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Continental teleconnections of the North American monsoon

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The dynamical response to heating from organized deep convection in the North American monsoon induces a continental scale teleconnection pattern often described as a "robust" feature of the monsoon. The teleconnection causes precipitation over the monsoon core region in northwest Mexico to be out-of-phase with precipitation over the central U.S. and in-phase with precipitation over the eastern coast of North America. We evaluated this teleconnection in simulations performed by 17 atmosphere-ocean general circulation models (AOGCMs) that provided output in support of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4). Results were analyzed both for current climate (1970-1999) and for a future-climate scenario with increased concentrations of greenhouse gases (SRES A1B scenario, nominally 2070-2099). Simulated precipitation over northwestern Mexico was consistent with the observed signal, but in most models the continental-scale teleconnection was weaker than observed. Inter-model variability was large, with some models producing realistic teleconnections, some producing overly strong and extensive teleconnections, and others producing no teleconnection or even a teleconnection of opposite sign to that observed. SRES A1B results for 2070-2099 indicated little change in the continental-scale teleconnection pattern, but the large inter-model variability implies little confidence in this finding. Surprisingly, there is no relationship between the accuracy or intensity of a model's precipitation in the monsoon core and its teleconnection pattern: regression of precipitation for the south-central U.S. against precipitation for the monsoon core yielded an r-squared value of only 0.044. The lack of such a relationship implies that current state-of-the-art AOGCMs do not realistically represent the dynamical response to latent heat release by convection in the monsoon core. We suggest that the ability of a model to reproduce the precipitation signal in the mon-

soon core is likely to be a necessary but not sufficient condition for reproducing the continental-scale circulation patterns associated with the NAMS.