



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

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M. Denhard**

Deutscher Wetterdienst

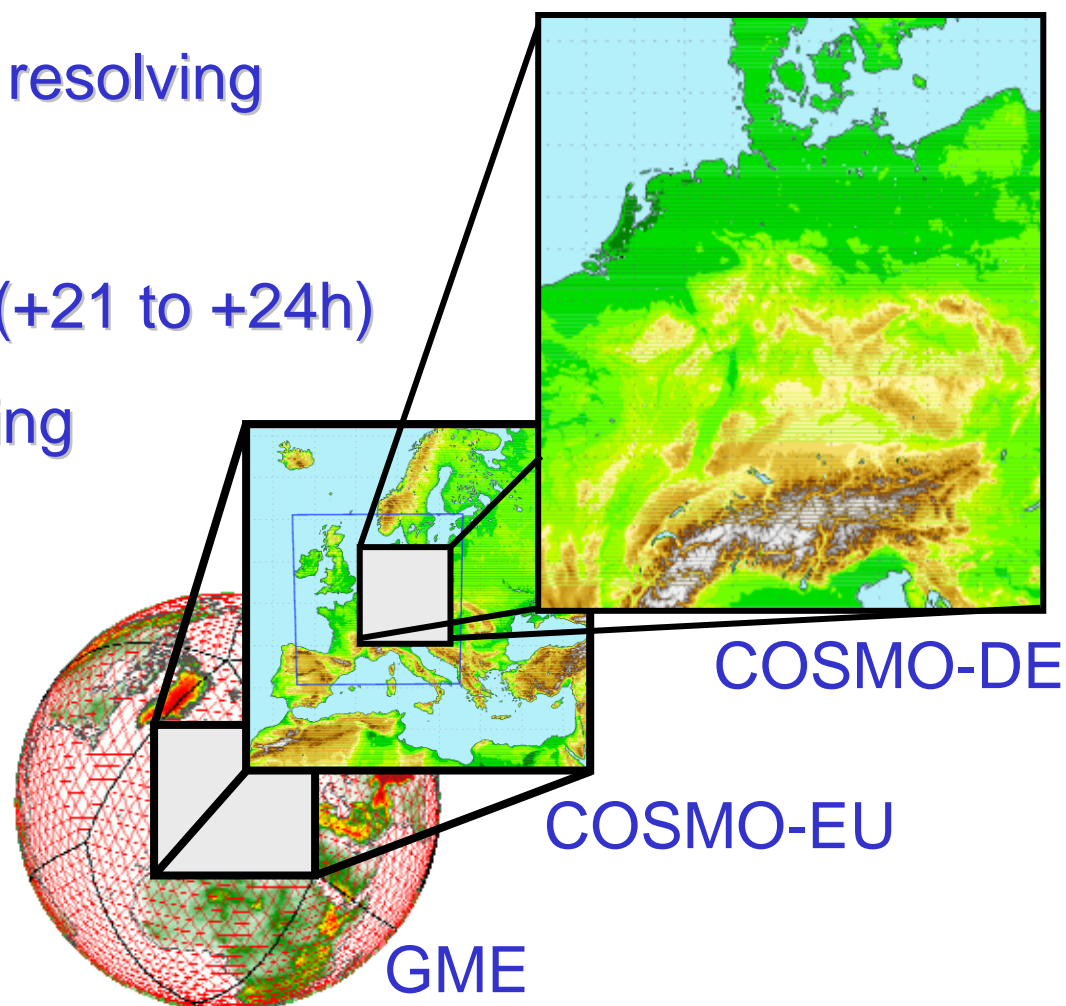


The model COSMO-DE

2.8 km grid-spacing

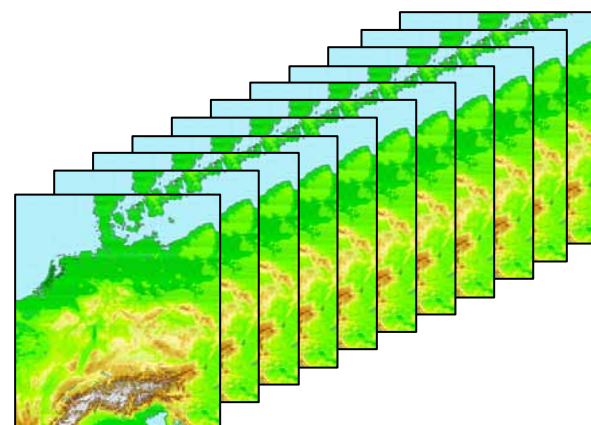
→ convection-permitting / resolving

- 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

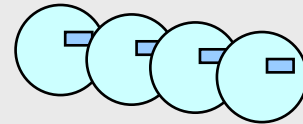
- each ensemble member runs with a different (fixed) configuration of model physics
- modifications of parameters in parameterization schemes
- strategy 1: **one perturbed parameter per member**
- strategy 2: **combination of perturbations in each member**
- set of slightly different model versions



