Evaluation of the Plant-Craig stochastic convection parameterisation in MOGREPS

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Abstract

We implement the PlantCraig stochastic convection parameterisation the Met Office Ensemble Prediction System MOGREPS and assess it in comparison with the standard convection scheme. This is done by considering both deterministic and probabilistic measures of the precipitation forecasts. We find the Plant-Craig parameterisation to improve probabilistic forecast measures for lower precipitation thresholds, while both schemes suffer from overforecasting heavy rain. The impact on deterministic forecasts at the grid scale is neutral, but when the schemes are assessed over larger areas the Plant-Craig scheme is found to be better. This is consistent with the idea that a stochastic parameterisation can improve the performance of a model in a statistical sense, even if it does not improve individual forecasts.

The improvements found are greater in conditions of relatively weak synoptic forcing. In these cases the convective precipitation is likely to be less predictable and so a stochastic scheme is of more relevance. We also apply the Ensemble Added Value score, a novel diagnostic intended to isolate the benefit of using an ensemble relative to its underlying individual forecasts. The Plant-Craig scheme is shown to improve the forecasts as measured by this diagnostic; this provides evidence that the stochasticity of the scheme is responsible for at least some of the improvements to the forecasts, since other structural differences between the two schemes would be expected to affect the ensemble and the individual forecasts in a similar way.

This work acts as a "proof of concept" of the Plant-Craig scheme, and the results provide support for implementing the Plant-Craig scheme in an up-to-date version of MOGREPS and carrying out more extensive tuning of the scheme.