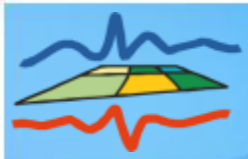

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Stefan Poll[1], Matthieu Masbou[2], Clemens Simmer[1]

Verification of precipitation forecast based on the high-resolution NWP model, COSMO-NRW

[1] Meteorological Institute, University of Bonn

[2] German Meteorological Service (DWD)

0 Motivation

Current Situation

- Improving forecasts ⟺ Increasing resolution

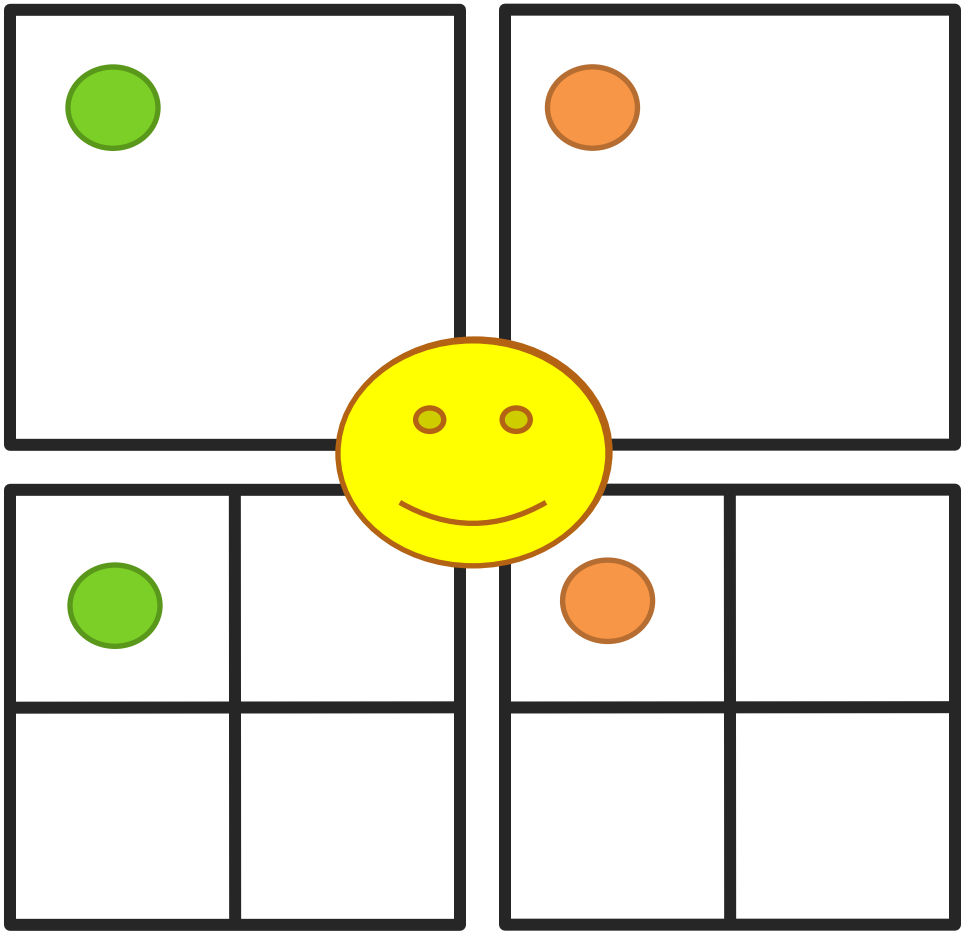
Problem

- Precipitation varies greatly in time and space

Aim

- Answer: how well are the precipitation forecasts in COSMO-NRW?

