Representation of model uncertainties in ECMWF ensembles

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Members in ensemble forecasts differ due to the representations of initial uncertainties and model uncertainties. The inclusion of stochastic schemes to represent model uncertainties has improved the probabilistic skill of the ECMWF ensemble by increasing reliability and reducing the error of the ensemble mean. Recent progress and challenges regarding stochastic representations of model uncertainties at ECMWF are described in the first part of the talk. Initial work on revising the perturbations to the radiative tendencies in SPPT will be presented as well as work on developing a new stochastically perturbed parametrisation scheme (SPP).

Future directions for the representation of model uncertainties in ECMWF ensembles will be summarised in the second part of the talk. The coming years are likely to see a further increase in the use of ensemble methods in forecasts and assimilation. This will put increasing demands on the methods used to perturb the forecast model. An area that is receiving greater attention than 5 to 10 years ago is the physical consistency of the perturbations. The development of SPP is an attempt to improve the physical consistency of the perturbations compared to SPPT. Other areas where future efforts will be directed are the expansion of uncertainty representations to the dynamical core and to other components of the Earth system as well as the overall computational efficiency of representing model uncertainty.