The convection-permitting COSMO-DE-EPS and PEPS at DWD

Detlev Majewski based on

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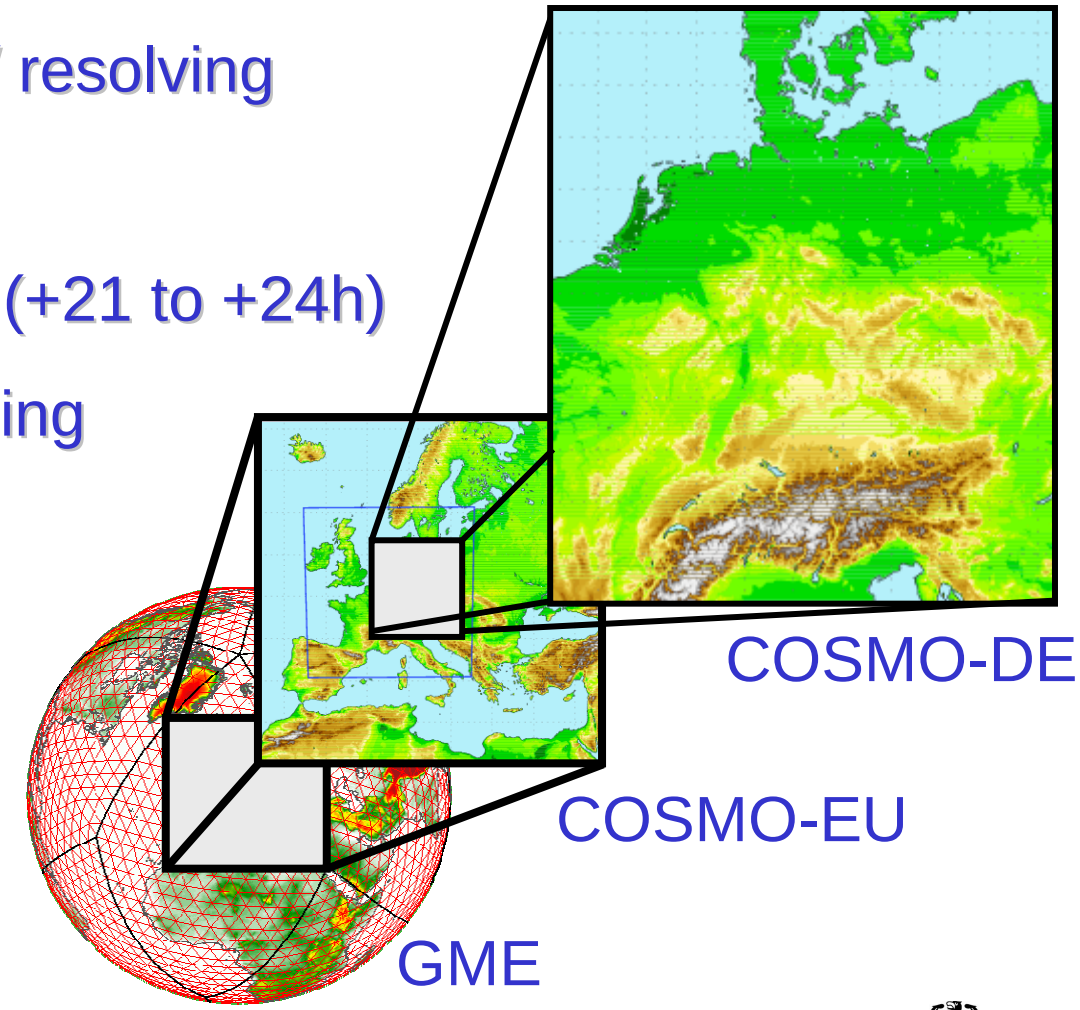
Deutscher Wetterdienst

The model COSMO-DE

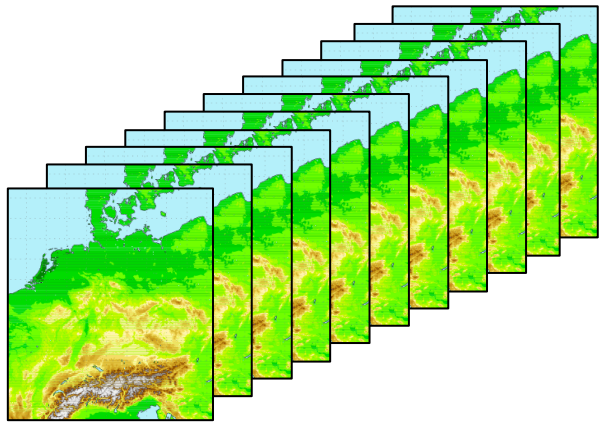
2.8 km grid-spacing
→ convection-permitting / resolving

- 50 vertical levels
- very short-range forecast (+21 to +24h)
- cloud microphysics including graupel, snow, and rain
- assimilation of radar data
- operational at DWD since April 2007