0 Double penalty problem

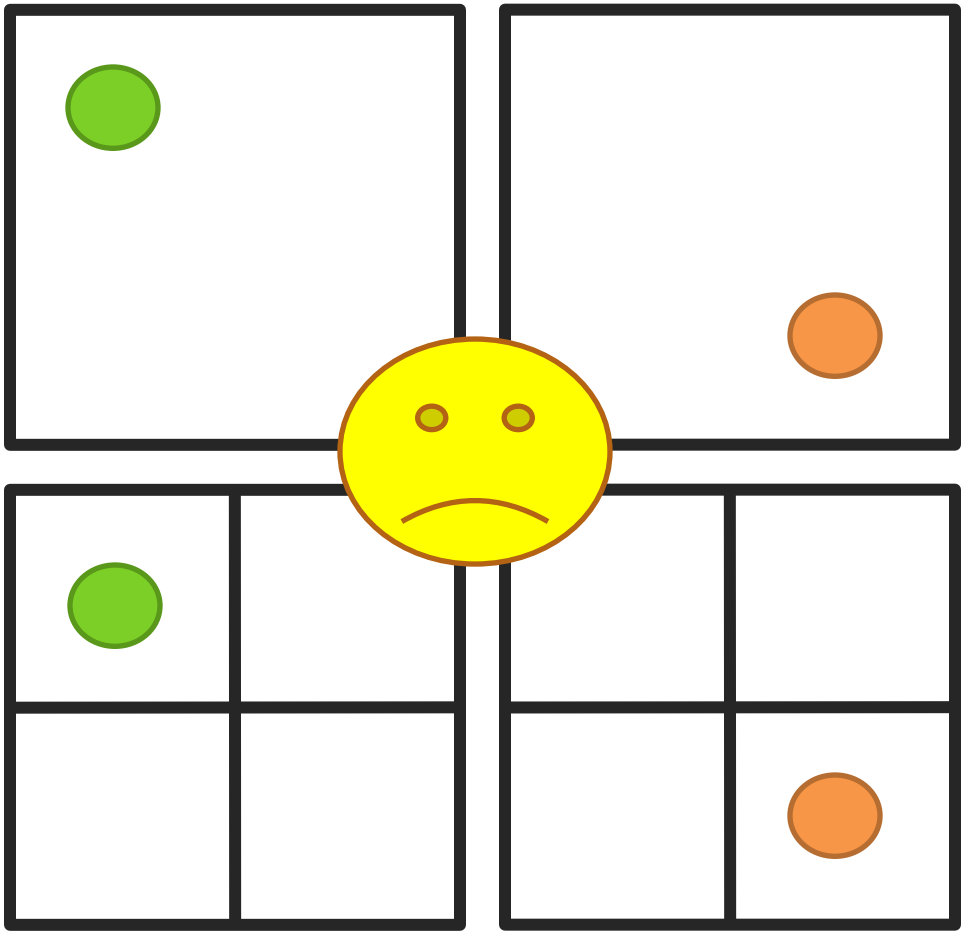


Rain-Event Observation

Rain-Event Forecast

Point-to-Point verification

Double penalty problem



Rain-Event Observation

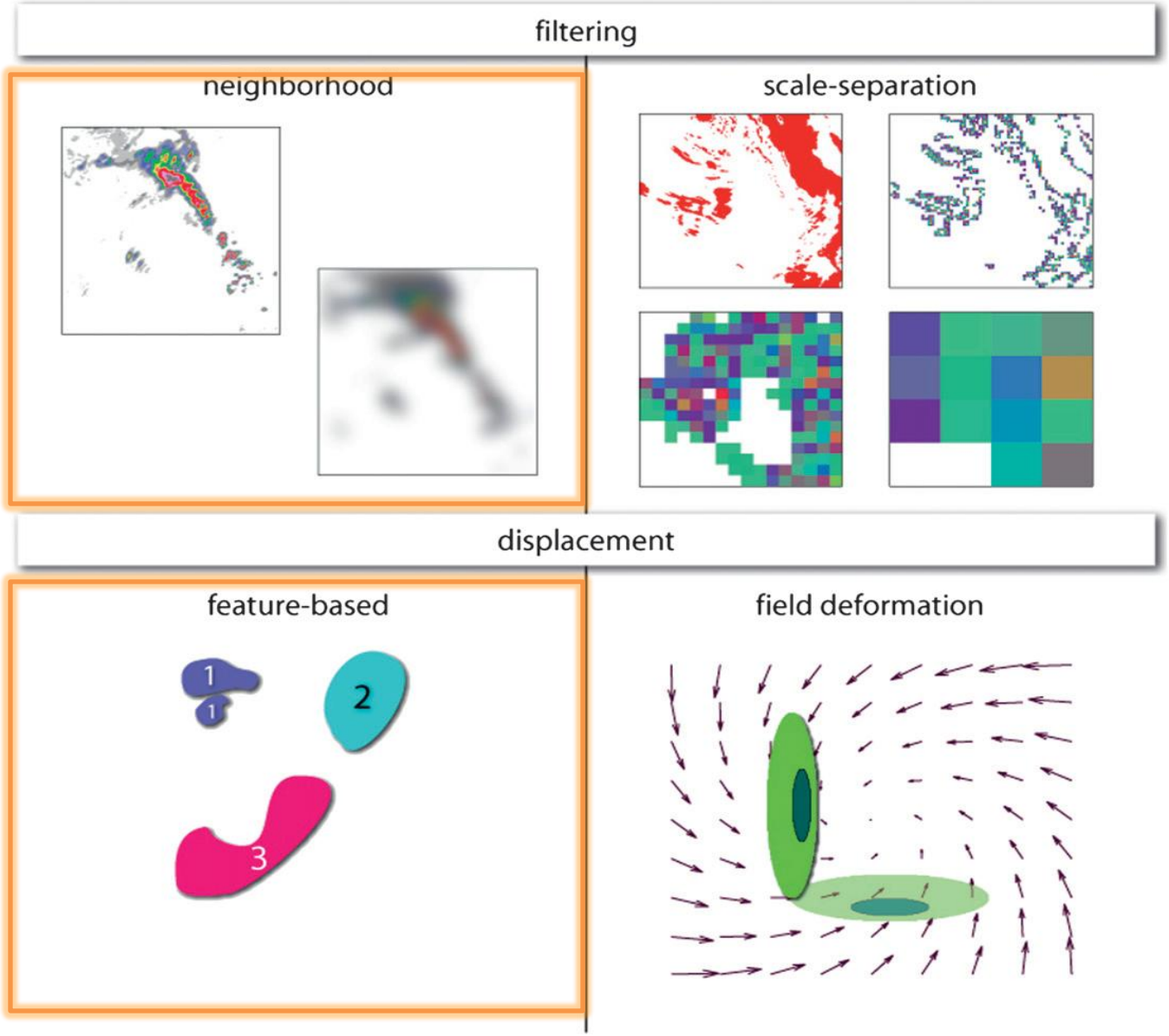
Rain-Event Forecast

Point-to-Point verification
does not pass this situation

Penalized for

- predicting an event, where it did not occur
- failing an event, where it did occur

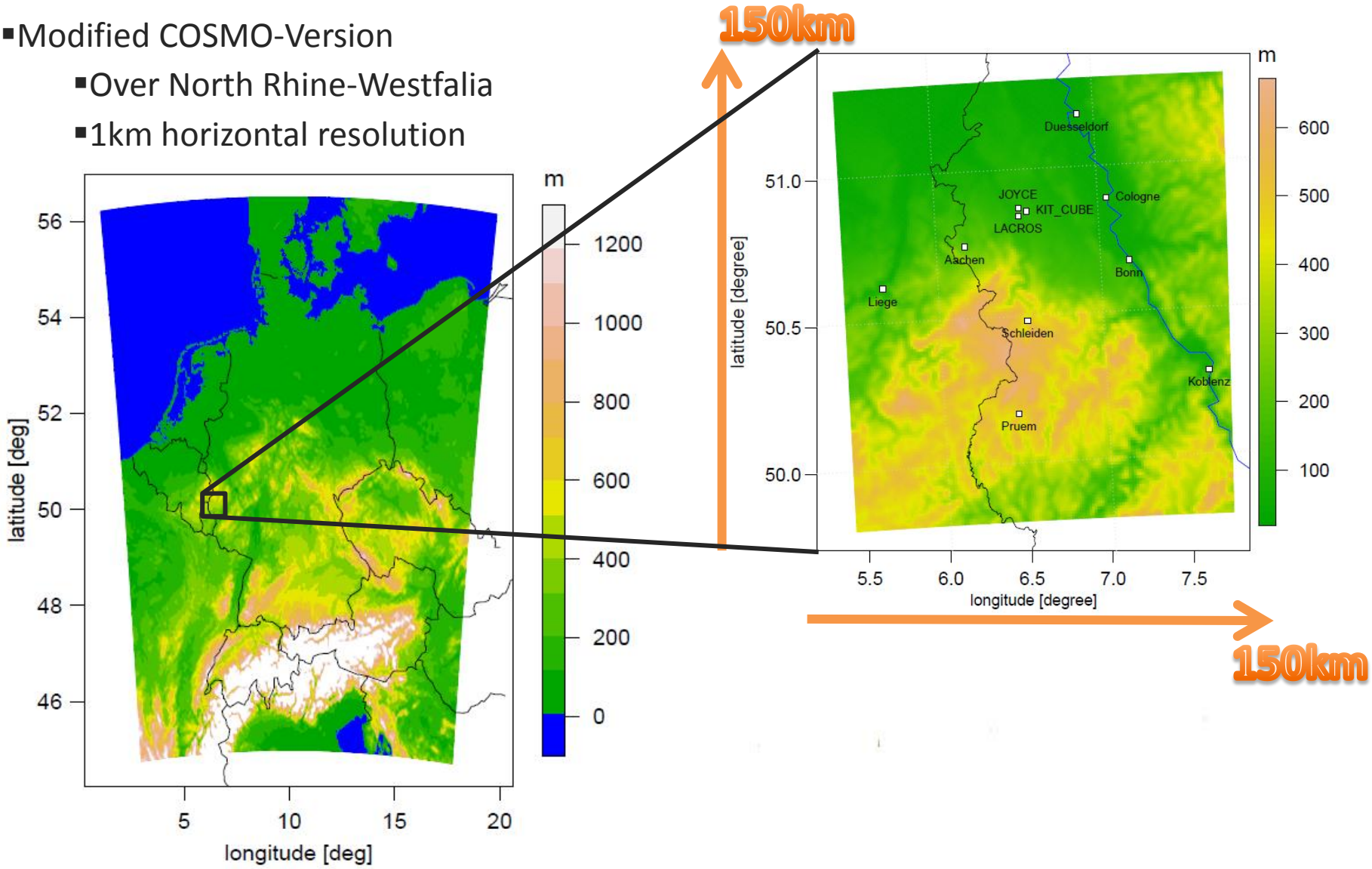
New verification methods



Source: Gilleland et al. (2009): Intercomparison of Spatial Forecast Verification Methods

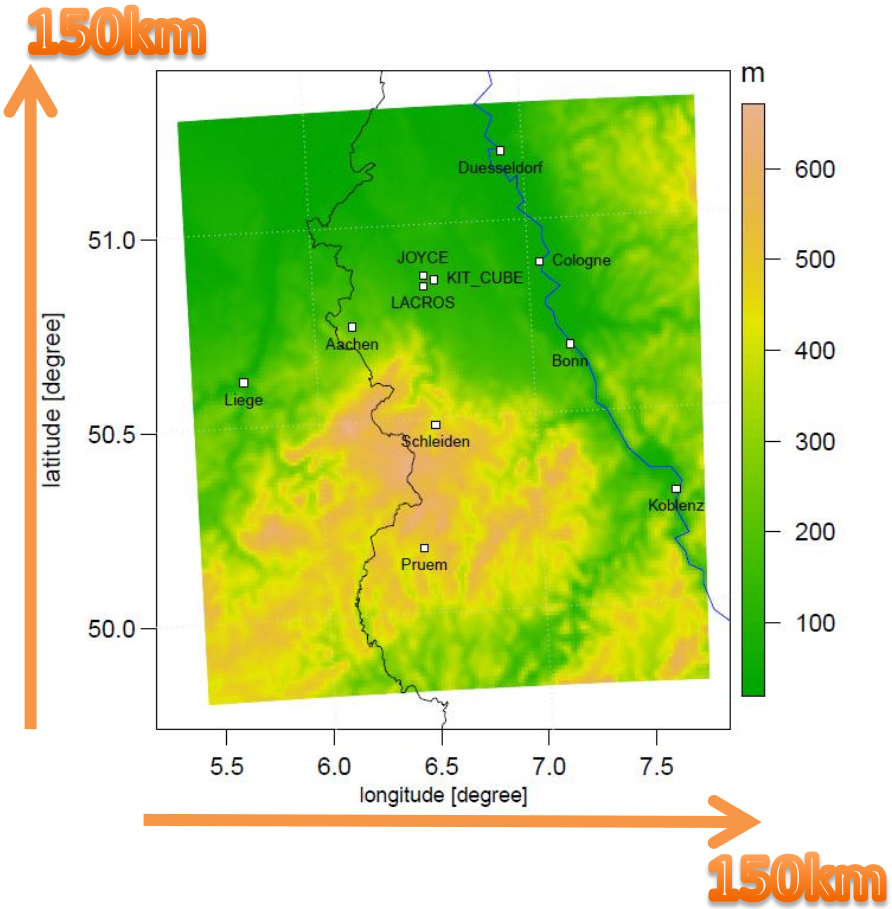
1 What is COSMO-NRW?

