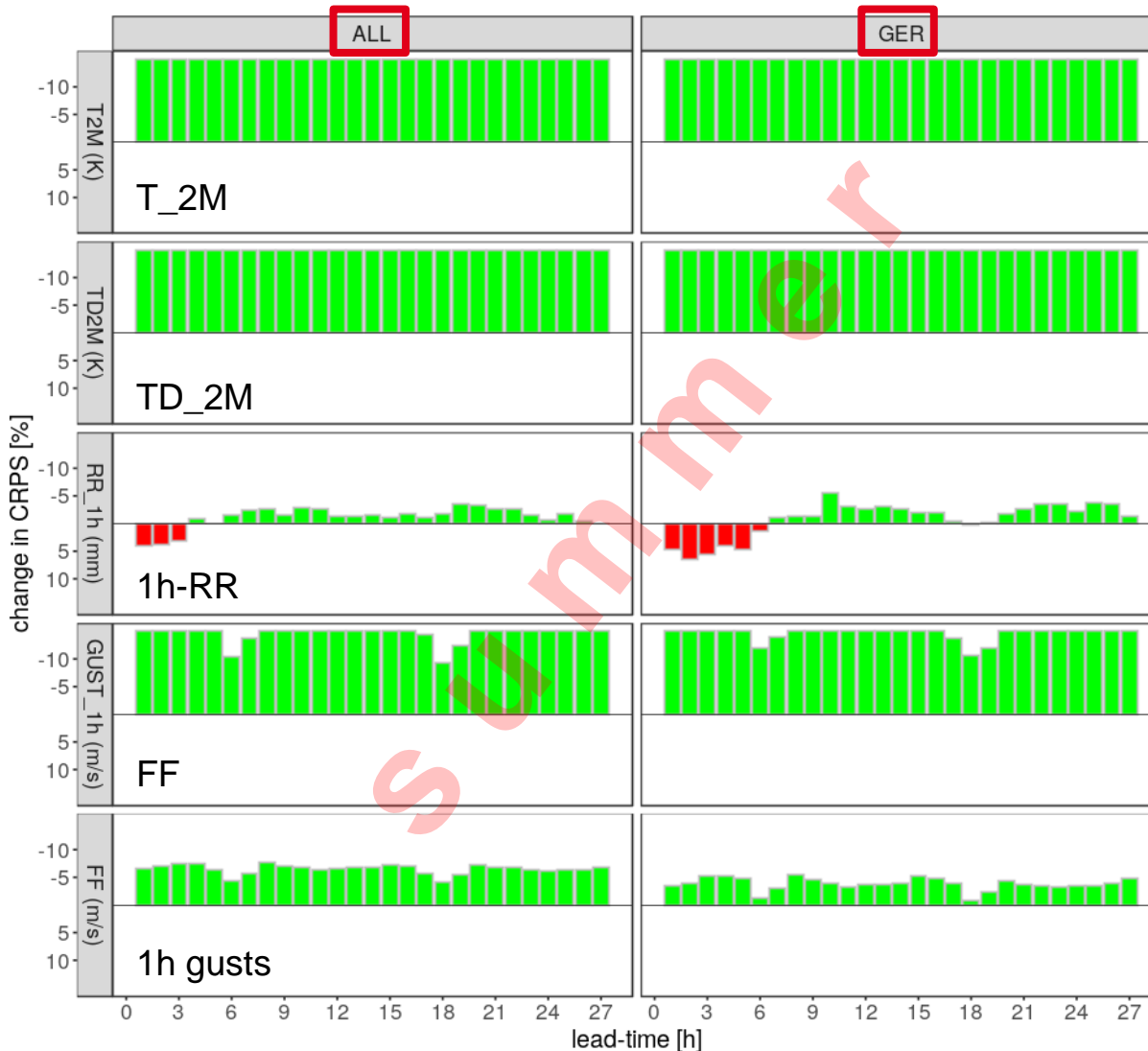


## Verification results for the pre-operational set-up

- Winter: December 2019 - February 2020
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Forecasts initialized from 2019/05/31 22UTC - 2019/07/31 00UTC  
Change in CRPS [%]

