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Towards an adaptive multiscale ensemble system with stochastic parameterisations

Kirstin Kober, George C. Craig, Annette Förster, and Tobias Selz
Ludwig-Maximilians-Universität München, Meteorologisches Institut, Germany (kirstin.kober@lmu.de)

A multiscale ensemble forecasting system enables to examine the relation between the predictability of high impact weather and uncertainty coming from both small and large scales. Within the project Pandowae (Predictability ANd Dynamics Of Weather Systems in the Atlantic-European Sector) such a multiscale ensemble system is under development focusing on variability caused by convection.

The large scale variability is provided by a selection of 10 members of the global IFS ensemble prediction system (EPS) of ECMWF. Within each of these 10 members, ten COSMO (Consortium for Small-scale Modeling) model runs with 7 km horizontal resolution are nested. The 100 high resolution forecasts use the the Plant-Craig stochastic convection parameterization representing convective variability.

The skill of this existing part of the ensemble system (100 members) is investigated and compared with observations with focus on precipitation forecasts. Neighbourhood verification techniques are applied to compare the skill of the stochastic realizations with the standard Tiedtke convection scheme. First results show that for high thresholds the forecasts with the Plant-Craig scheme are superior to the Tiedtke forecasts. The probabilistic skill of the ensemble is also investigated.

The last component of the multiscale EPS representing small scale variability is currently under development. COSMO experiments with 2.8 km horizontal resolution are nested into the 100 7 km members with perturbations to the convective boundary layer. The amplitude of the variability is determined based on physical processes affecting the initiation of convection in the boundary layer like surface heating, subgrid scale orography or cold pools. Perturbations based on these processes are added to the tendencies and analysed.