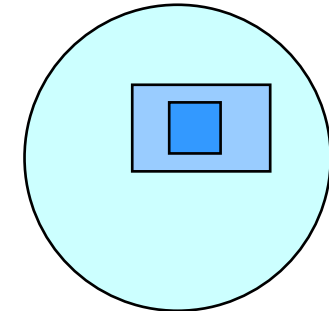
Perturbation strategy: boundary conditions



Part of AEMet-SREPS
(COSMO: 25 km)



AEMet, Madrid

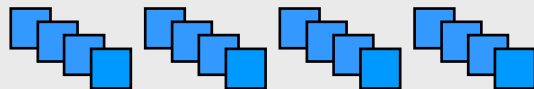


COSMO-SREPS (10 km)



ARPA-SIM,
Bologna

COSMO-DE-EPS (2.8 km)



DWD,
Offenbach



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

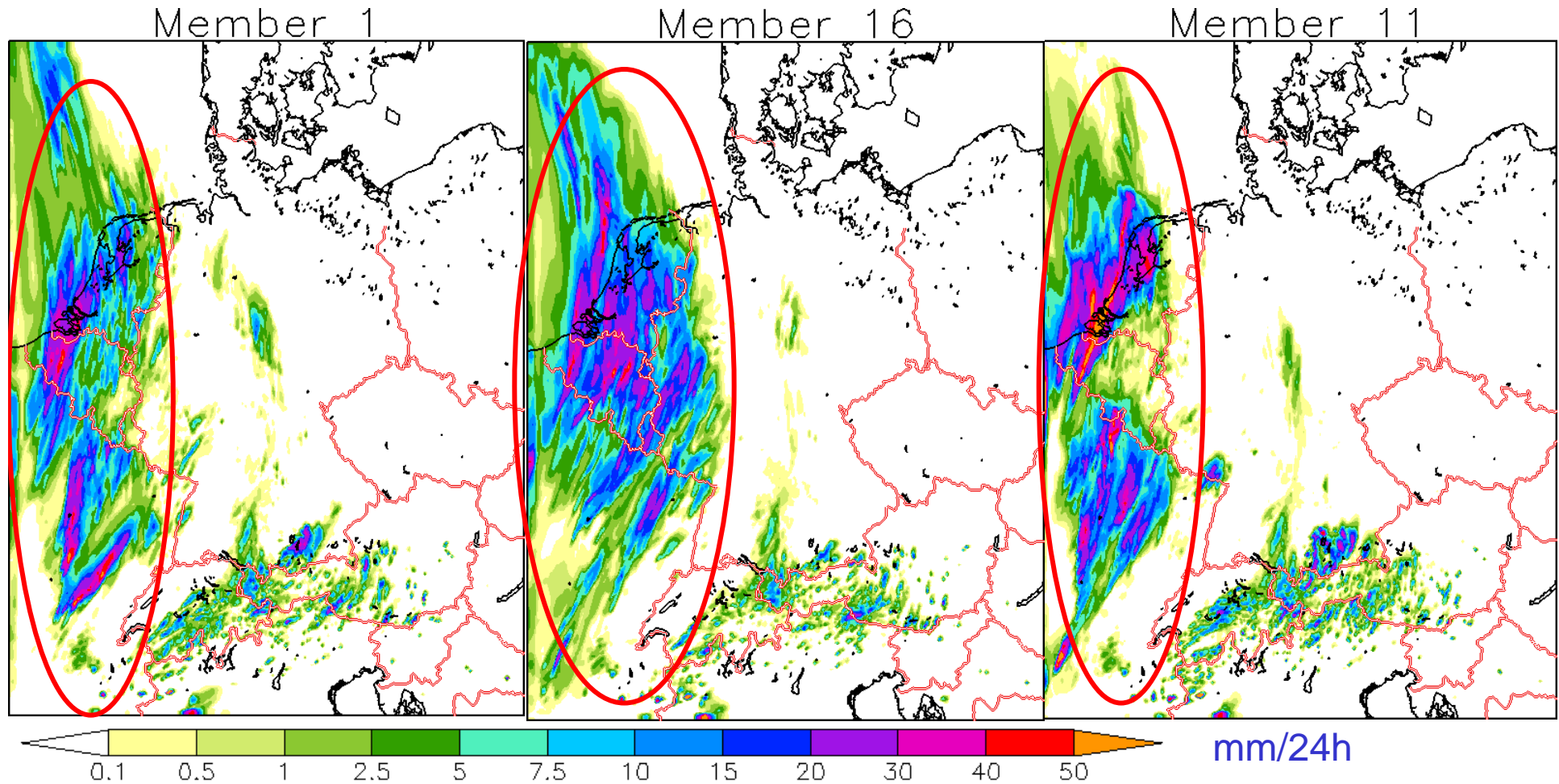
→ one group per member

July 2008 (daily)