10988 better COSMO better

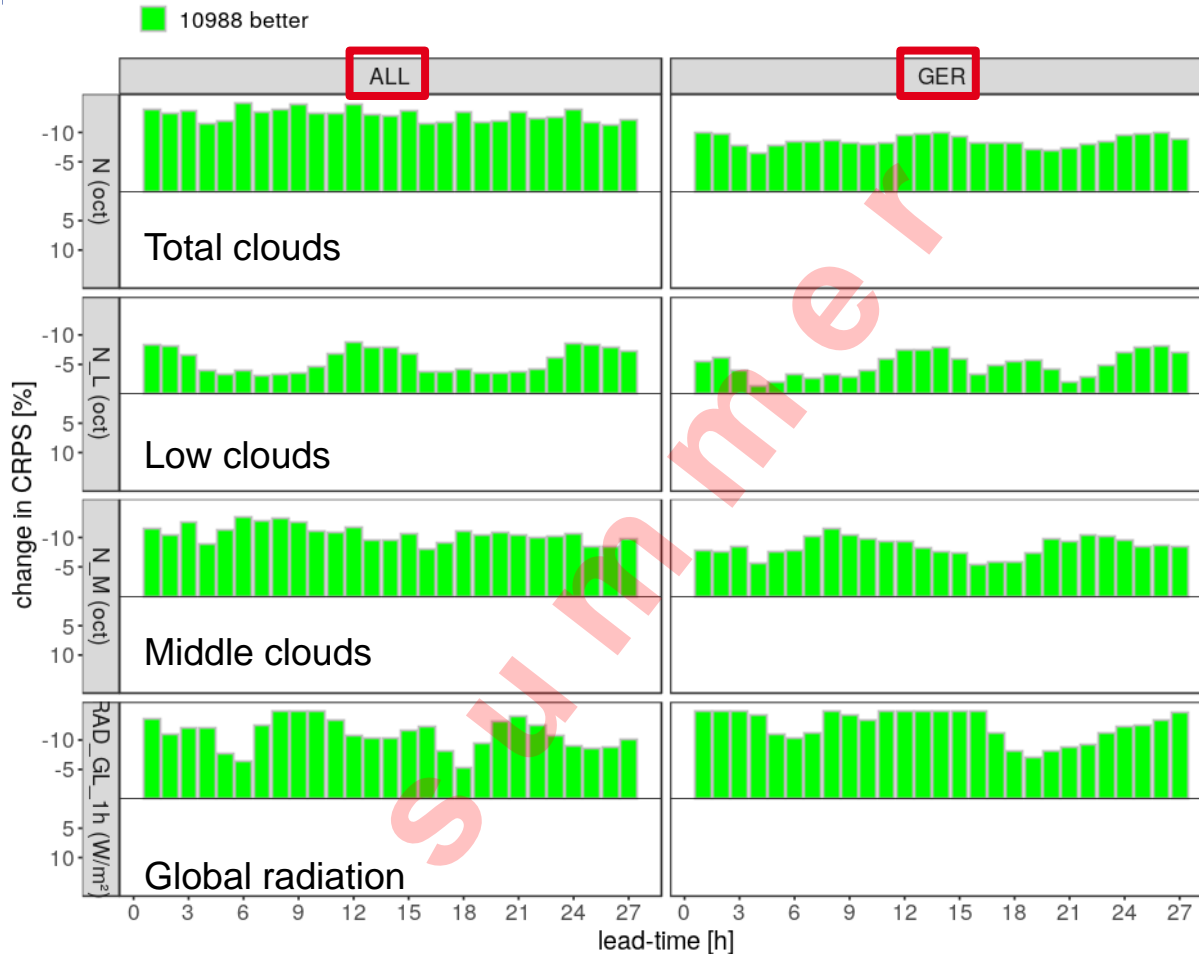


Relative change in CRPS

00, 12 UTC runs

ICON-D2-EPS or  
COSMO-D2-EPS better

Forecasts initialized from 2019/05/31 22UTC - 2019/07/31 00UTC  
Change in CRPS [%]