- Modified COSMO-Version
  - Over North Rhine-Westfalia
  - 1km horizontal resolution



1 What is COSMO-NRW?

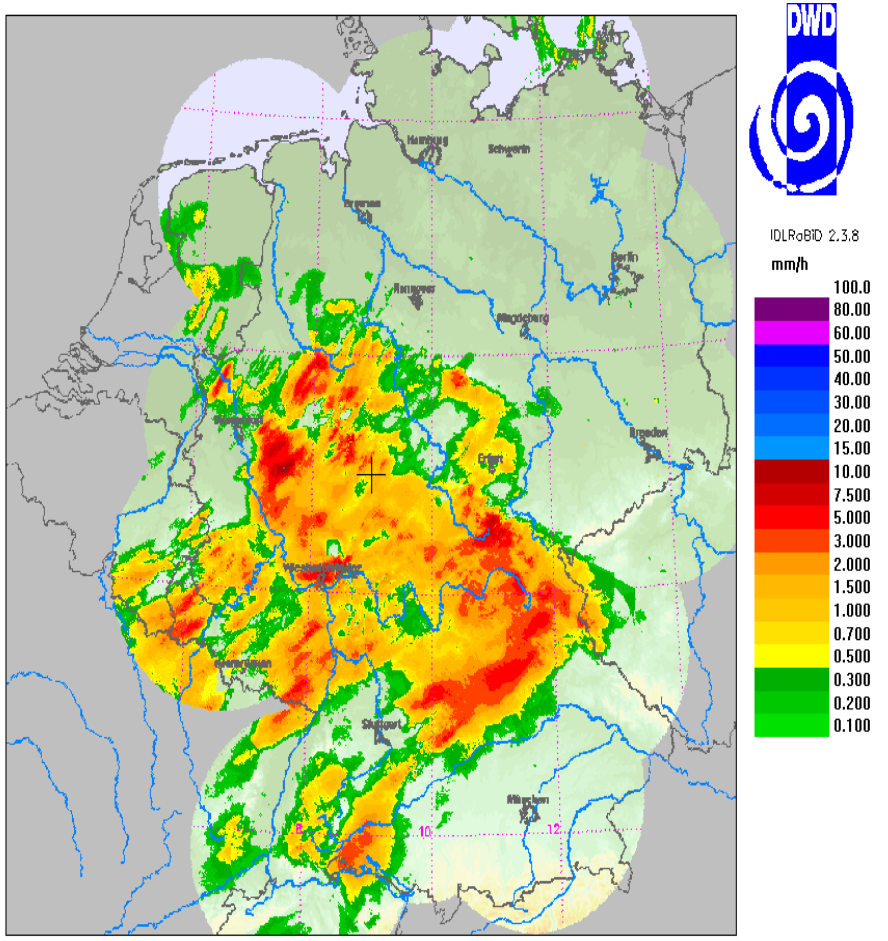
- Modified COSMO-Version
  - Over North Rhine-Westfalia
  - 1km horizontal resolution
- Initialisation: 00UTC
- Developed by University of Bonn / TR32
- Daily „operational“ since 2011
- Without data-assimilation
- Continous data set since march 2013
- Used for the HD(CP)2-HOPE-campaign



1 Observation: RADOLAN-Data

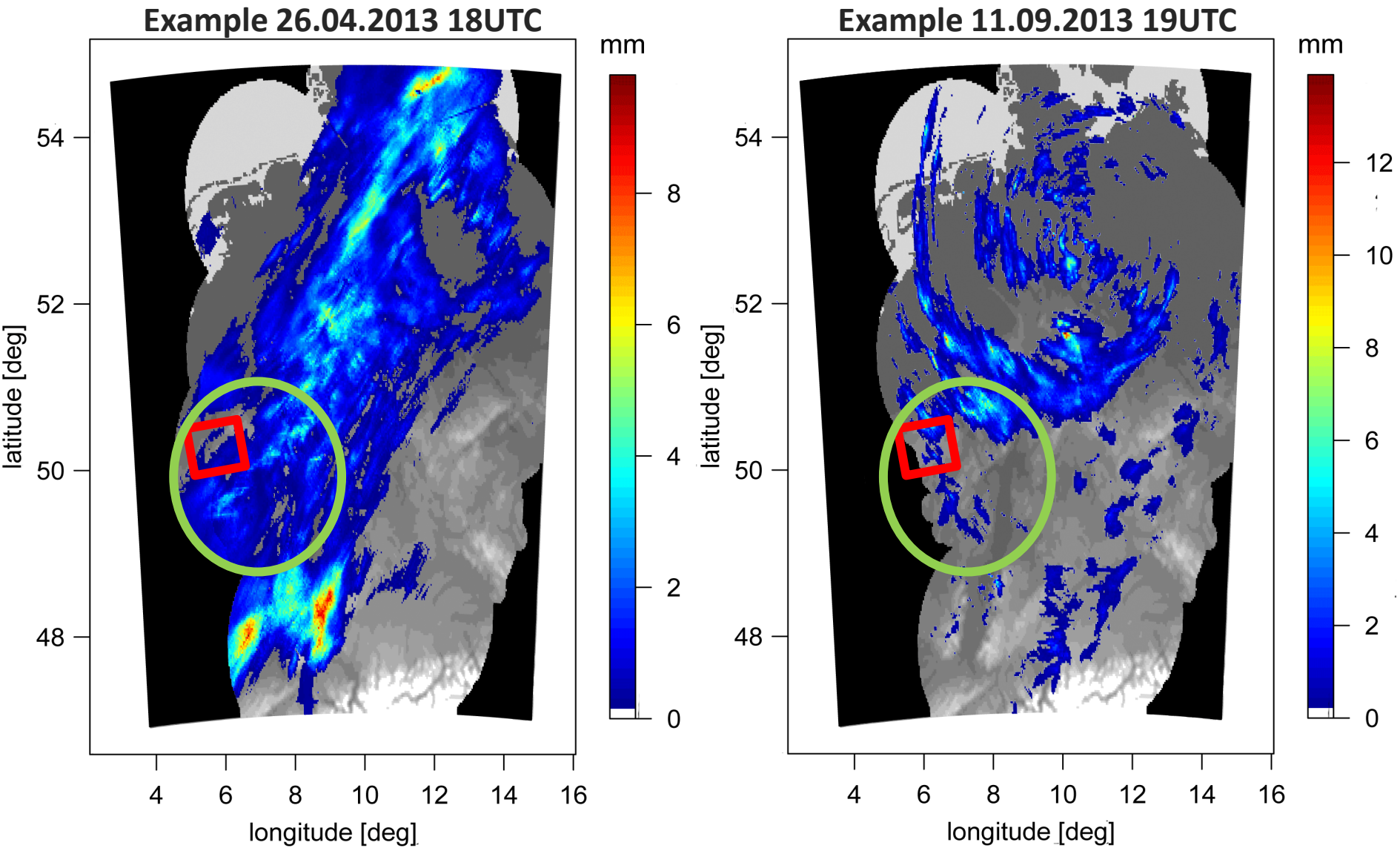
- RADOLAN (Radar-Online-Adjustment)
- Nearly complete Germany
- 1km horizontal resolution

