Non-Gaussian statics and data assimilation in the global atmospheric dynamics with 10240-member ensemble Kalman filter

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In our previous work, impacts of removing covariance localization are investigated by increasing the ensemble size up to 10240, with an intermediate AGCM known as the SPEEDY (T30/L7) model and an ensemble Kalman filter (EnKF). The analysis accuracy without localization was greatly improved, and we found that the long range covariance structures up to several thousand km helped to extract information from distant observations. By contrast, the improvement in the tropical regions was relatively small. In this study, we hypothesize that this little improvements be related to the non-Gaussianity of the error statistics due to highly-nonlinear processes of convections. Actually, we found that strong non-Gaussianity such as bimodal distributions frequently appears in the tropical regions, and the spatial patterns of the occurrences of the non-Gaussian error statistics correspond well to that of the analysis error. We test some ideas to partly account for non-Gaussianity in the EnKF framework. We will present the results up to the time of the workshop.

Keywords: data assimilation, numerical weather prediction, non-Gaussianity