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Title: Summer-Season Forecast Experiments with Land Upgrade in the NCEP Climate Forecast System
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Abstract:
The Noah land surface model (LSM) version 2.7.1 is currently used in the operational NCEP Climate Forecast System (CFS) to update soil moisture, soil temperature, and to compute surface flux terms related to land-atmosphere interactions. It is the version that was implemented in the operational GFS in May 2005. Since then, the Noah LSM has many physical enhancements added by external researchers in collaboration with the NCEP/EMC land team. The recent released Noah LSM version 3.4.1 has improved treatments of background albedo, emissivity, roughness length, snow albedo, and potential evapotranspiration among others. In addition, the new version of Noah land model makes use of the newly modified MODIS/IGBP vegetation classification and STATSGO soil texture datasets that are more representative of recent land-use changes.

To improve seasonal prediction skill and to examine the impact from using these advances in the NCEP CFS, summer-season T126 CFS reforecast experiments are carried out using both versions of the Noah LSM for nine selected years with four ensemble members whose initial conditions are from early May. Using anomaly correlation as a primary measure, the CFS skill using the two versions of the Noah LSM is assessed for SST, precipitation and 2-meter air temperature over the Contiguous United States (CONUS) on an ensemble basis and at seasonal time scales.

Results from the CFS experiments indicate that the upgrade from Noah 2.7.1 to Noah LSM 3.4.1 has a positive impact on the SST prediction skill over the Atlantic Ocean, the Indian Ocean, and the western Pacific Ocean in the Northern Hemisphere, but not over the eastern equatorial Pacific Ocean. The differences in June-July-August (JJA) mean precipitation and 2-meter air temperature prediction skill generally reflect the disagreement in predicting SST anomalies over the coastal states. The largest differences are found to be in the inland states where the CFS with the new version of Noah LSM shows a better performance in predicting precipitation anomaly over the central Great Plains and 2-meter air temperature anomaly over the western CONUS, illustrating that ocean is still the main control and land impact is only pronounced where the land-atmospheric coupling strength is strong.

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