

Constraining Stochastic Parametrisation Schemes using High-Resolution Model Simulations

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Stochastic parametrisation is used in weather and climate models to represent model error. We present a technique for systematically deriving new stochastic parametrisations or for constraining existing stochastic approaches. A high-resolution simulation is coarse-grained to the desired forecast model resolution. This provides the initial conditions and forcing data needed to drive a Single Column Model (SCM). By comparing the SCM parametrised tendencies with the evolution of the high-resolution model, we measure the ‘error’ in the SCM tendencies. As a case study, we use this approach to assess the physical basis of the Stochastically Perturbed Parametrisation Tendencies (SPPT) scheme. We provide justification for the multiplicative nature of SPPT, and for the large temporal and spatial scales used in the stochastic perturbations. However, we also identify issues with SPPT. In particular we find that an alternative approach is needed to represent uncertainty in the convection scheme.