Using "Replay" to MERRA for AGCM Model Development

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The use of MERRA prognostic fields to diagnose and correct atmospheric model errors is demonstrated with a series of experiments using the current version of the GEOS-5 atmospheric general circulation model (AGCM). The experiments were run in "replay" mode, which means that the atmospheric state is constrained to follow a sequence of states from MERRA output. This is accomplished by adding an "analysis increment" to the AGCM fields, computed as the difference between a forecasted and a MERRA state, at each time that MERRA fields are available. The analysis increments are used as an indicator of model error.

The series of experiments reported here demonstrate the use of "replay" to improve one of the GCM's physical parameterizations related to the atmospheric humidity field and the related total precipitation. The use of replay experiments to approximate the behavior of the AGCM in the full analysis system is borne out with a more limited set of data assimilation experiments.

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