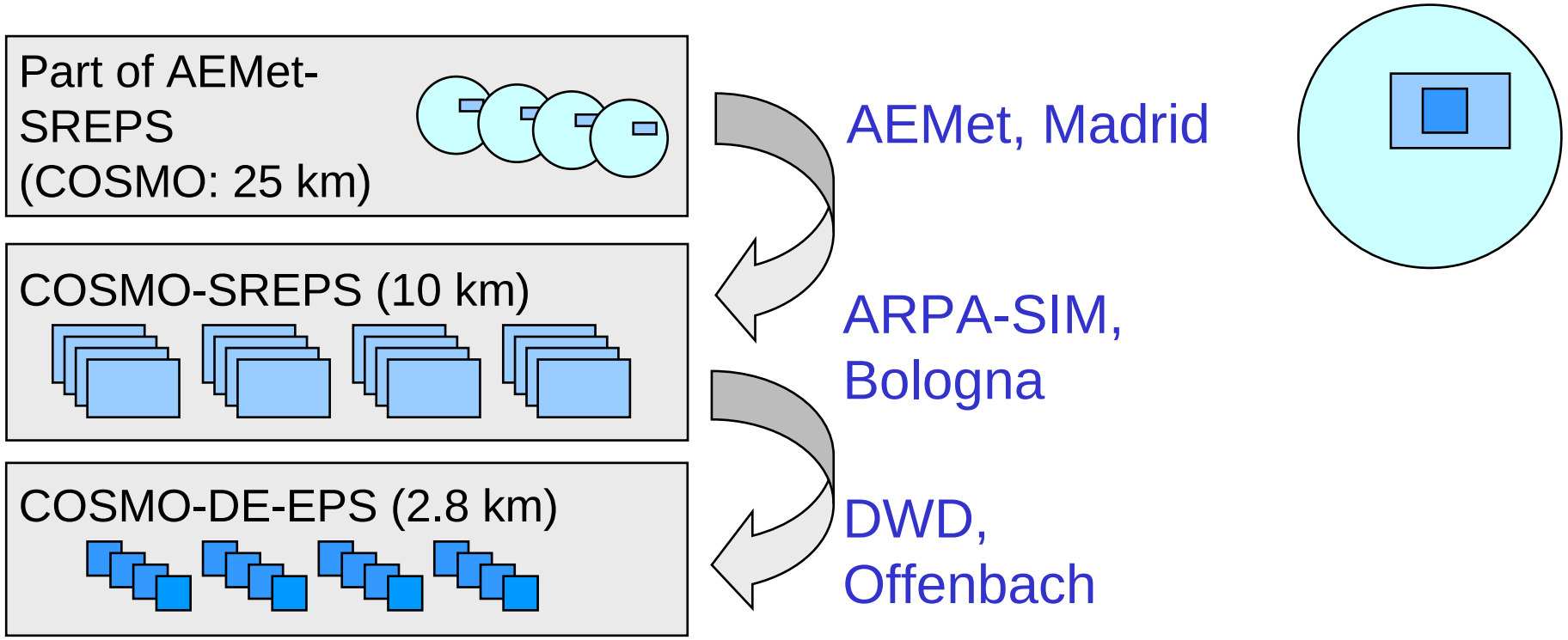


Perturbation strategy: model uncertainties

- each ensemble member runs with a different (fixed) configuration of model physics
- modifications of parameters in parameterization schemes
- strategy 1: one perturbed parameter per member
- strategy 2: combination of perturbations in each member
- set of slightly different model versions



Perturbation strategy: boundary conditions



Ensemble experiments performed so far

„single“

4 boundary conditions

5 physics perturbations

→ one pert. per member

July 2008 (daily)