- RW-product:
  - Radar-Composit adjusted on stations



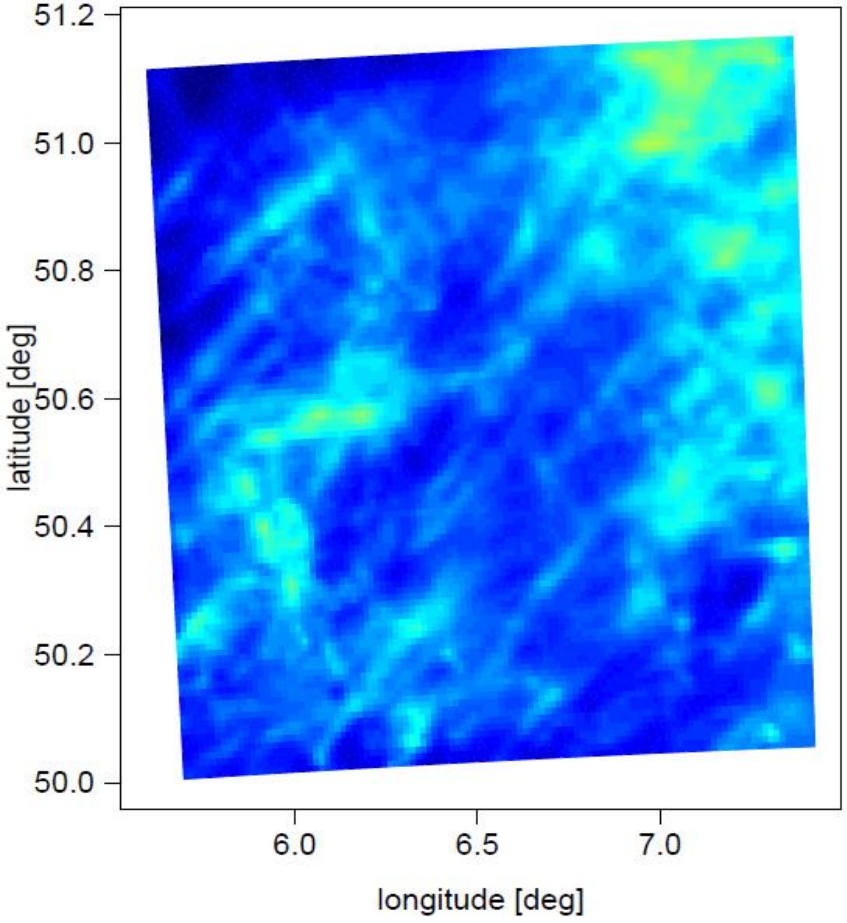
Source: www.dwd.de

1 Radar failure: Neuheilenbach out of order

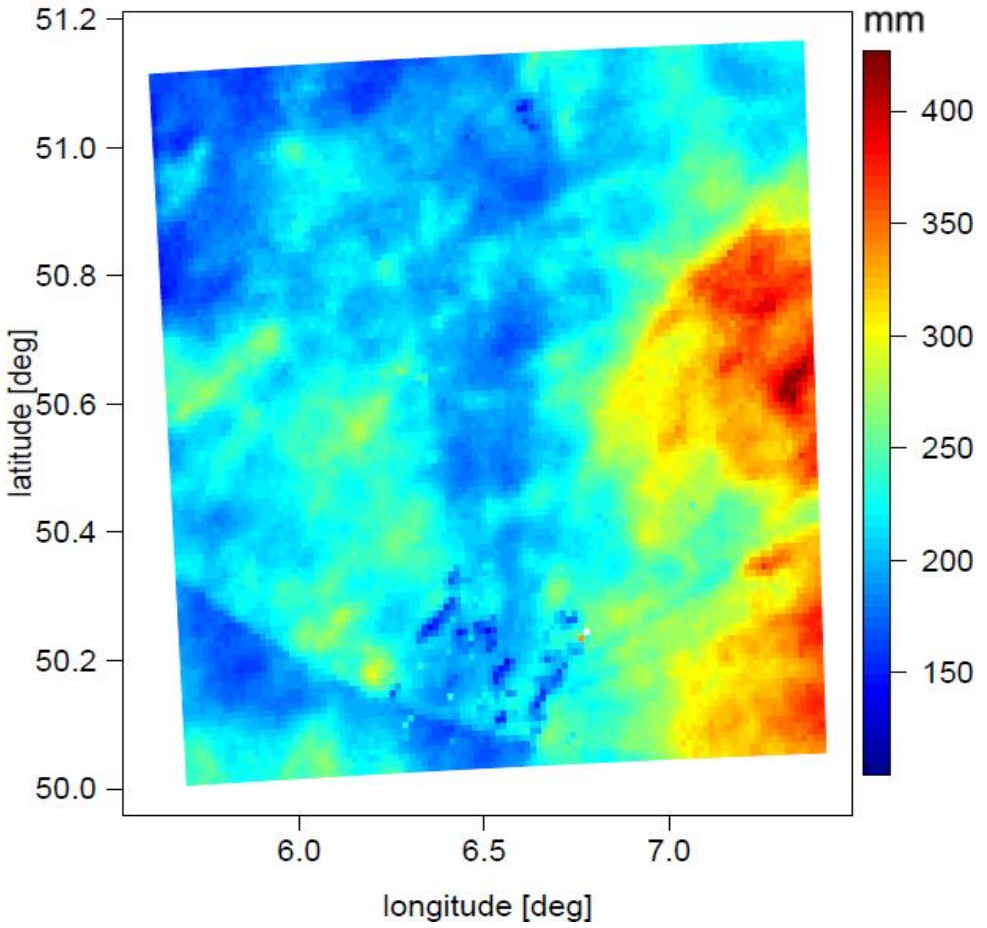


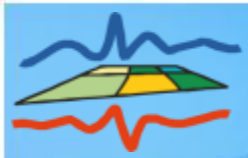
1 Accumulated precipitation April-August 2013

COSMO-NRW



RADOLAN RW-Product





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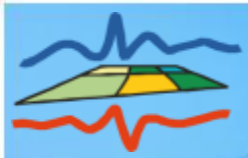
Verification of precipitation forecast based on the high-resolution NWP model, (COSMO-DE)



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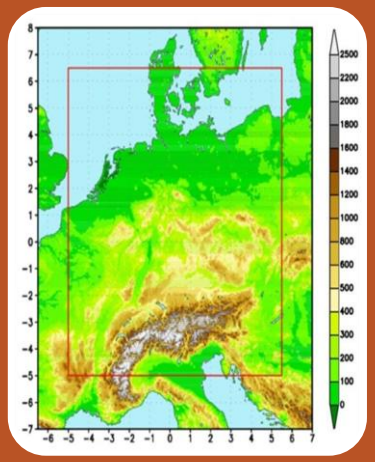
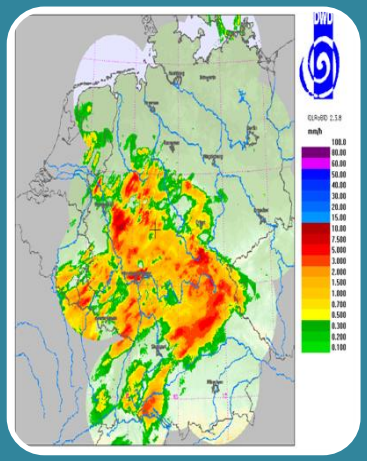
Verification of precipitation forecast based on the high-resolution NWP model, COSMO-DE