Relative change in CRPS

00, 12 UTC runs

ICON-D2-EPS or  
COSMO-D2-EPS better



00 UTC

2019/05/31 22UTC - 2019/07/31 00UTC  
INI: 00 UTC, DOM: ALL

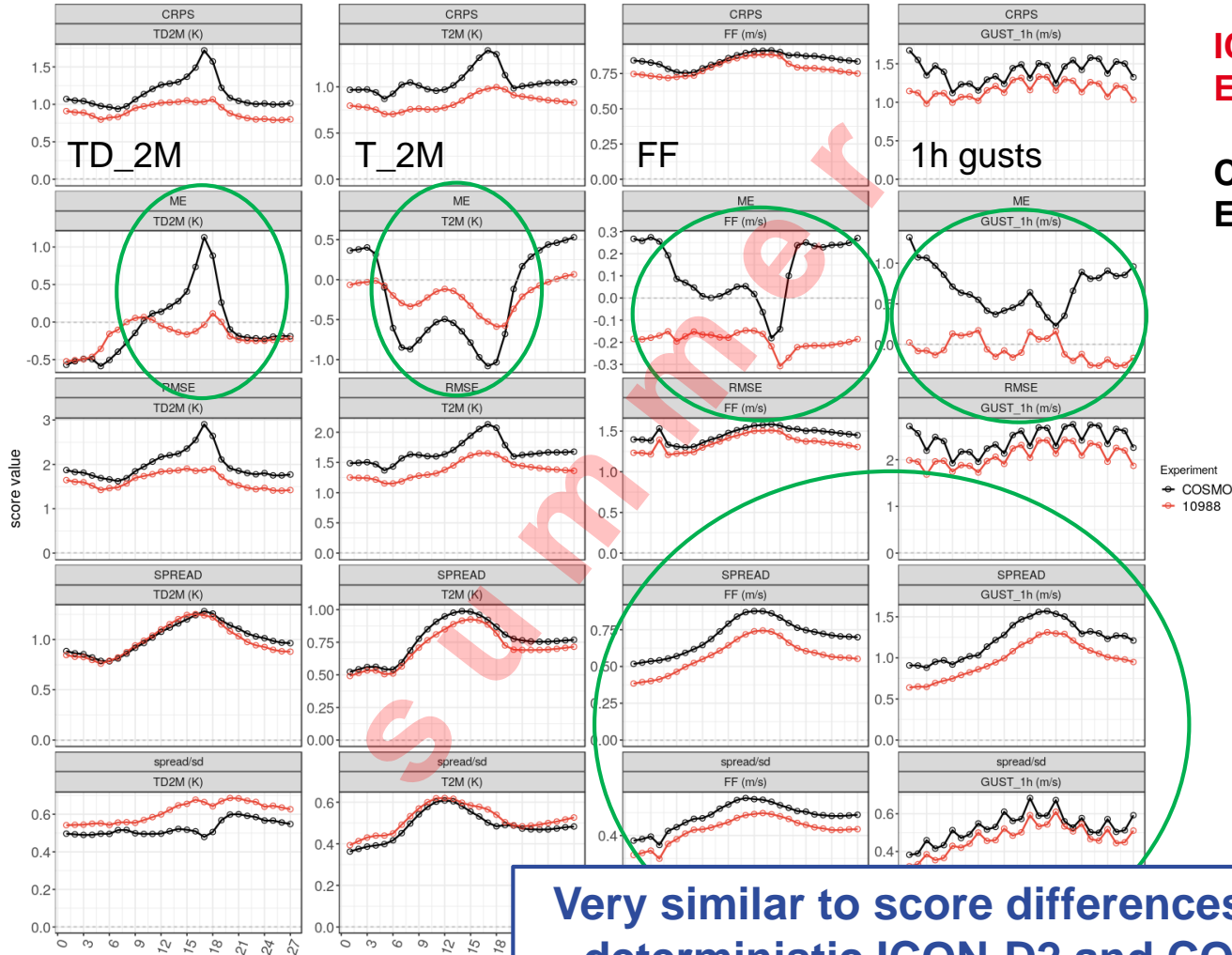
CRPS

Bias

RMSE