00 UTC for 24 hours

„combined“

4 boundary conditions

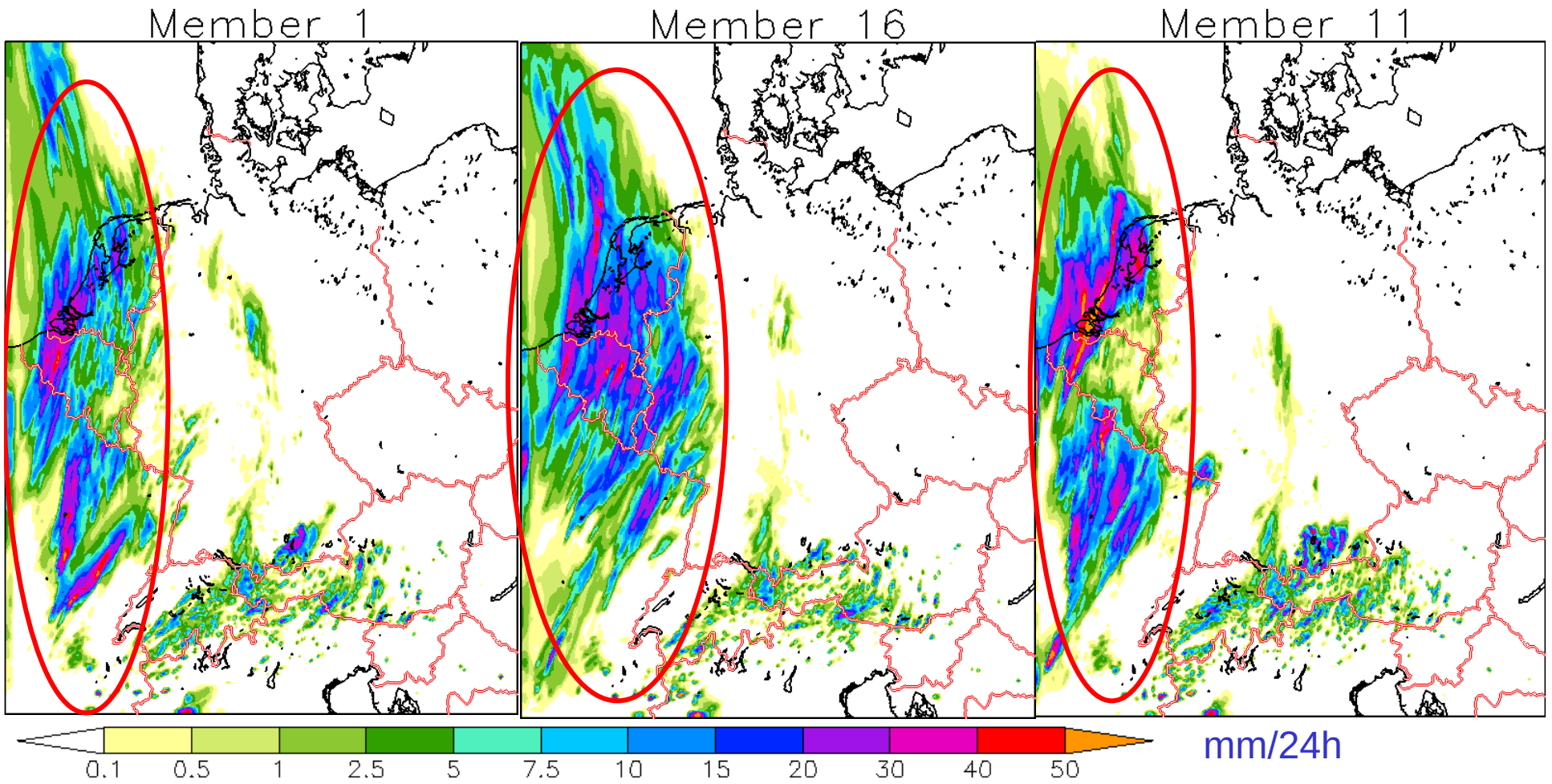
5 groups of physics perturbations

→ one group per member

July 2008 (daily)

00 UTC for 24 hours

24-h precipitation, 2 July 2007, different boundary conditions, identical physics perturbation



