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Stochastic representation of dynamic model tendency : Preliminary results

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Stochastic representation of forecast uncertainties has been taken into account to improve dynamical seasonal prediction. In this study, perturbing the dynamic tendency by a random number is introduced to account for inherent uncertainties associated with computational representations of the underlying partial differential equations that govern the atmospheric motion. Compared to the traditional approach to perturb the physical tendency, the sensitivity of fluctuations in forecast variables to the magnitude of random forcing is found to be greater in the case of perturbing the dynamical tendency. Realizing that the major advantage of stochastic tendency in traditional approaches lies in the increase in ensemble spread, our approach manifests a greater potential in the field of dynamical ensemble prediction. An evaluation of a simulated climate for a boreal summer demonstrates a significant enhancement in forecast skill in terms of the large-scale features and precipitation, when both the dynamical and physical tendencies are simultaneously perturbed. This finding implies that model uncertainties could be addressed in terms of not only the physical parameterization but also the dynamical portion that used to be regarded as deterministically solved.