Spread

Spread/  
Skill



ICON-D2  
EPS

COSMO-D2  
EPS

Experiment  
● COSMO  
● 10988

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00 UTC

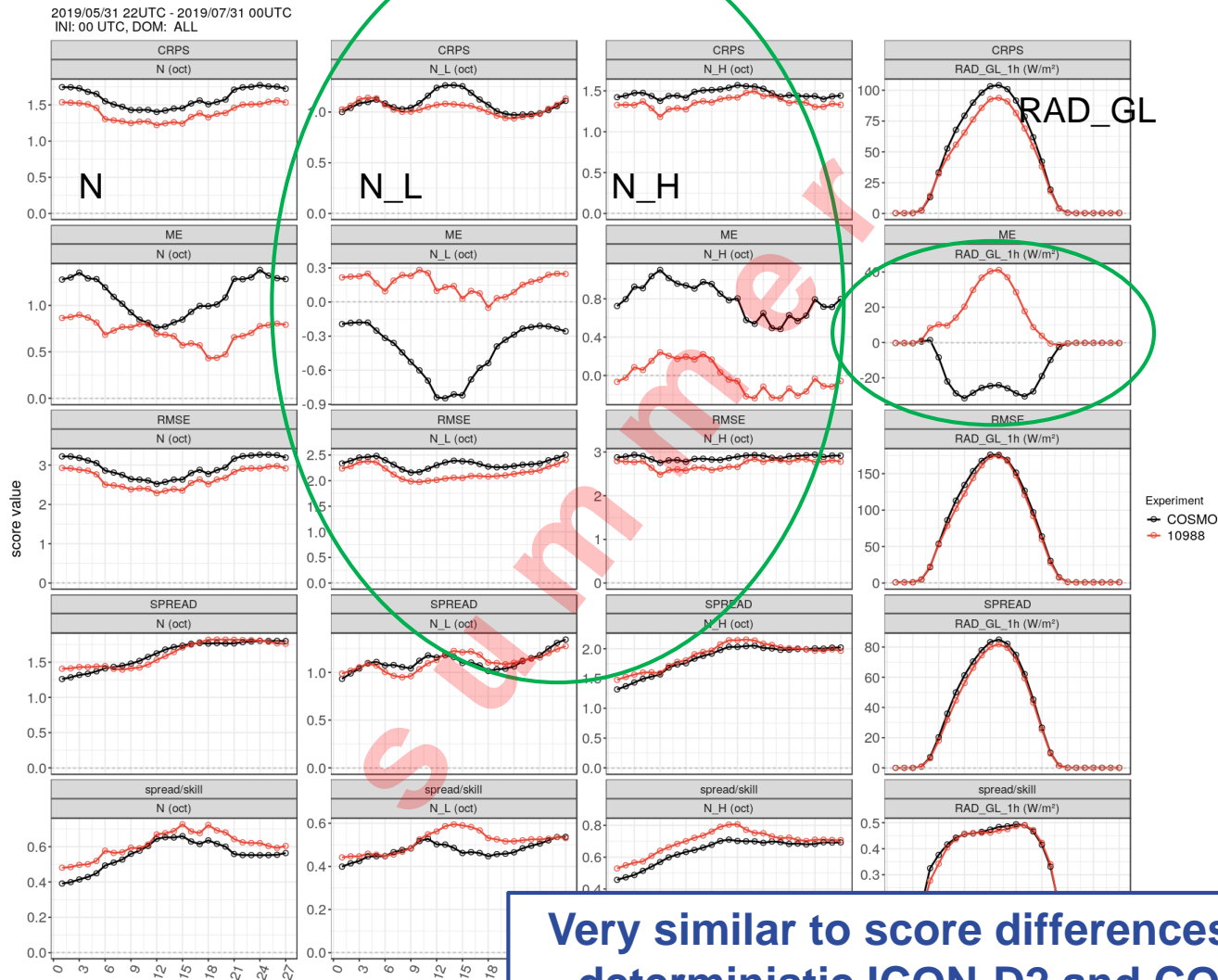
CRPS