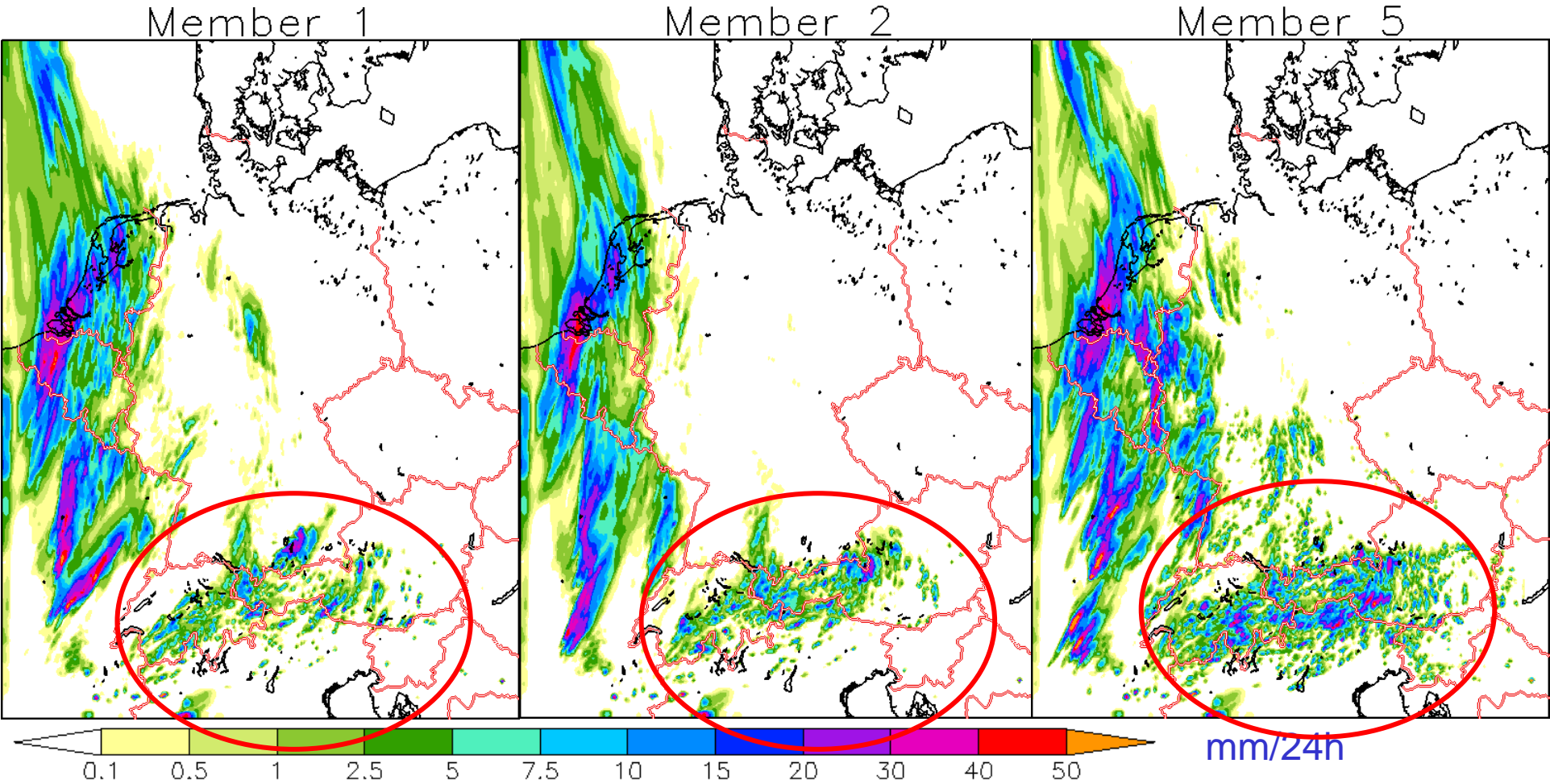
00 UTC for 24 hours



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



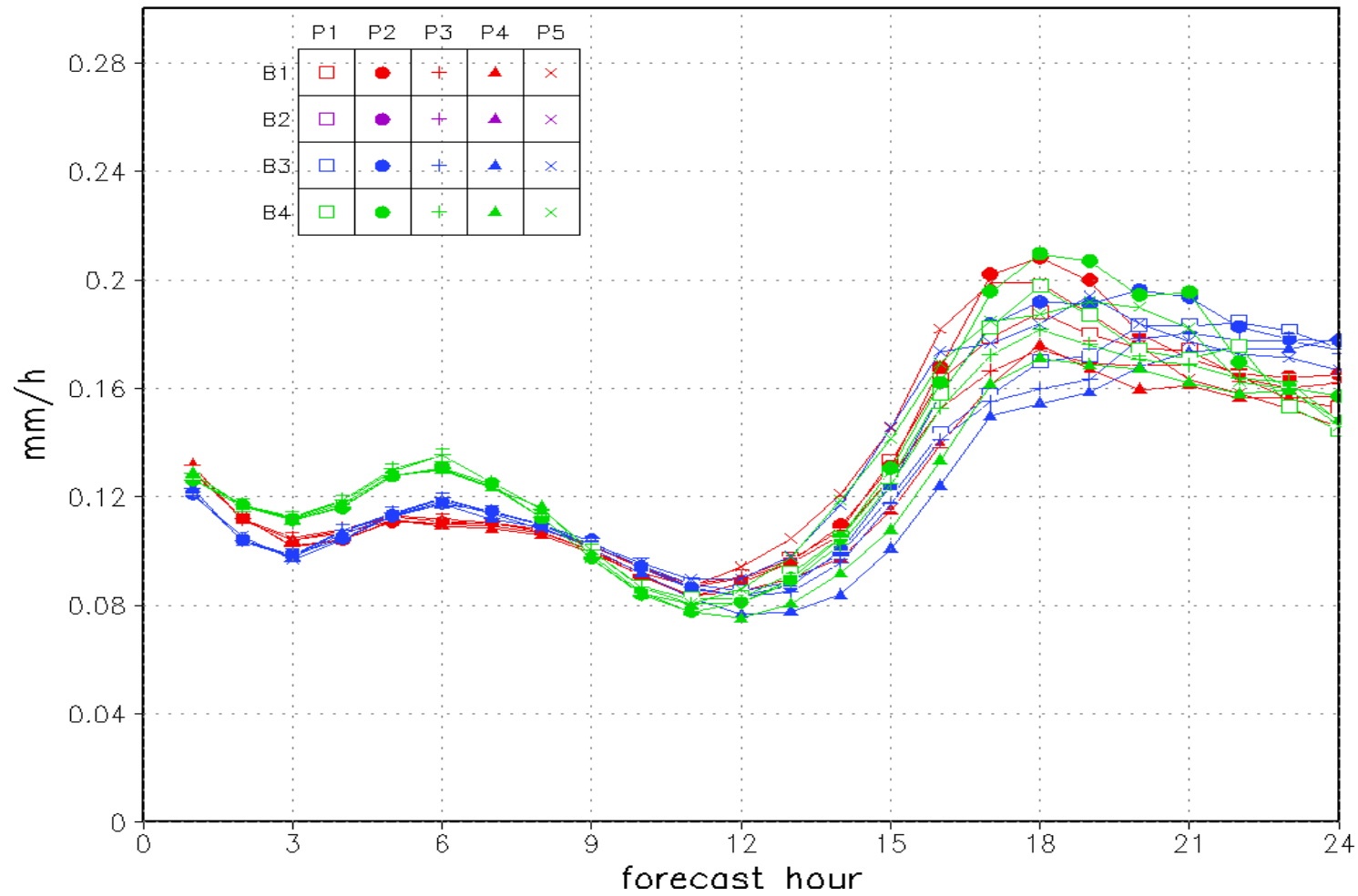
