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Sampling of Errors in the Parameterization of Subgrid Convection

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A method for sampling and representing errors associated with sub-grid convection is proposed and its impact on the performance of a global ensemble prediction system is evaluated. In the proposed method, a version of the mass-flux type of parameterization scheme for sub-grid deep convection is perturbed by permuting five possible closure assumptions and four parameter sets. Each permutation represents a component of the intrinsic uncertainty involved in the parameterization of convection. The results from the evaluation of the method on the performance of the global ensemble prediction system show that an improvement in the ensemble is achievable by sampling and representing model physics errors associated with the sub-grid convection parameterization scheme. Particularly, the ensemble generated from the use of the method produces a decrease in root mean squared errors accompanied by an increase in the ensemble spread of 500-mb geopotential heights and 850-mb temperature in both the tropics and extratropics, and thus leads to discernable improvements in the ensemble performance as compared with the control ensemble. These results support the long-standing notion that properly sampling model errors is essential to improving the quality of the ensemble spread. Questions and issues for future study are also discussed.