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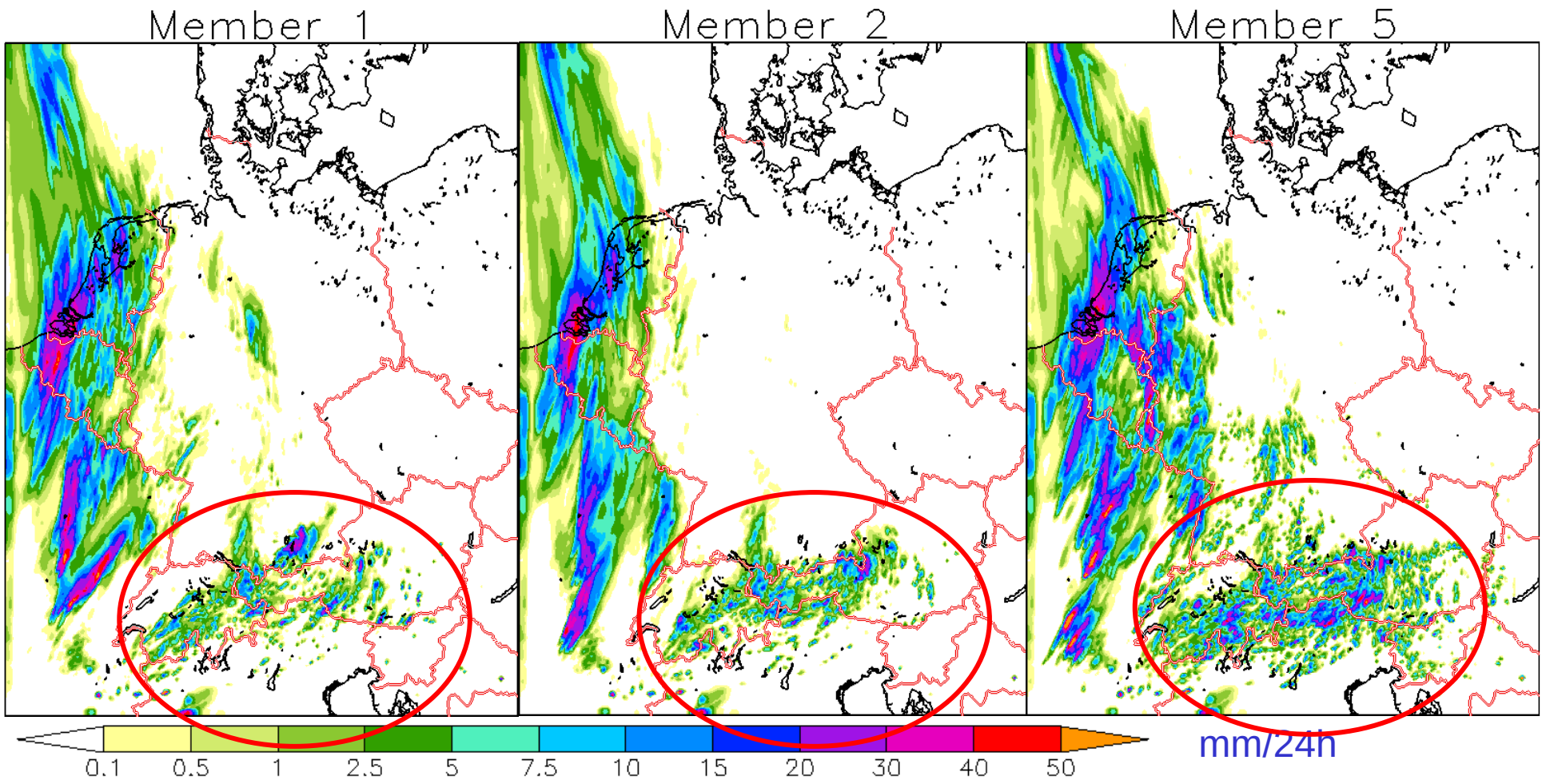
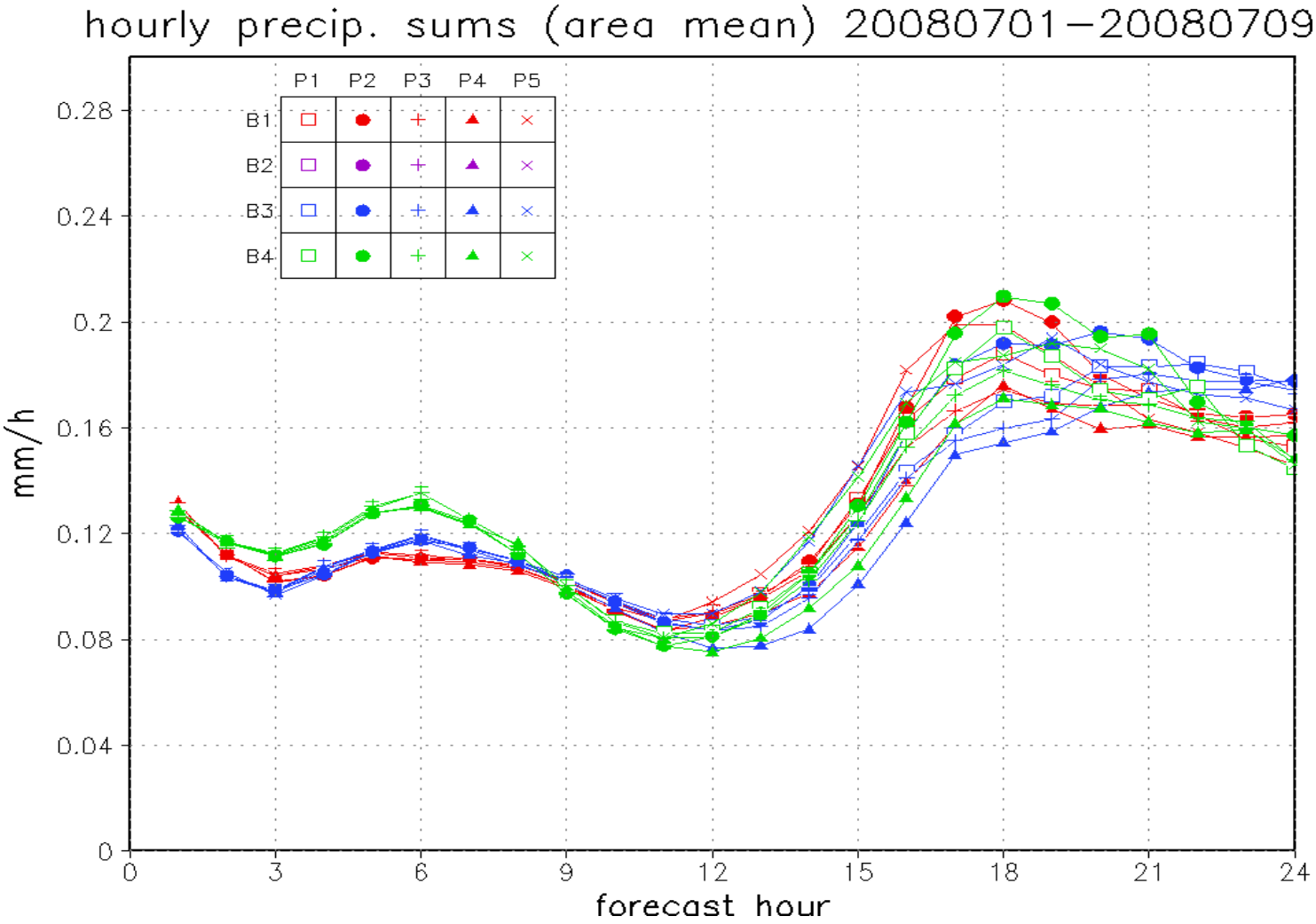
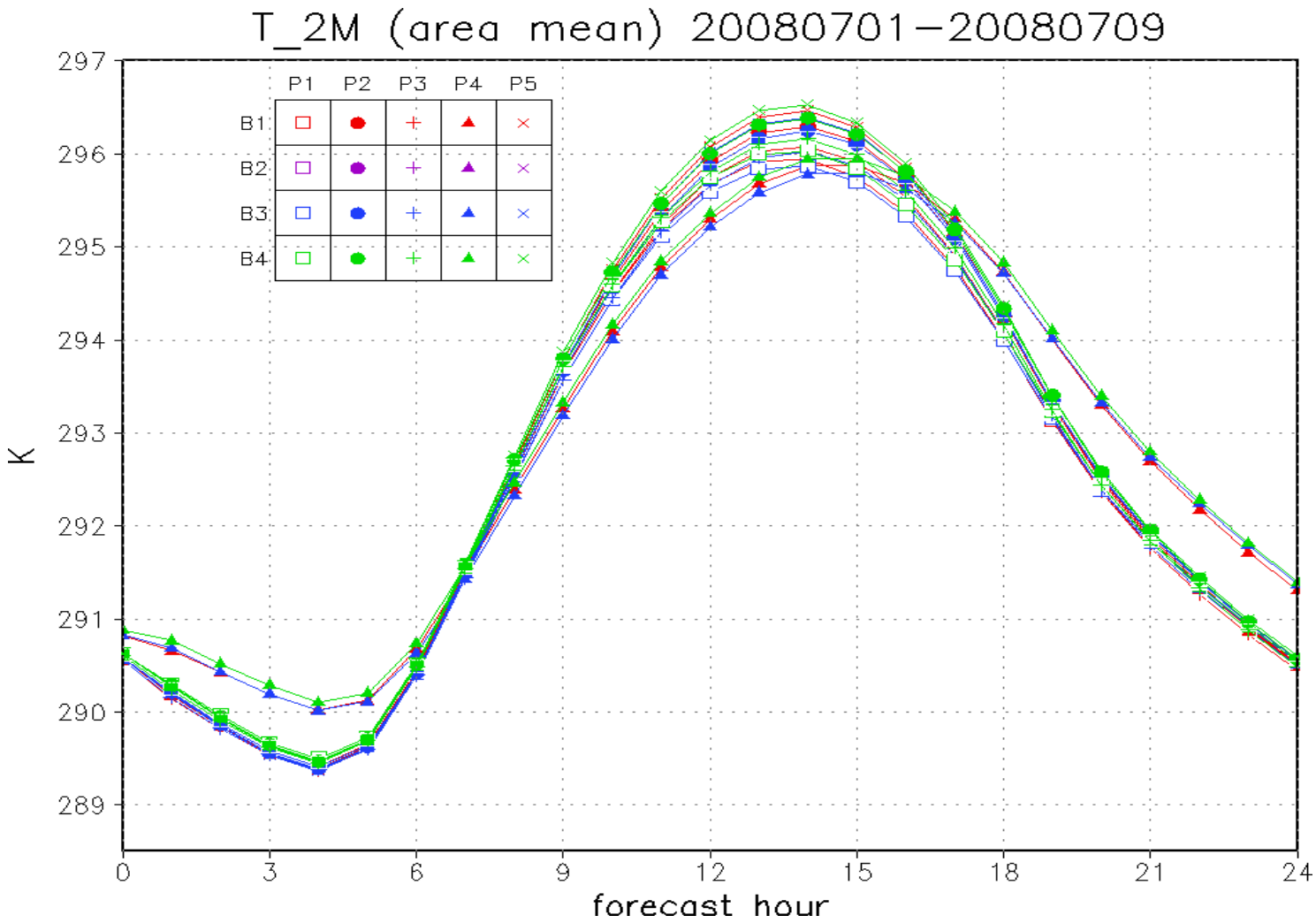


