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Investigation of Land Surface Conditions Impact on Processes and Predictability of the North American Monsoon

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This study aims to identify and understand the roles of land surface conditions on the onset, evolution and decay of the North American Monsoon System (NAMS) and to examine the sources and limits of predictability related to the land surface in warm season precipitation. To achieve this objective, four groups of ensemble experiments, consisting of two control and two sensitivity runs, were performed using the Finite Volume General Circulation Model with high- (¼ degree) and coarse (1 degree) resolutions for May-September 2004, coincident with the North American Monsoon Experiment (NAME). The control ensemble simulations use interactive land surface model, and the sensitivity experiments land surface conditions are prescribed by the Global Land Data Assimilation System (GLDAS), and all runs employ identical sea surface temperature. The preliminary results indicate that for the simulated NAMS onset, certain aspects evolution and intensity are improved using the prescribed GLDAS land surface conditions, implying the GLDAS's enhanced land surface forcing has significant potential predictability in warm season precipitation. The correlation analysis further demonstrates larger soil moisture is linked to stronger evaporation, high cloudiness and lower lifted condensation level. As a result, more precipitation is generated which supports a positive soil moisture-precipitation feedback associated with NAMS development. Future analysis will explore how the soil moisture–precipitation feedback influence NAMS daily and seasonal precipitation variation and assess whether model resolution affects large-scale atmospheric circulation and hence modifies soil moisture-precipitation feedback during the evolution of NAMS.

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