1 Used Data Set



COSMO-DE

- Operational version
- Initialisation 00UTC
- 2.8km horizontal resolution

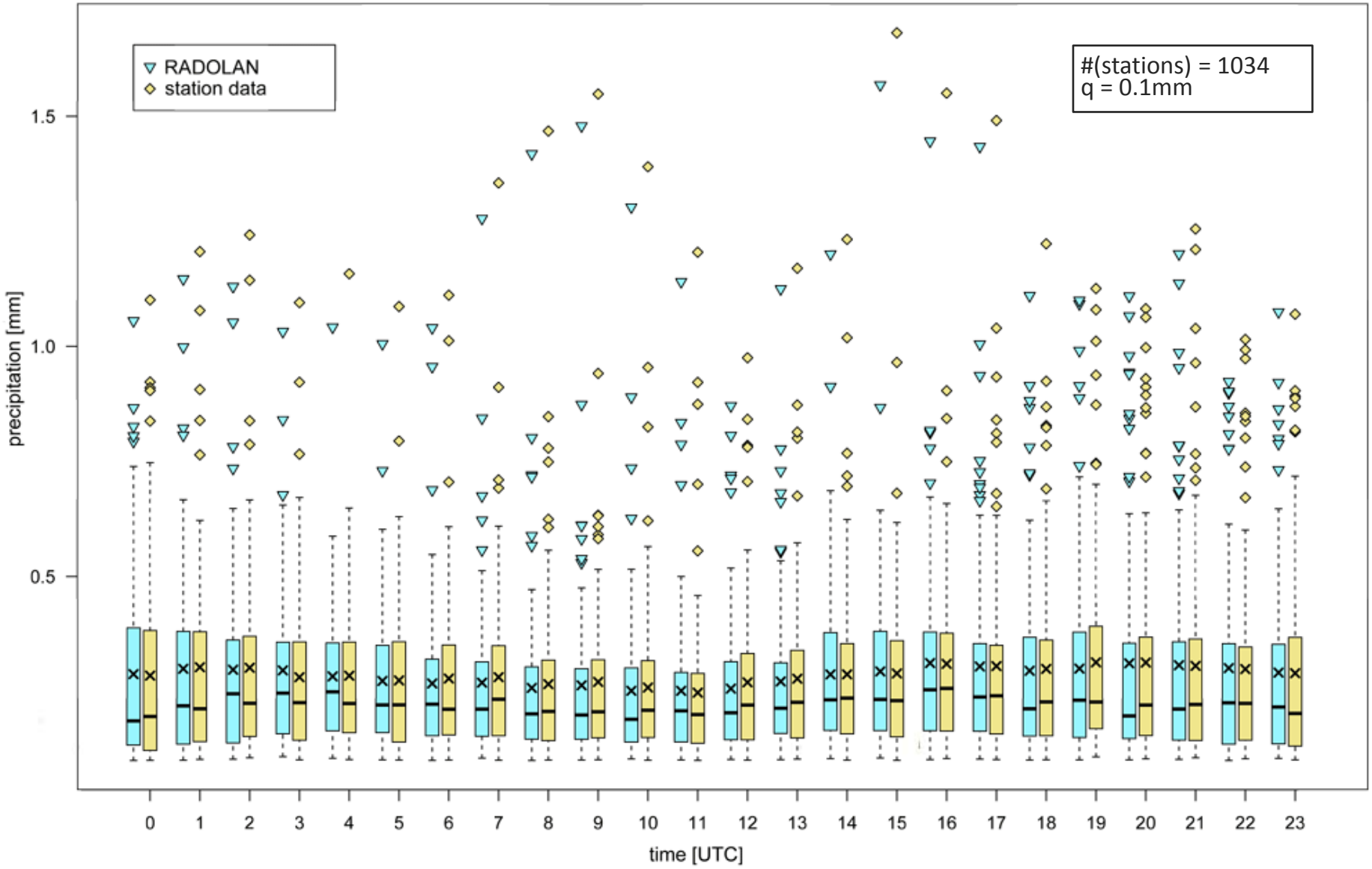


RADOLAN

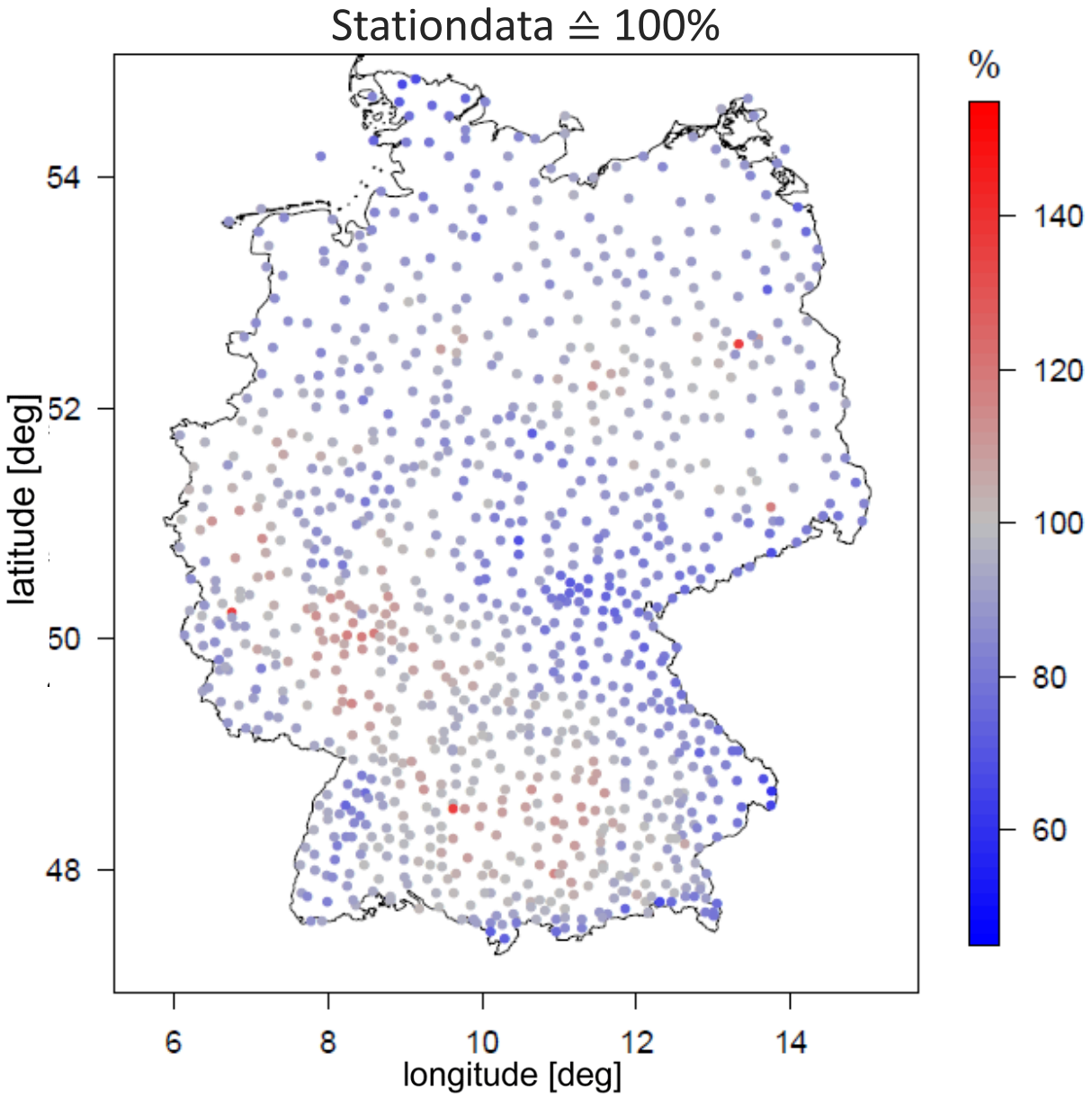
- RW-Product
- Jan-Dec 2011

Source: www.dwd.de

1 Averaged precipitation – diurnal variation year 2011

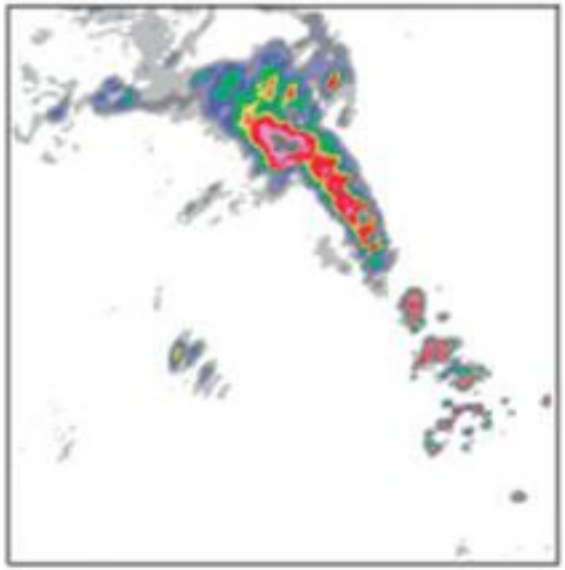


1 Sum year RADOLAN / Stationdata



2 Neighborhood-approach

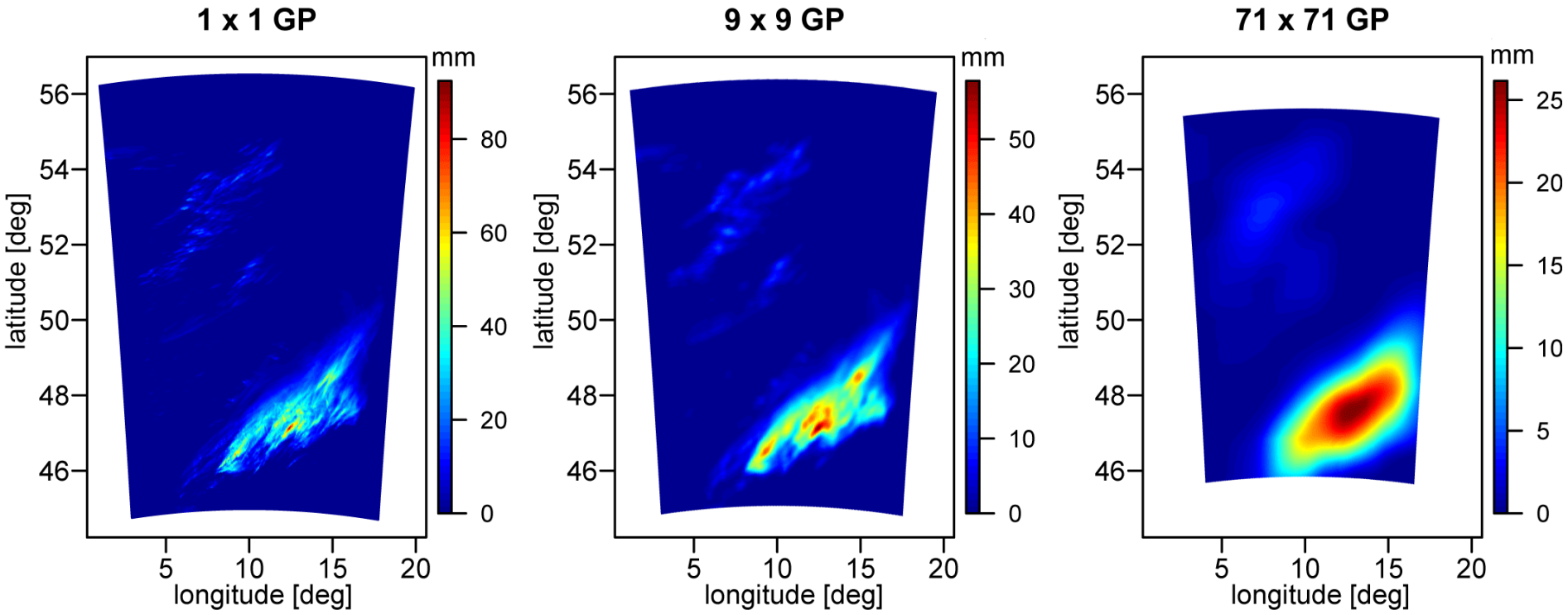
neighborhood



Source: Gilleland et al. (2009): Intercomparison of Spatial Forecast Verification Methods

