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Local Land-Atmosphere Coupling (LoCo): Forecast precipitation skill for different land-atmosphere coupling regimes in the Southeast United States

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Extreme hydrologic events in the form of droughts are a significant source of social and economic damage in many parts of the world. The Southeast United States is one such area that is prone to severe drought. Having sufficient warning of these extreme events allows managers to prepare for and reduce the severity of their impacts. One tool that can aid managers in their policy decisions is a hydrologic forecast system. However there is still much uncertainty associated with such a system. Precipitation plays a key role in the ability to make skillful hydrologic forecasts; as such it is important for climate forecast models to capture processes that affect precipitation. Land-atmosphere interaction (coupling) strength has been shown to directly impact the diurnal precipitation cycle. Specifically, the surface heat and moisture fluxes impact the growth and attributes of the atmospheric boundary layer which in-turn determines the onset of convective precipitation. Recently, there has been work done to analyze coupling globally through the use of Modern Era Retrospective-analysis for Research and Applications (MERRA) reanalysis and Earth Observing System (EOS) remote sensing data products, including Atmospheric Infrared Sounder (AIRS) atmospheric temperature and humidity profiles. This research focused on characterizing geographic regions into coupling regimes defined by predominantly wet or dry soil triggering of convective precipitation. The goal of this study is to look at inter-annual variability of coupling regimes over the Southeast United States and the impact that coupling has on the skill of precipitation from seasonal forecast models. This will be done by comparing the forecast skill in precipitation for the different coupling regimes. The analysis will focus on the NCEP Climate Forecast System (CFS), which was recently updated. To analyze the impact of recent updates to CFS on forecast skill, version 1 and version 2 will be used. The coupling regime will be defined using remote sensing data to estimate the convective triggering potential and humidity index from AIRS to estimate the state of the land, soil moisture from remote sensing will be used from the Land Surface Parameter Model (LPRM). Due to remote sensing data availability, the analysis will be done from 2003-2010.