24-h precipitation, 2 July 2007, identical boundary conditions, different physics perturbation



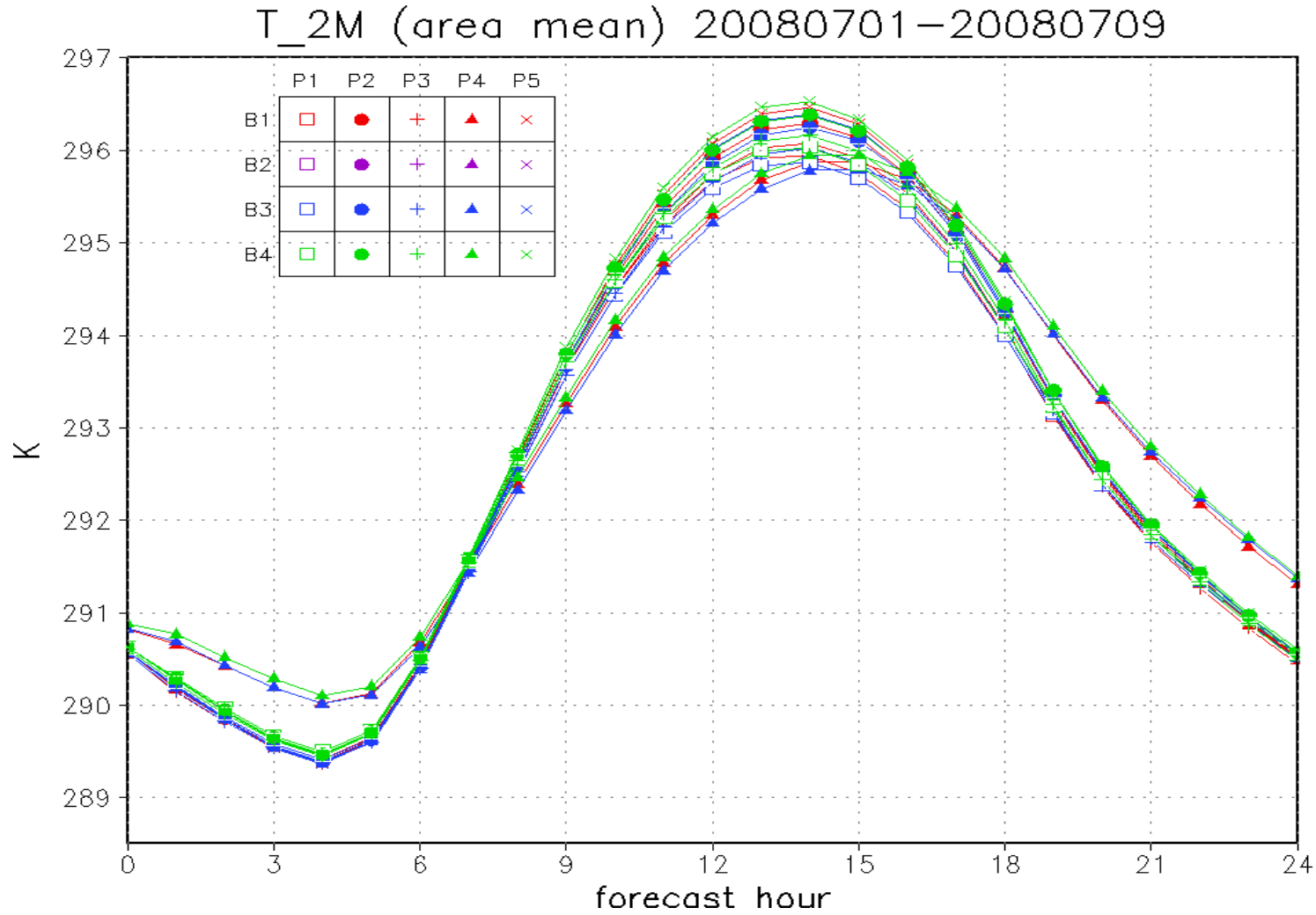
Hourly precipitation, spatial and temporal mean