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Spread

Spread/  
Skill



ICON-D2  
EPS

COSMO-D2  
EPS

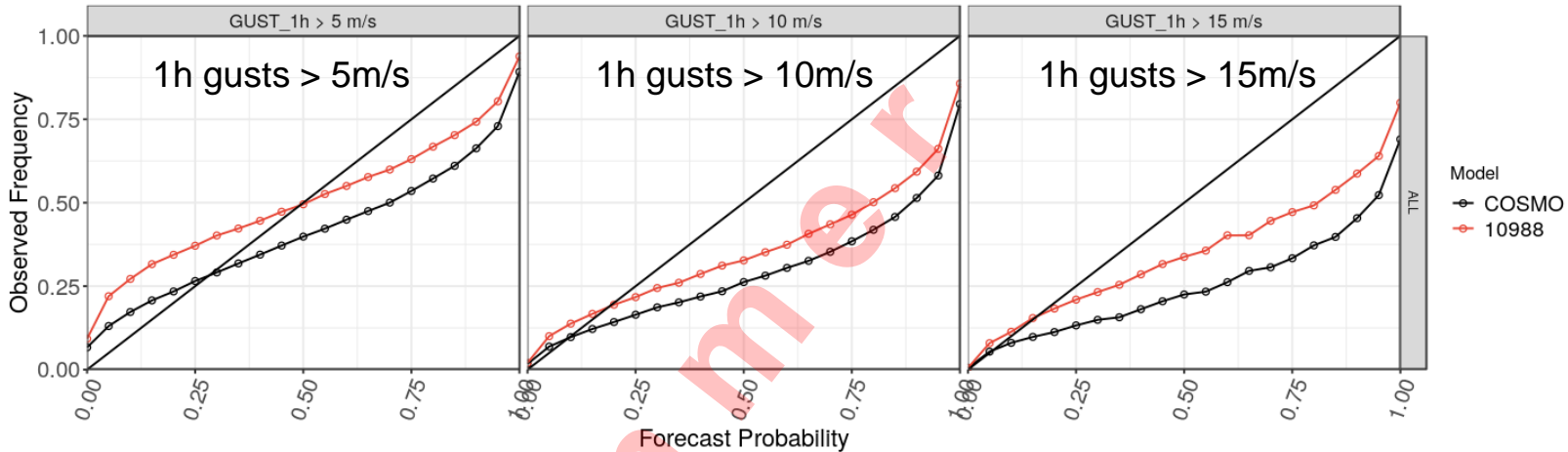
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# Reliability diagram

