Forecast error covariance in a coupled Land-Atmosphere Ensemble Data Assimilation with NASA-Unified WRF model

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Complexity of coupled models and high-dimensional nature of the augmented state vector require an advanced data assimilation system. One of the most important components of such data assimilation system is the augmented forecast error covariance that has a capability of representing complex and sometimes unknown correlations and cross-correlations between model variables. Such complex systems may be best represented by an ensemble or hybrid variational-ensemble error covariance.

In this work we present preliminary development of an ensemble-based coupled land-atmosphere data assimilation system to that employs NASA-Unified Weather Research and Forecasting (NU-WRF) model and incorporates assimilation of all-sky satellite radiances. At this stage of development we focus on the forecast error covariance structure and examine the error correlations between model variables for land and atmosphere.

We will also discuss other issues of land-atmosphere coupled data assimilation including the choice of control variables, high dimensions, computational limitations, and dynamical balances.