Session: C10 Poster: M30B

## Investigation of summer land-atmosphere feedback over the U.S. with observations, reanalysis data and models

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The first part of this study examines the impact of sea surface temperature (SST) and soil moisture on summer precipitation over two regions of the U.S. (the Upper Mississippi River Basin and the Great Plains) using data from observational SST and precipitation, and VIC-simulated soil moisture. Based on conditioned soil moisture-precipitation correlation analysis, soil moisture-precipitation feedback is more likely to be positive and significant during the years when the skill of precipitation prediction based on SST alone is low, and in the years of large precipitation anomalies, which underlines the complementary roles both SST and soil moisture play in determining precipitation and the importance of considering soil moisture in predicting climate extremes. The second part compares land atmosphere coupling strength over the U.S. between observations (and reanalysis) and model output, with as a coupling strength indicator the probability density functions of conditioned correlation over the years of large precipitation anomalies. Among the eight different regions classified by land cover types, our results identify the Great Plains as a hot spot for strong land-atmosphere coupling strength; results of comparison between soil moisture-precipitation coupling and soil moisture-surface temperature coupling indicate that soil moisture is more promising for predicting surface temperature than precipitation. In addition, contrary to previous speculation of models overestimating soil moisture-precipitation coupling, our results suggest that the coupling strength is stronger in observational data than in the models examined. Part of the reason is due to the strong decrease of coupling strength from CAM3-CLM3 to CAM4-CLM4, which is further supported by GLACE1 experiments and attributed to changes in CAM.