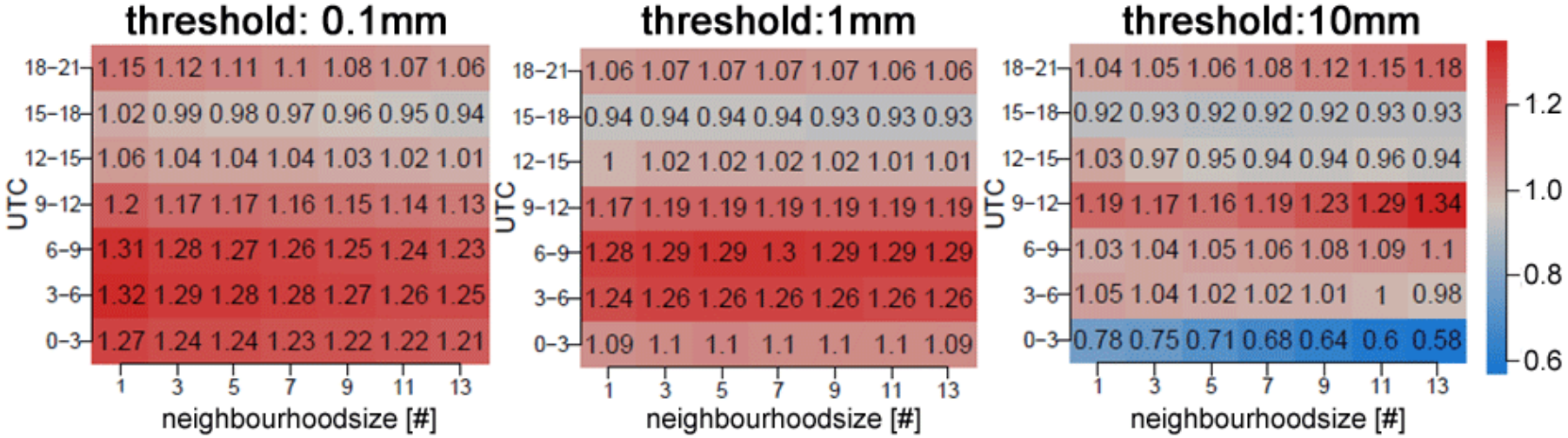
2 Neighborhood-approach

Example: 23.06.2011 (acc. 06-18UTC)

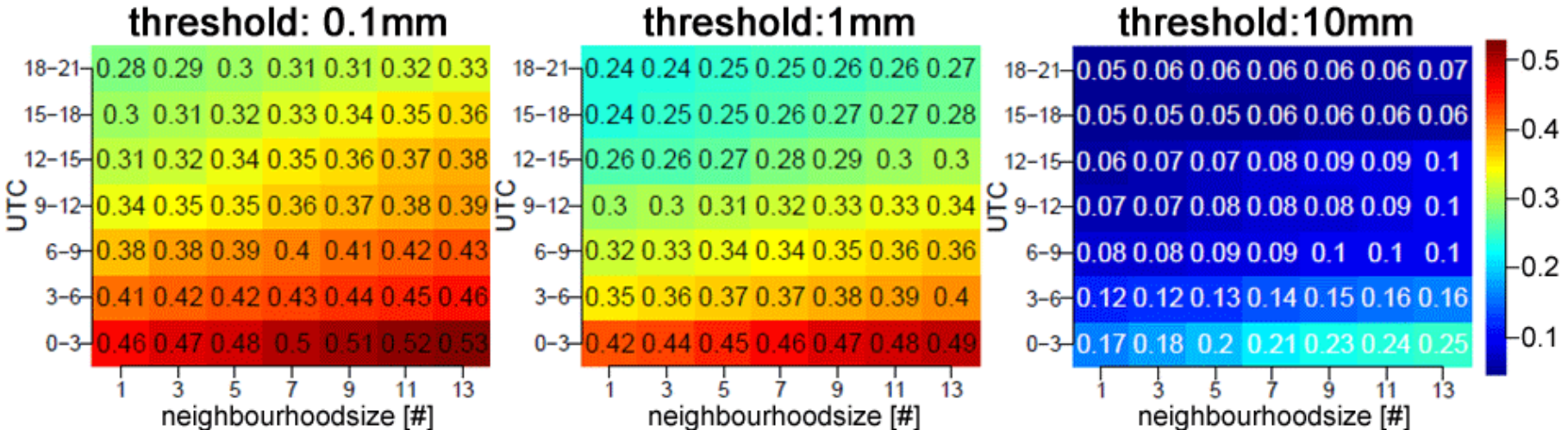


2 Scores COSMO-DE 00UTC year 2011 (3h acc.)

BIAS



ETS



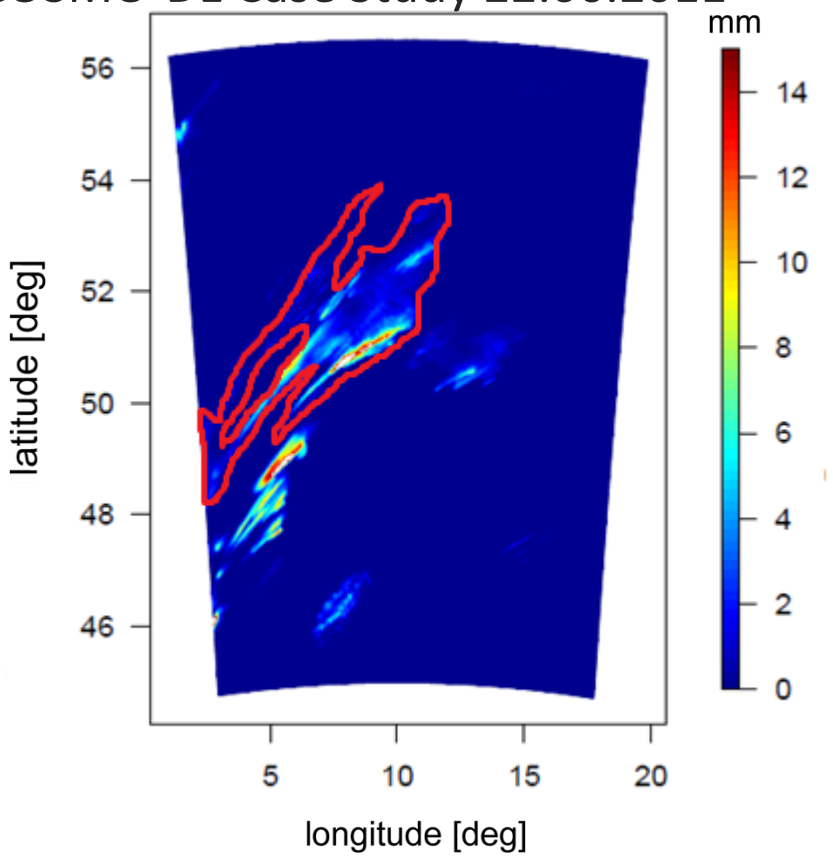
2 Feature-based approach

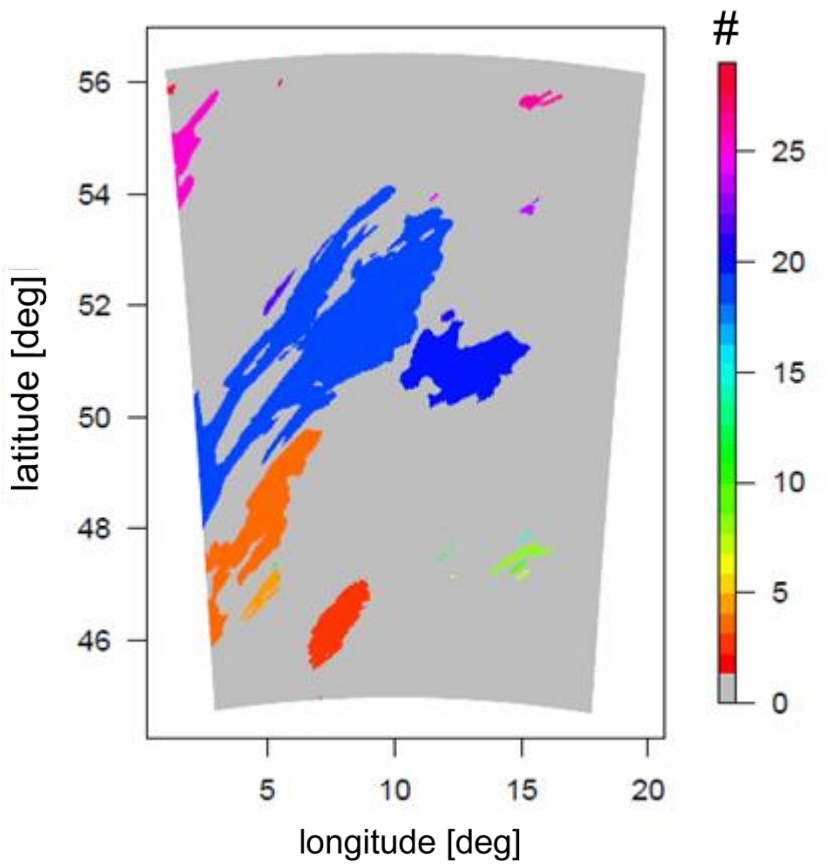
Source: Gilleland et al. (2009): Intercomparison of Spatial Forecast Verification Methods