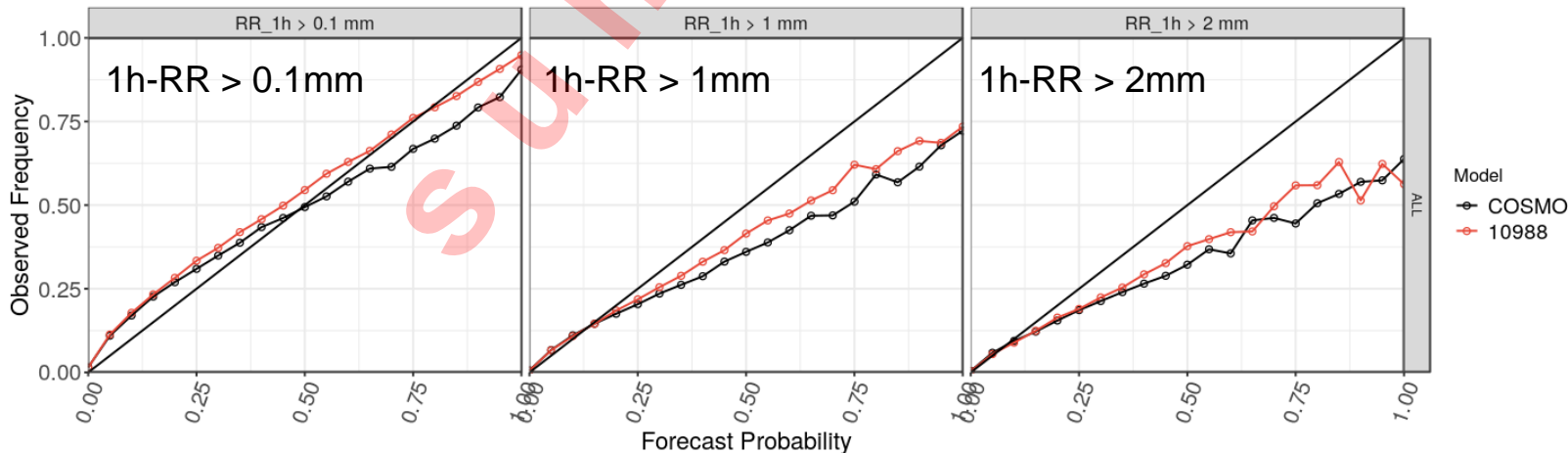
00 & 12 UTC  
vv = 1 – 27h

ICON-D2  
EPS  
COSMO-D2  
EPS

2019/05/31 22UTC - 2019/07/31 00UTC  
INI: ALL UTC, DOM: ALL



2019/05/31 22UTC - 2019/07/31 00UTC  
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# Brier skill score Brier decomposition