Hourly precipitation, spatial and temporal mean



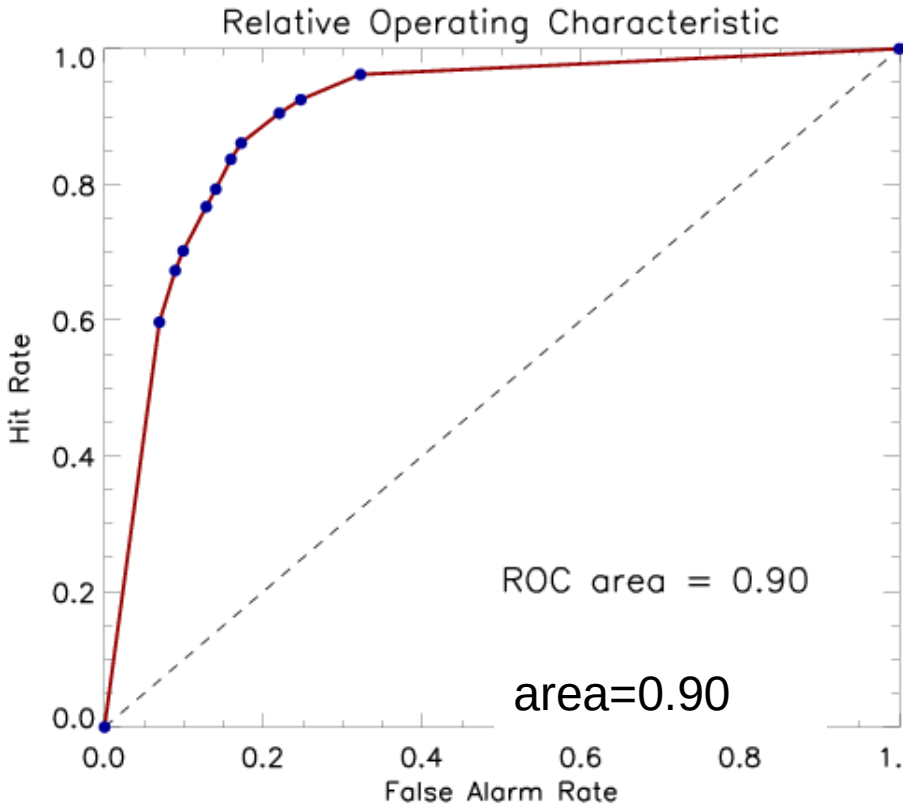
2m-temperature, spatial and temporal mean



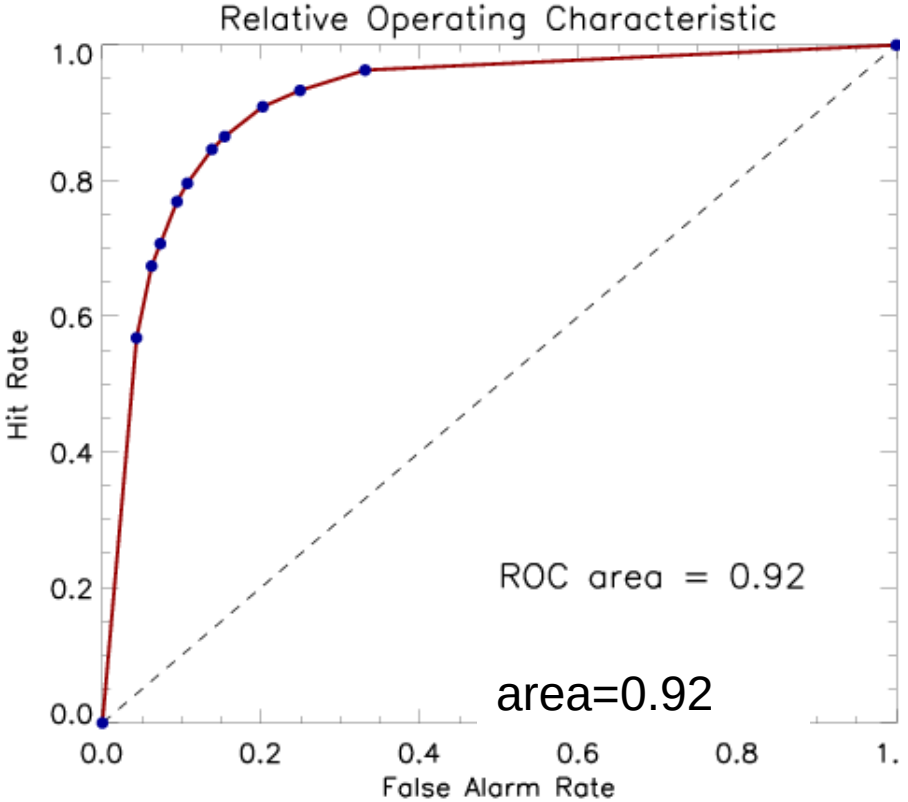
Verification results for 24-h precipitation

