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Title: The importance of land-atmosphere coupling for seasonal drought prediction
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Abstract:
Recent summers in the United States have been plagued by intense droughts that have caused significant economic impact to agriculture and to society at large. The ability to forecasts such events would allow for preparations that could help reduce the impact on society. Coupled land-atmosphere-ocean models were created to provide such forecasts but there are large uncertainties associated with their predictions. The predictive skill of these models is particularly low during the convective season due to the weaker connections with the oceans and an increase in the land-atmosphere interactions. To better understand the degradation of forecasts skill during the summer months and its connection to the land-atmosphere interactions we analyze NCEP's Climate Forecast System version 2 (CFSv2) in terms of its climatological land-atmosphere interactions. To do this we use a recently developed classification of land-atmosphere interactions to compare the reanalysis from the Climate Forecast System (CFSR) with CFSv2 re-forecasts (CFSRR) over the period 1982-2009. The results show that the coupling in the CFSRR tends toward the wet coupling regime for a large portion of the U.S. The long-term tendency to wet coupling precludes the forecast model from consistently predicting and maintaining drought over the continental U.S. Although the seasonal forecasts from CFSRR fail to capture the coupling, the persistent nature of the coupling regimes from the reanalysis suggests that the use of a statistical model for prediction in conjunction with CFSv2, may offer a more skillful drought forecasts. We explore the use of a statistical approach to generate ensemble predictions of summer time precipitation and temperature at the seasonal scale, based on the coupling statistics identified by CFSR. The statistically-based ensemble forecasts are compared against those from CFSRR, and advantages and disadvantages of a statistical modeling approach is discussed.
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