00 & 12 UTC

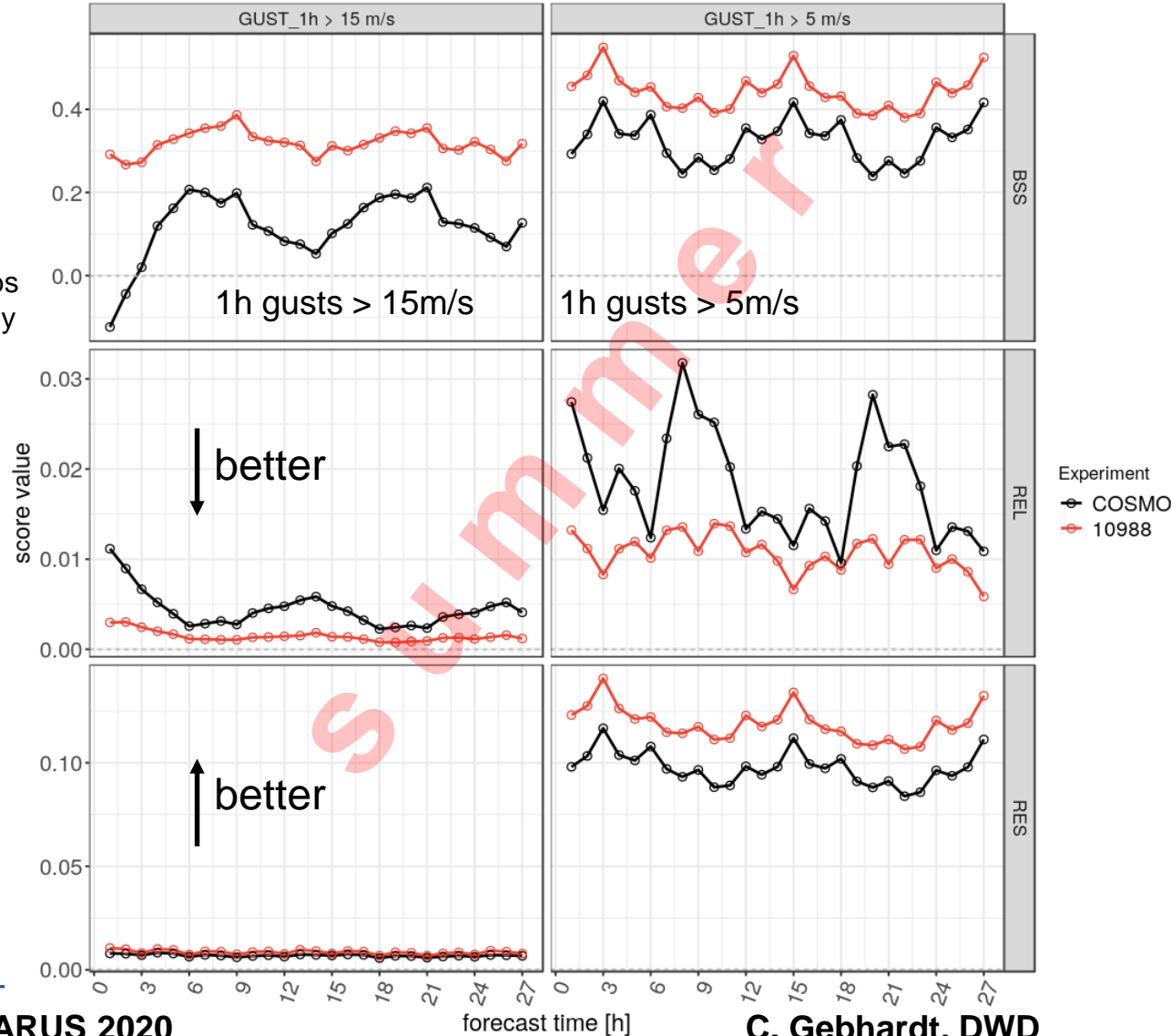
ICON-D2  
EPS  
COSMO-D2  
EPS

reliability  
component

resolution  
component

Brier  
Skill  
Score  
against obs  
climatology

2019/05/31 22UTC - 2019/07/31 00UTC  
INI: ALL UTC, DOM: ALL



# Brier skill score Brier decomposition

00 & 12 UTC

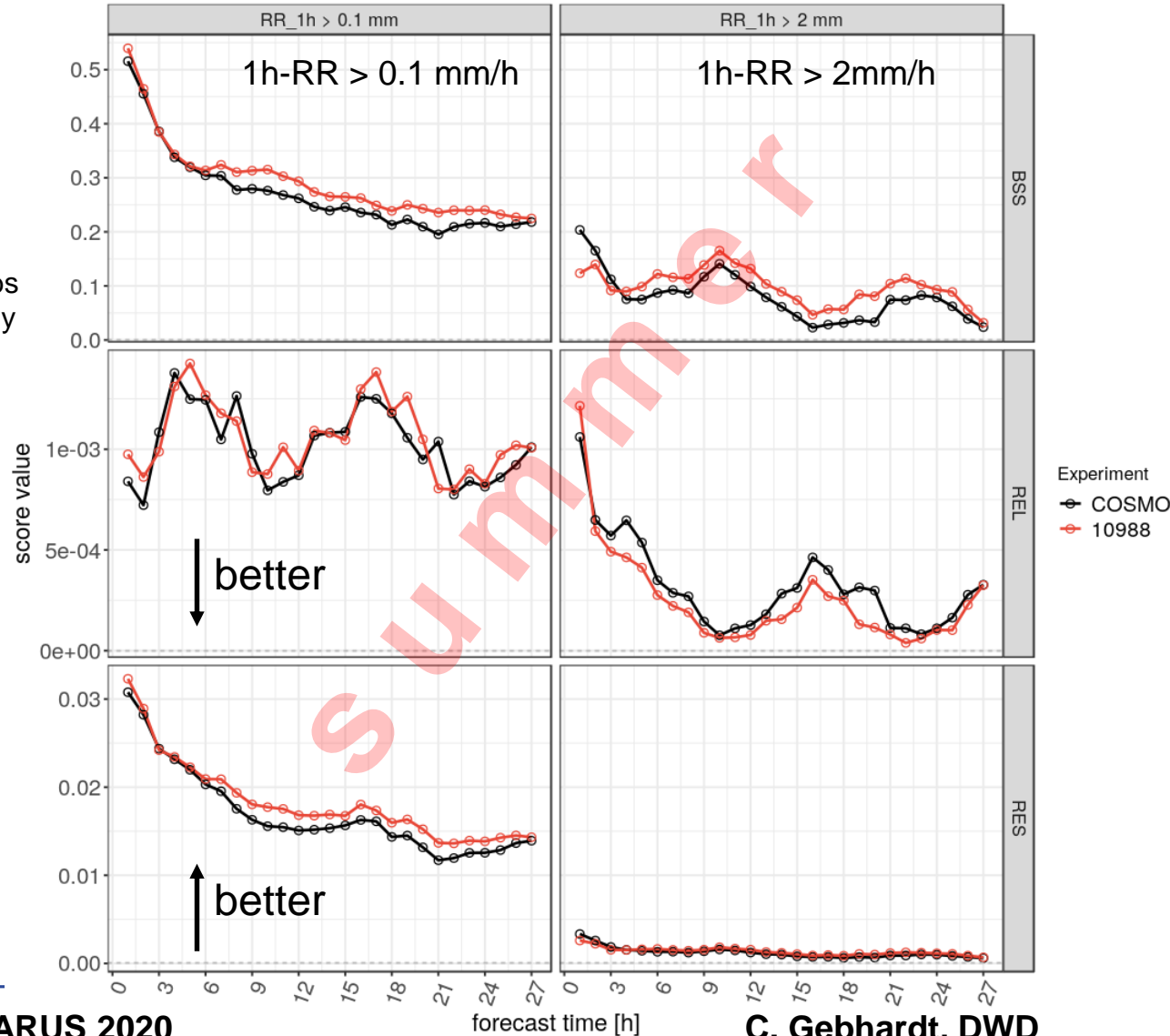
ICON-D2  
EPS  
COSMO-D2  
EPS

Brier  
Skill  
Score  
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reliability  
component

resolution  
component

2019/05/31 22UTC - 2019/07/31 00UTC  
INI: ALL UTC, DOM: ALL



# Ensemble products for ICON-D2-EPS with Fieldextra

Chiara Marsigli  
Deutscher Wetterdienst

## Motivation

- Post-processing of the ICON-LAM model fields by using the COSMO SW Fieldextra
- Fieldextra can manage the unstructured ICON grid, by using the icontools package (developed for ICON at DWD and MPI)
- The ICON-LAM fields are transformed to a regular grid before further post-processing
  - regular latlon
  - rotated latlon
- Interpolation is made with the radial basis function method. The nearest neighbour interpolation method does not work for ICON-LAM
- It is planned to provide in Fieldextra full support of the ICON grid

## Products generated

- Parameters:
  - Temperature
  - Gusts
  - Cloud Cover
  - Precipitation, Snow
  - CAPE
  - Future: Reflectivity, Lightning Potential Index
- Quantities:
  - Ensemble mean, minimum, maximum
  - spread / interquartile range
  - Exceedance probabilities (thresholds according to forecasters' needs)
  - Percentiles
  - Upscaled probabilities (10x10 grid points)



## Next steps

- further modifications of parameter perturbations and KENDA
- Q4 of 2020 / Q1 2021 : operational start of ICON-LAM-EPS
  
- alternative/complementary:  
model for the model error (“EM-scheme”)
- alternative/complementary:  
stochastic representation of shallow convection (see Maïke’s presentation)
- alternative/complementary: .....