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Sources of error in a convective-scale ensemble prediction system

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Errors in forecasts originate from a number of sources, e.g.: (i) the forecast's initial conditions, (ii) the boundary conditions and (iii) the model formulation, which all follow from and influence the data assimilation schemes used. Meso-to-convective-scale data assimilation and forecasting present new challenges because at these scales model errors are thought to become dominant. Here we investigate sources of model error that may affect the forecast skill at convective scale.

We present work on the effect of model error resulting from the parameterisation of unresolved processes (specifically microphysics and turbulent boundary layer processes). An experimental 1.5-km resolution convection-permitting version of the UK Met Office's 24-member Global and Regional Ensemble Prediction System (MOGREPS) has recently been developed (the 1.5km-EPS). The 1.5km-EPS accounts for model error from unresolved processes through the use of a stochastic perturbation technique known as the random parameters (RP) scheme. We assess the effects of the RP scheme on the ensemble spread and forecast skill.

Sampling error, due to the finite ensemble size, may be thought of as a further source of error in the probability density function of the state as represented by the EPS. An extension of this system to 93 ensemble members is used to investigate the convergence of forecast error statistics with increasing ensemble size.