hourly precip. sums (area mean) 20080701–20080709

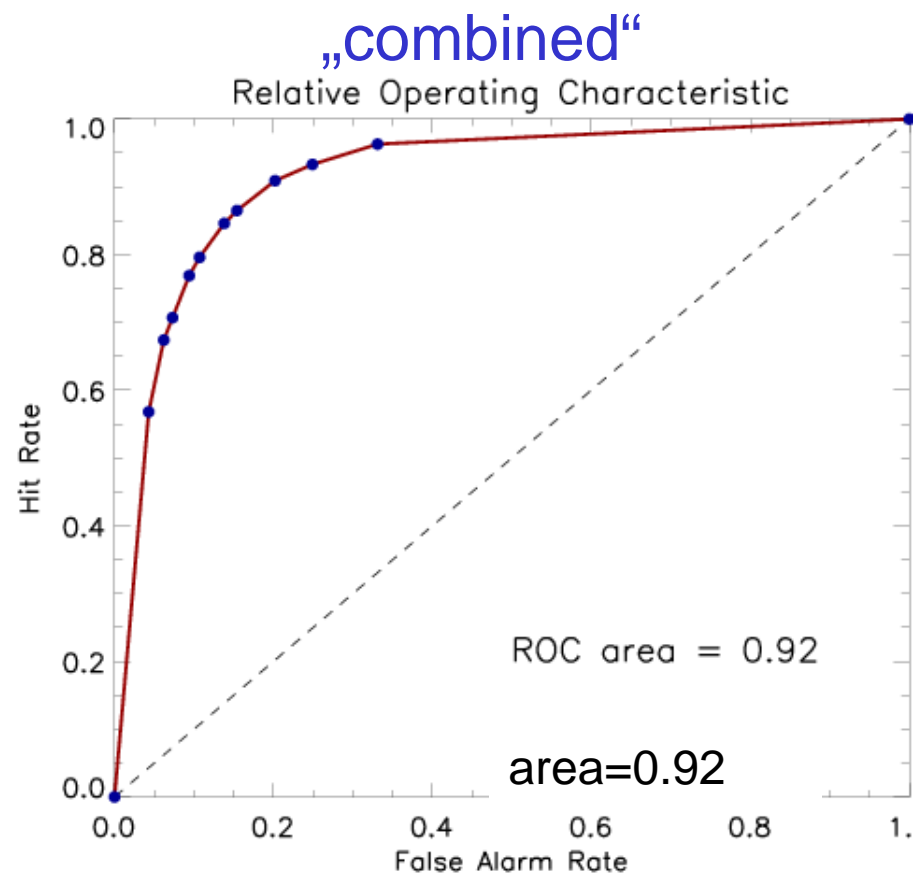
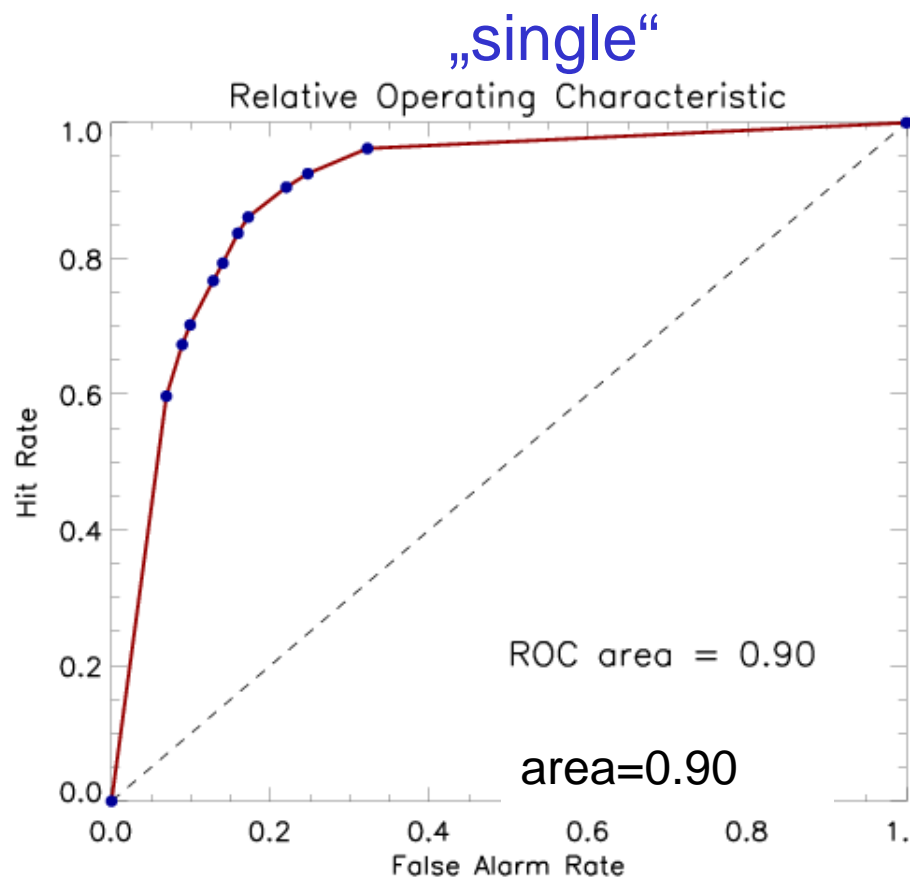


