1.7 SOME EXPERIMENTS WITH A SIMPLE DYNAMICAL COVARIANCE EVOLUTION SCHEME FOR THE ASSIMILATION OF ATMOSPHERIC MOISTURE OBSERVATIONS

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Model-based assimilation of atmospheric moisture observations is complicated by the lack of realistic error covariance models, both for the data themselves and for the background estimates provided by the model. This is partly due to the high variability of the atmospheric moisture field. Background error covariances are therefore especially difficult to model, and the use of covariance specifications based on time- and space-averaged statistics can lead to very poor moisture analyses in some locations.

We showed in earlier work that this problem can be somewhat alleviated by a suitable change of analysis variable, which is defined by a background-dependent scaling of the specific humidity. In this new variable, time- and space averaging of the errors becomes more meaningful, so that simple covariance models based on statistical averages do present some useful information about local errors.

With this as a starting point, we embarked upon an effort to further improve the description of moisture errors by modeling the three main dynamic effects on the error covariances in the assimilation cycle: (1) advection of initial errors, (2) error growth due to model defects, and (3) error reduction due to the incorporation of observations. We have formulated simple representations of each of these effects, which are intended to be incorporated in the moisture error covariance specification of the Physical-space/Finite-volume Data Assimilation System (fvDAS) at NASA's Data Assimilation Office. We plan to present the results of initial assimilation experiments with this scheme.

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