threshold: 1mm/24h

„single“



„combined“



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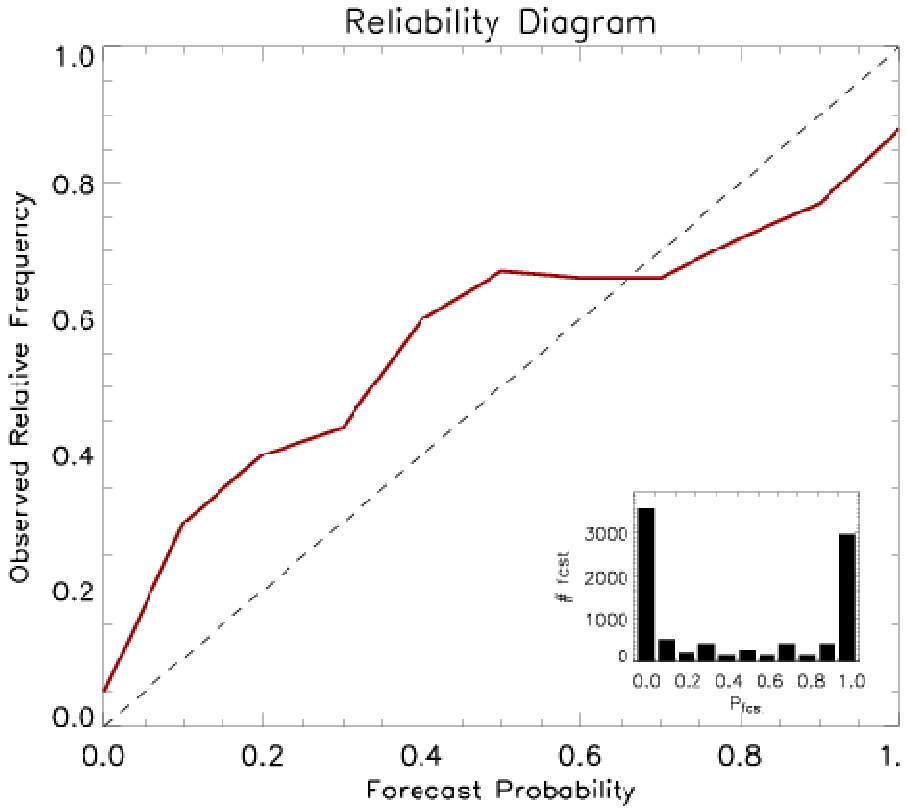

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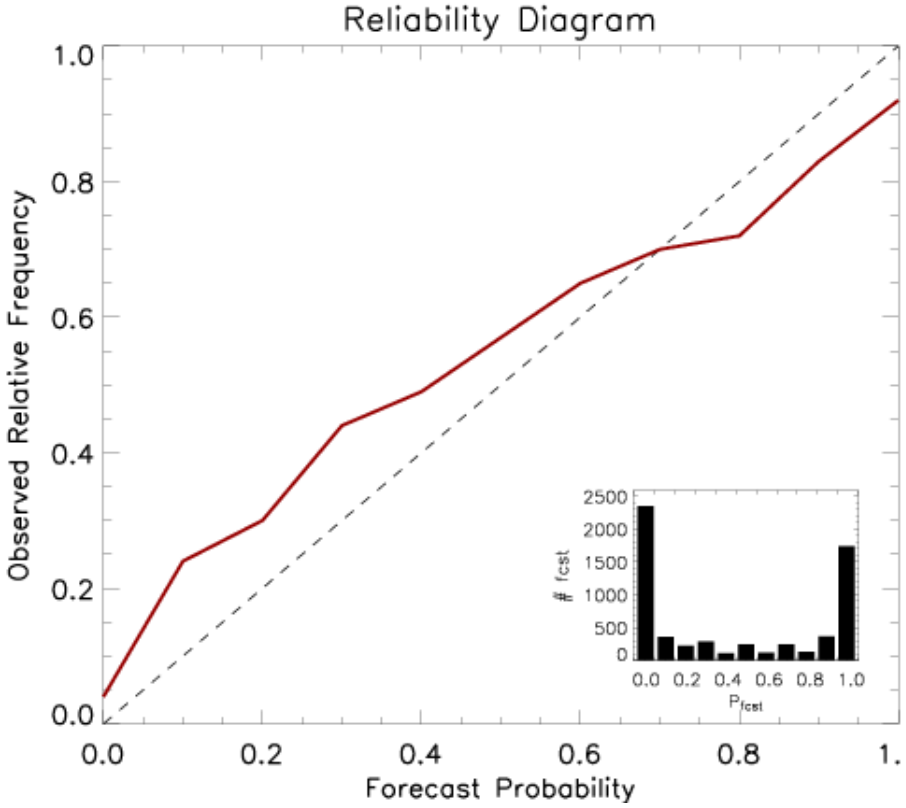