2m-temperature, spatial and temporal mean





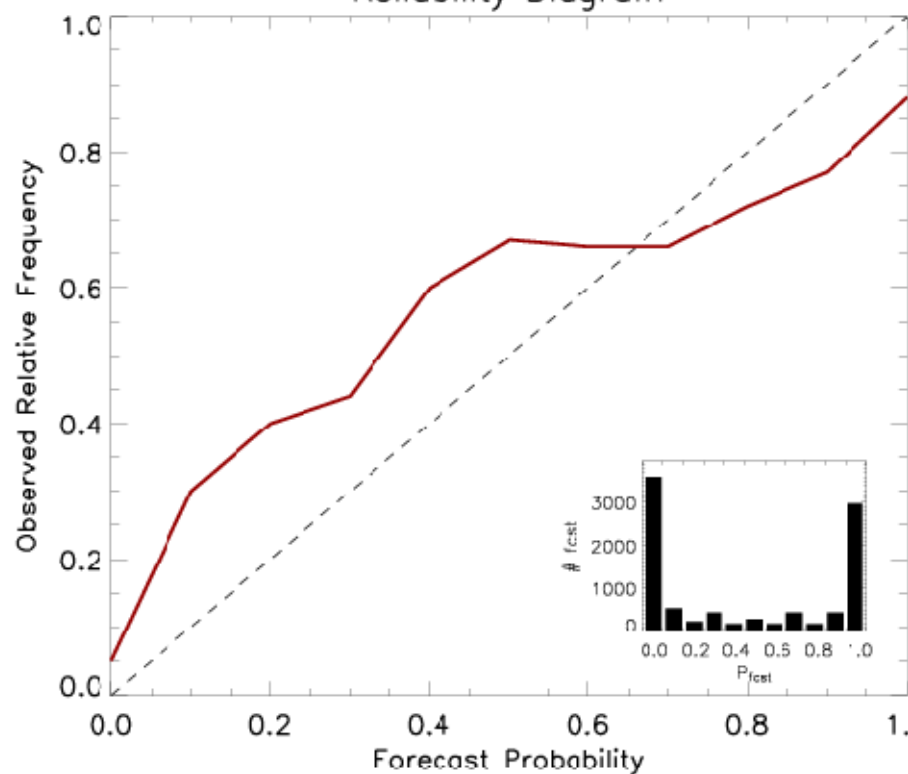
Verification results for 24-h precipitation threshold: 1mm/24h