2 Identification of Objects (Wernli et al., 2008; Zimmer, 2011)

$$R^* = f \cdot Q(R, 95) \qquad f \equiv 1/15$$

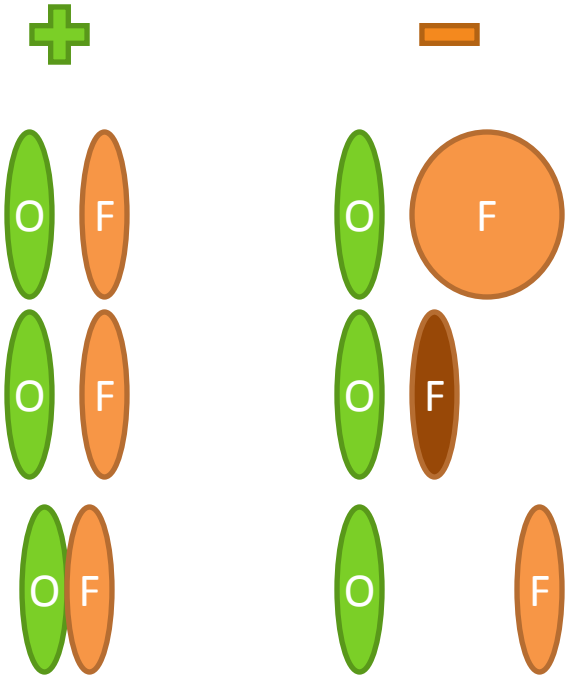
COSMO-DE Case Study 22.06.2011





2 Structure Amplitude Location (SAL)

- Method
  - Identification of objects
  - Structure component S
  - Amplitude component A
  - Location component L



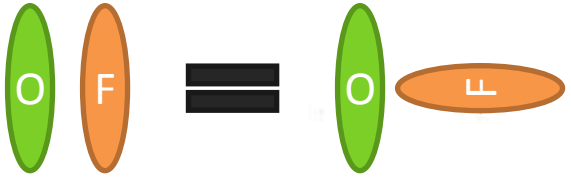
Range

[-2..+2]

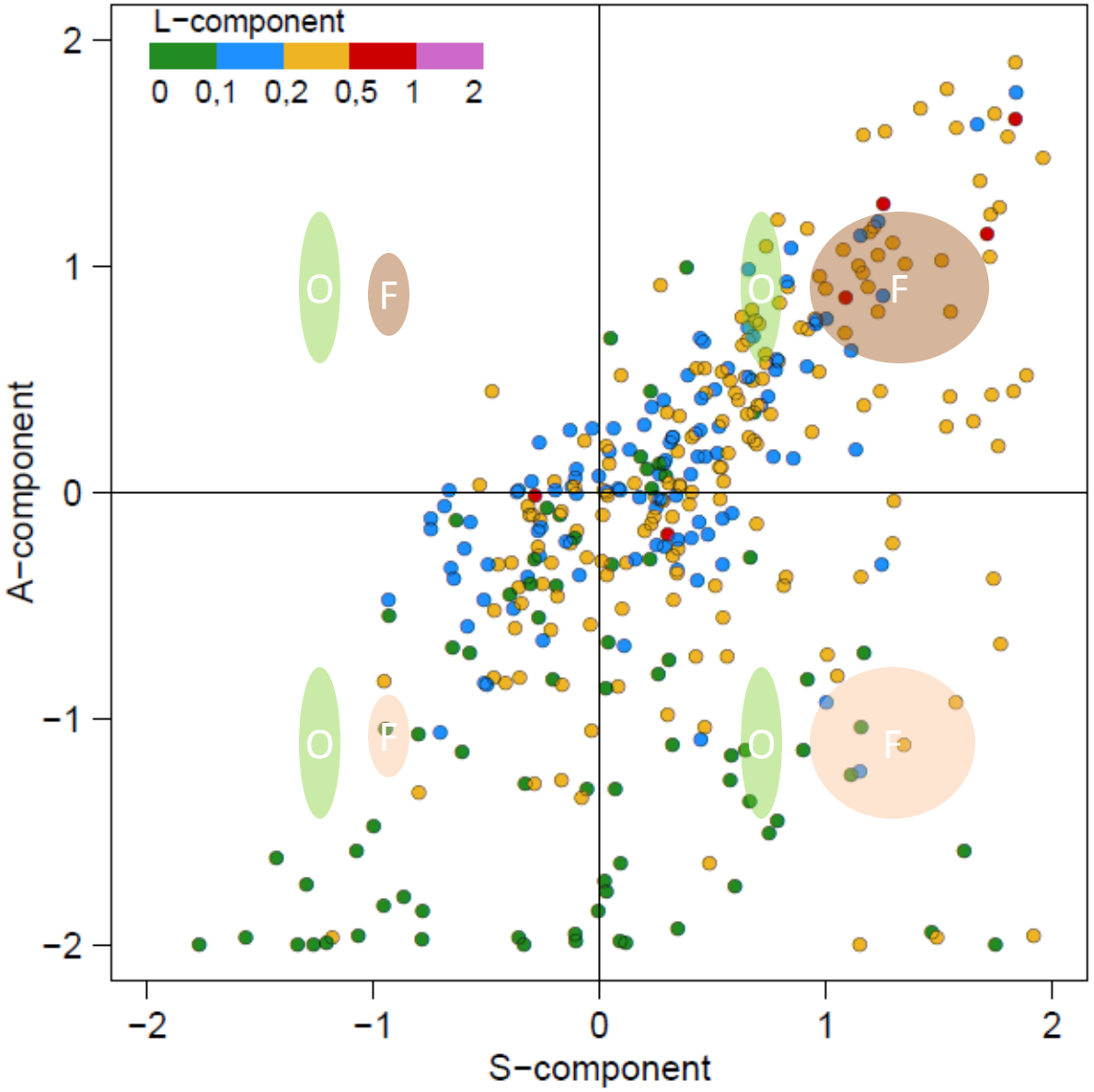
[-2..+2]

[0..+2]

- perfect value = 0
- Problem:

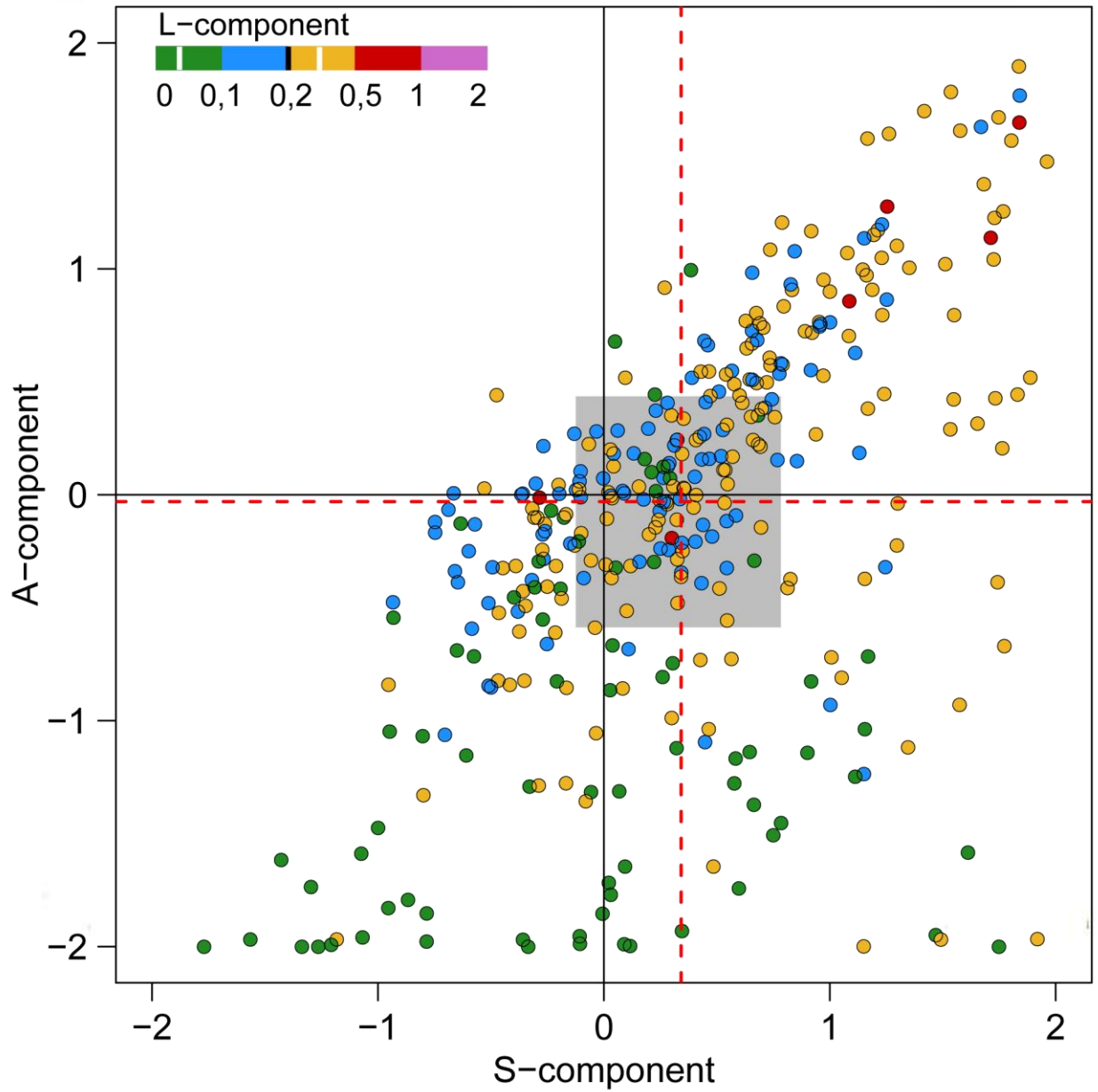


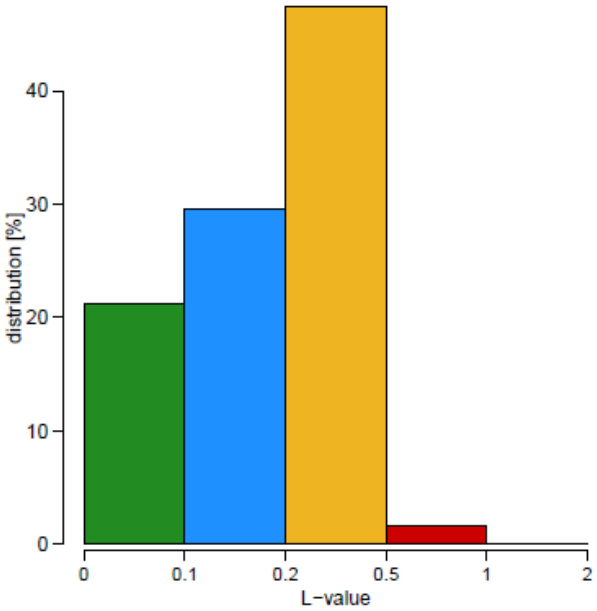
2 SAL-value daily mean year 2011 (3h acc.)



CT	OY	ON
FY	358	2
FN	3	2

2 SAL-value daily mean year 2011 (3h acc.)

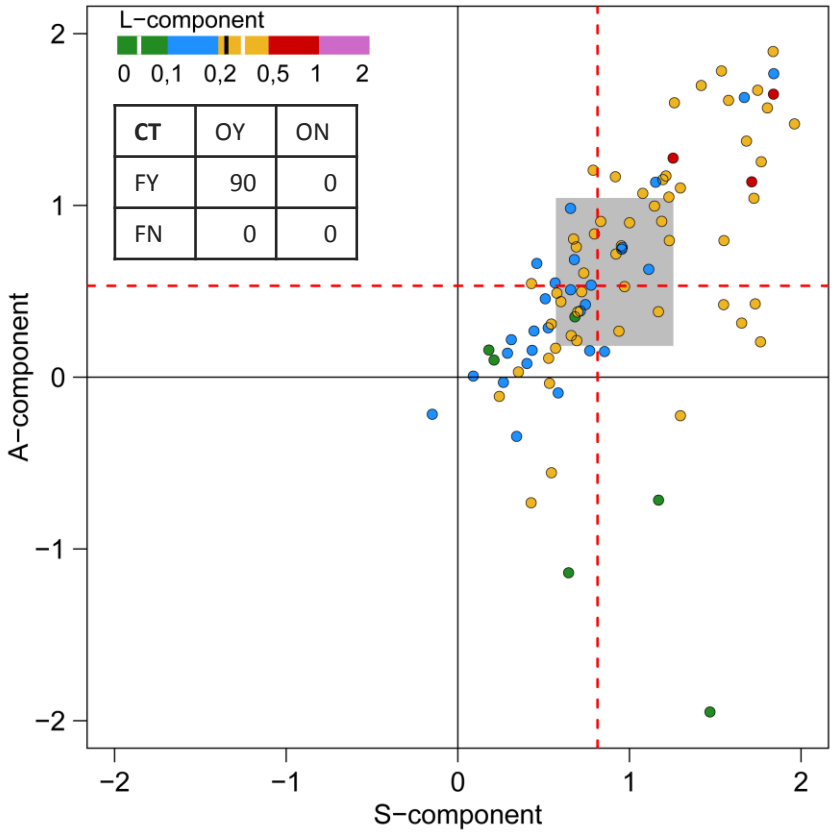


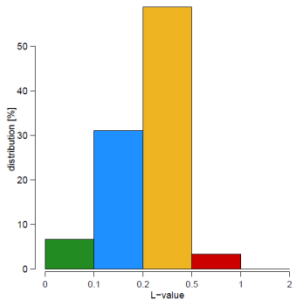


CT	OY	ON
FY	358	1
FN	3	3

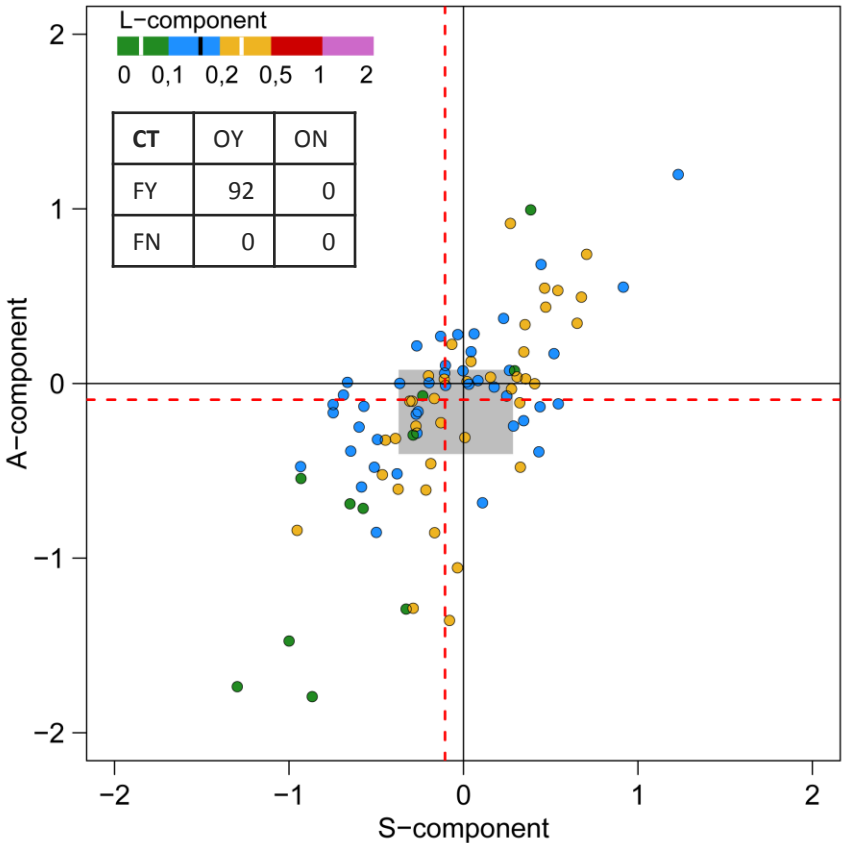
2 Seasonal SAL-values daily mean 2011 (3h acc.)

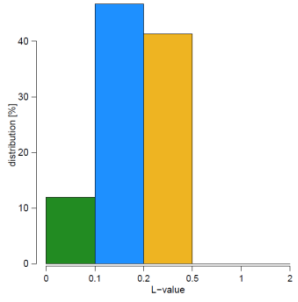
winter (DJF)





summer (JJA)





3 Conclusion

RADOLAN

- Introduced as verification-dataset

two verification methods

neighborhood method

- deterioration in time

feature-based method (SAL)

- Overestimation of S; A fits well
- seasonal differences

Thank you for your attention

The authors thank the German Meteorological Service (DWD) for providing the COSMO model and the RADOLAN data set. We gratefully acknowledge financial support from SFB/TR32 “Patterns in Soil-Vegetation-Atmosphere Systems: Monitoring, Modelling and Data Assimilation“ funded by the Deutsche Forschungsgemeinschaft (DFG).