Perturbation strategy: initial conditions

- Plan: Ensemble Transform Kalman filter to be developed in COSMO (project KENDA)
- in between: perturb parameters of the COSMO nudging scheme

$$\frac{\partial}{\partial t} y(x,t) = F(y,x,t) + G_y \cdot \sum_{k_{obs}} W_k(x,t)\left[y_k^{obs} - y(x_k,t)\right]$$

- correlation length of observation increments
- geostrophic balance
- divergent flow correlations

Outlook

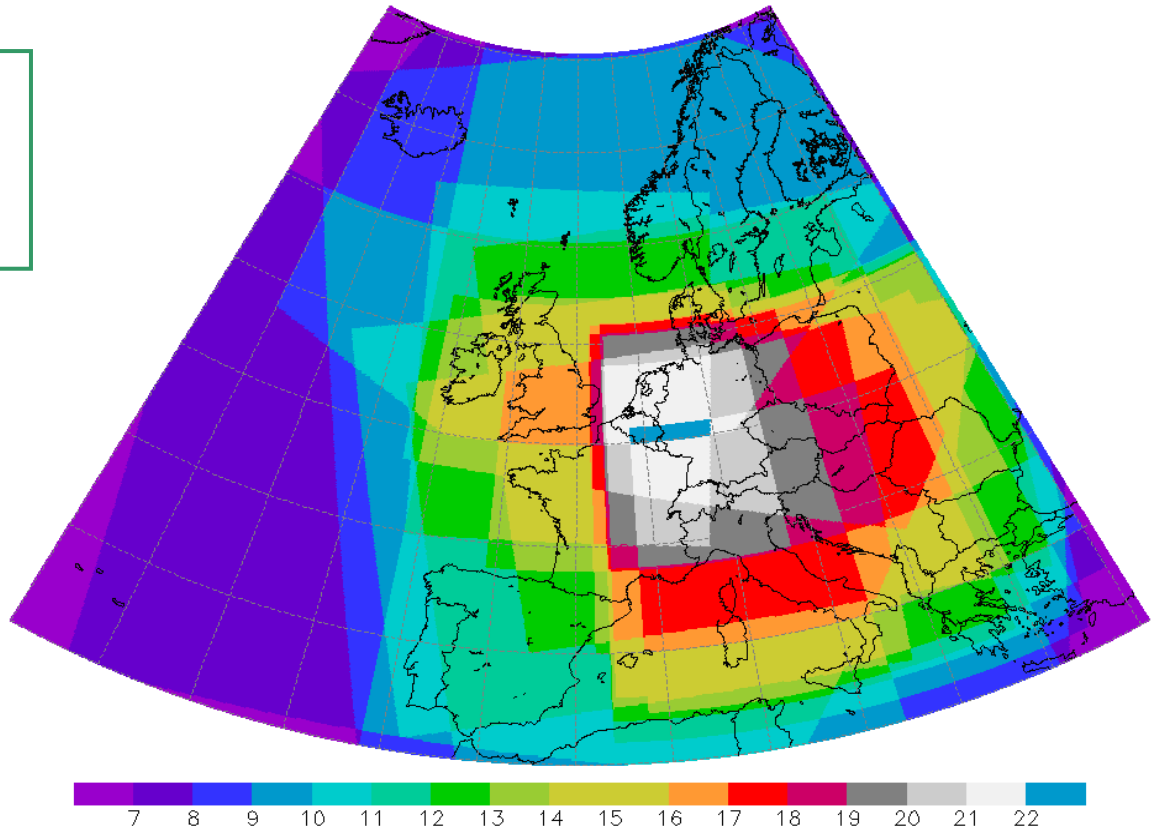
- tuning of the physics perturbations
- calibration of the ensemble
- intensify work on initial conditions