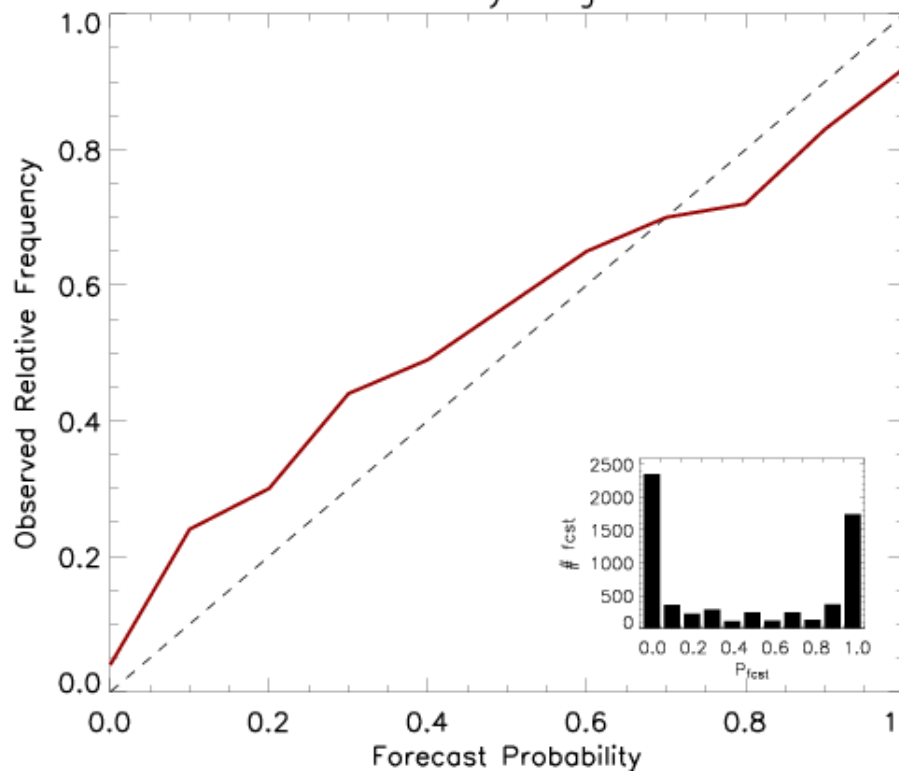


Verification results for 24-h precipitation threshold: 1mm/24h

„single“
Reliability Diagram



„combined“
Reliability Diagram





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

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

- 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**

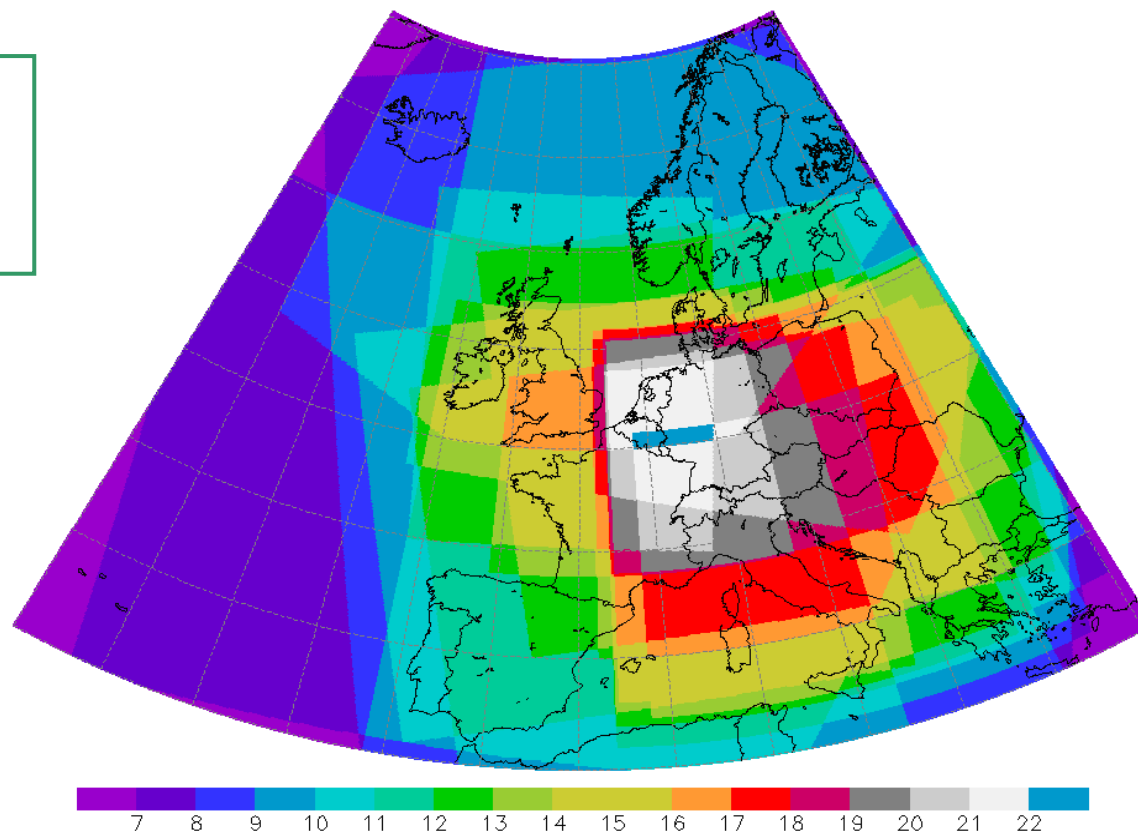




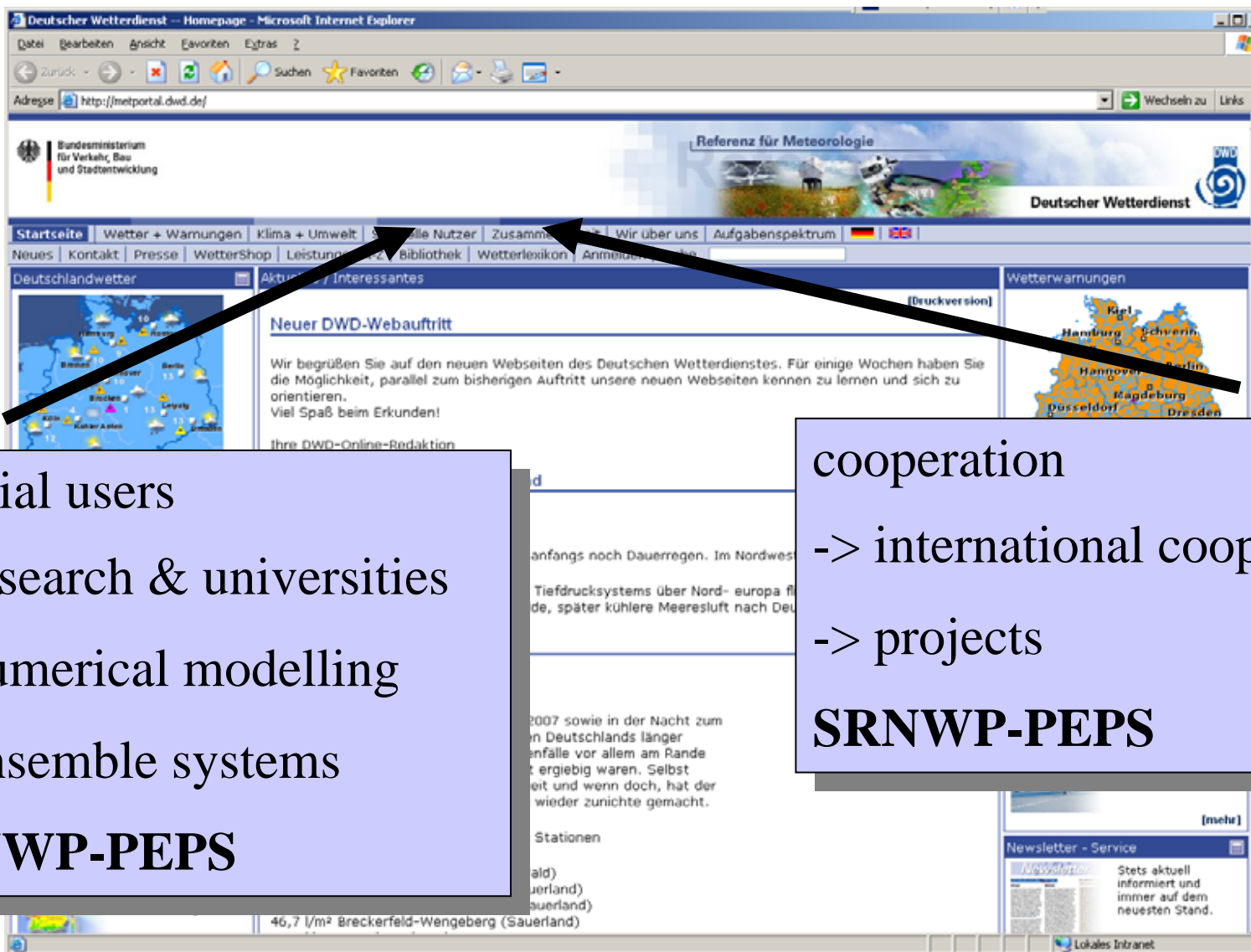
Meteorological Service	Regional Model	Coupling Model	Resolution (km)	Forecast Period (h)	Time Interval (h)	Main Runs (UTC)
Belgium	ALADIN-BE	ARPEGE	15	+80	1	0, 12
France	ALADIN	ARPEGE	11	+48	3	0, 12
Portugal	ALADIN-PT	ARPEGE	12.7	+48	1	0, 12
Austria	ALADIN-AT	ARPEGE	8.8	+48	1	0, 12
Croatia	ALADIN-LACE	ARPEGE	8	+72	3	0, 12
Czech. Repub.	ALADIN-LACE	ARPEGE	11	+48	1	0, 6, 12, 18
Hungary	ALADIN-LACE	ARPEGE	11	+48	1	0, 12
Slovakia	ALADIN-LACE	ARPEGE	11	+48	3	0, 12
Slovenia	ALADIN-LACE	ARPEGE	8.4	+48	3	0, 12
Denmark	HIRLAM	ECMWF	18	+80	1	0, 6, 12, 18
Finland	HIRLAM	ECMWF	22	+64	1	0, 6, 12, 18
Spain	HIRLAM	ECMWF	18	+48	1	0, 6, 12, 18
Netherlands	HIRLAM	ECMWF	22	+48	1	0, 6, 12, 18
Ireland	HIRLAM	ECMWF	18	+48	3	0, 6, 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, 6, 12, 18
Sweden II	HIRLAM	ECMWF	22	+48	3	0, 6, 12, 18
Germany	LME	GME	7	+78	1	0, 6, 12, 18
Switzerland	sLMo	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, 6, 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

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