Water cycle drift and coupling between land and atmosphere in CFSv2

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We examine the behavior of key aspects of the water cycle in the CFSv2 reforecasts and reanalysis. Two main characteristics are investigated. First, we examine the drift in the 9-month ensemble reforecast in precipitation, soil moisture and terms that diagnose the behavior of those variables. Drift is characterized as a function of lead-time and season. Most divergence of reforecast means from initial state means occurs in the first month, but changes continue in later months, sometimes in the same sense while in some locations the drift changes sign and even reverses. Such drift needs to be taken into account if operational forecasts are to be used to predict hydrologic anomalies such as the Standardized Precipitation Index.

Second, we estimate the surface component of land-atmosphere coupling strength, which quantifies the link between soil moisture and latent heat flux. We determine the land feedback to the atmosphere based on the terrestrial coupling index of Dirmeyer (2011). This index is applied both to the CFSv2 reanalysis and to the reforecasts to see how data assimilation (and for forecasts beyond 1-month, climate drift) affect the characterization of the terrestrial branch of land-atmosphere coupling strength in the model.

Dirmeyer, P. A., 2011: The terrestrial segment of soil moisture-climate coupling. *Geophys. Res. Lett.*, **38**, L16702, doi: 10.1029/2011GL048268.