Use of SRNWP-PEPS in Research

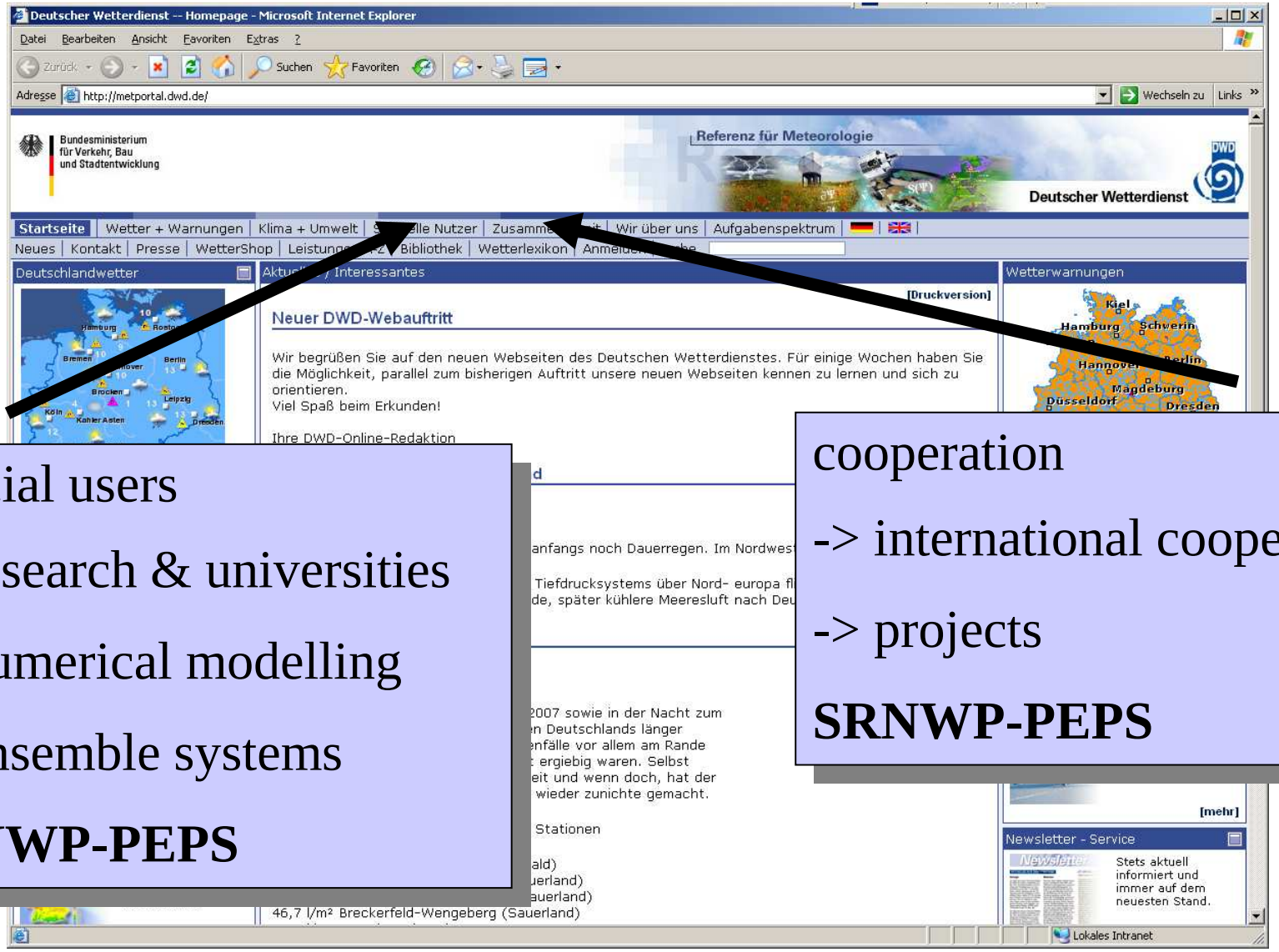
- **Calibration using Bayesian Model Averaging** (Frans Alkemade, KNMI)
- **Comparison of SRNWP-PEPS and INM-SREPS using high resolution precipitation observations** (Carlos Santos, INM)
- **Investigating the Performance of PEPS products for daily weather forecasts in Austria** (Harald Seidl, ZAMG)
- **Calibration and Verification** (Michael Denhard, DWD)
- **Eurorisk Preview Windstorms**
- **Windpower Prediction**
  BMU research project with energy & meteo systems GmbH
- **MAP D-Phase**
- **Hydrological ensemble forecasting (MULDE)**
  BMBF reseach project related to the Elbe flood 2002
- **TIGGE-LAM archive at ECMWF**

Meteorological Service	Regional Model	Coupling Model	Resolution (km)	Forecast Period (h)	Time Interval (h)	Main Runs (UTC)
Belgium	ALADIN-BE	ARPEGE	15	+60	1	0, 12
France	ALADIN	ARPEGE	11	+48	3	0, 12
Portugal	ALADIN-PT	ARPEGE	12.7	+48	1	0, 12
Austria	ALADIN-AT	ARPEGE	9.6	+48	1	0, 12
Croatia	ALADIN-LACE	ARPEGE	9	+72	3	0, 12
Czech. Repub.	ALADIN-LACE	ARPEGE	11	+48	1	0, 3, 12, 18
Hungary	ALADIN-LACE	ARPEGE	11	+48	1	0, 12
Slovakia	ALADIN-LACE	ARPEGE	11	+48	3	0, 12
Slovenia	ALADIN-LACE	ARPEGE	9.4	+48	3	0, 12
Denmark	HIRLAM	ECMWF	16	+60	1	0, 3, 12, 18
Finland	HIRLAM	ECMWF	22	+54	1	0, 3, 12, 18
Spain	HIRLAM	ECMWF	18	+48	1	0, 3, 12, 18
Netherlands	HIRLAM	ECMWF	22	+48	1	0, 3, 12, 18
Ireland	HIRLAM	ECMWF	16	+48	3	0, 3, 12, 18
Norway I	HIRLAM	ECMWF	11	+30	1	0, 12
Norway II	HIRLAM	ECMWF	22	+30	1	0, 12
Sweden I	HIRLAM	ECMWF	11	+48	3	0, 3, 12, 18
Sweden II	HIRLAM	ECMWF	22	+48	3	0, 3, 12, 18
Germany	LME	GME	7	+78	1	0, 3, 12, 18
Switzerland	aLMo	ECMWF	7	+72	1	0, 12
Poland	LM	GME	14	+72	3	0, 12
Italy	EuroLM	EuroHRM	7	+48	3	0, 12
United Kingdom	UM-EU	UM global	12	+48	3	0, 3, 12, 18

PEPS-Grid
with a grid spacing of
0.0625˚ (~7 km)
covering Europe



the precision of the estimated probabilities depend on location



Special users

-> research & universities

-> numerical modelling

-> ensemble systems

SRNWP-PEPS

cooperation

-> international cooperation

-> projects

SRNWP-PEPS

You can get access to the daily SRNWP-PEPS forecasts. Please contact:

Michael.Denhard@dwd.de Sebastian.Trepte@dwd.de or Bernd.Frey@dwd.de