

Interactive comment on “Correlated observation error models for assimilating all-sky infrared radiances” by Alan J. Geer

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General Comments:

This paper presented an observation error model that combines the inter-channel correlations with the situation dependency as a function of symmetric cloud proxy variable required for the all-sky assimilation. This might be the first reported application of the correlated errors to the all-sky assimilation that provides the benefits to both the analysis and the NWP forecast accuracy. The need to inflate the trailing eigenvalues has been clearly explained through the concept of the eigendeparture and eigenjacobian, and the manuscript is well written.

Specific comments:

C1

In the eigenspace spanned by the eigenvectors, the eigenvalues of the error covariance matrix are the equivalents of the error standard deviations which can be seen from the expression (6) on P9, so smaller the eigenvalues, larger the weights given to the eigendepartures. In this sense, the robustness of the error covariance matrices estimated based on different data samples and different version of systems should be assessed not only by the leading eigenvalues and eigenvectors but also by the trailing eigenvalues and eigenvectors. Both Fig.3 and Fig.4 indicate that the matrices examined have the relatively large differences in their trailing eigenvalues and eigenvectors. The data assimilation system might be very much sensitive and behave different because of these differences. Therefore, I suggest to run an additional experiment on top of the experiment "All-sky adjusted 1.0" or "All-sky adjusted 0.37" with any 45r1 all-sky error covariances to verify the robustness of the original 43r1 covariances that were used in all of the cycle experiments presented in this paper. My concern is the estimates might not be as robust as they look like in the sense that the extra tuning by trial and error might be still needed whenever to upgrade to a newer version of the matrix.

Technical corrections

P30L15, P33L8 and P41L25: all 'eigenvectors' should be replaced with 'eigenvalues'

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