

Ensemble-based algorithmic optimisation of OpenIFS

Lauri Tuppi (lauri.tuppi@helsinki.fi), Madeleine Ekblom, Pirkka Ollinaho and Heikki Järvinen

Text Abstract

Manual optimisation of numerical weather prediction (NWP) models is known to be a laborious and time consuming task. Therefore, there has been a desire to utilise algorithmic methods for long time already, and many different methods exist. In this study we optimise simultaneously the deterministic values of 20 parameters belonging to the Stochastically Perturbed Parameters scheme of OpenIFS NWP model. As the optimisation algorithm we use Ensemble Prediction and Parameter Estimation System (EPPES). We run a small number of optimisation experiments with OpenIFS resolution of T399 corresponding to about 50 km grid spacing and medium-sized ensembles of 20 members. Both optimisation and subsequent verification are done against operational analyses. The results show that EPPES is remarkably efficient in finding optimal parameter values even though very bad initial parameter value distribution is given, and the model versions EPPES finds are considerably more skillful than the original OpenIFS. In our experiments algorithmic tuning tends to improve especially low level wind and specific humidity near tropopause. We also show that it is possible to enhance the results obtained with EPPES with a relatively small amount of manual work. We also test the optimised parameter values also with different OpenIFS resolutions, and the results show that the optimised parameter values are somewhat resolution specific but they can be used with other resolutions as well with some reservations.