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Predictability of the North American monsoon system in nested regional climate model results from the NARCCAP ensemble

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Observational studies indicate that evolution of the North American monsoon is dependent both on the large-scale circulation regime and on regional-scale features such as terrain, land-sea contrasts, and patterns of antecedent soil moisture. Furthermore, meso-beta scale circulations such as surges through the Gulf of California play important roles in dynamics of the monsoon. These considerations imply that accurate simulation of the effect of climate change on the North American monsoon may require finer spatial resolution than commonly used in general circulation models (GCMs), such that a dynamical downscaling methodology is appropriate. Here we compare results for the North American monsoon in six regional climate models participating in the North American Climate Change Assessment Program (NARCCAP). A controlled experiment is established by configuring all of the regional models to use the the same domain, spatial resolution, and data source for initial and lateral boundary conditions. Results indicate that the primary monsoon signal of increased convective precipitation in northwestern Mexico is broadly consistent among the models, while simulated teleconnections of the monsoon with seasonal precipitation trends in other parts of North America are more variable among the models. Such inter-model variability indicates that projections of changes to the North American monsoon in future climates should should not rely on a single regional or global model but should instead adopt a multi-model ensemble approach.