Assessing the Credibility of North American Monsoon Projections from the NARCCAP Regional Climate Models

Abstract:

Climate models are challenged by the complexity of the North American monsoon (NAM) system. Here, dynamically downscaled simulations produced as a part of the North American Regional Climate Change Assessment Program (NARCCAP) are assessed for their skill in reproducing NAM system precipitation and the drivers behind the precipitation. NARCCAP has produced 50-km horizontal resolution climate change simulations using 6 regional climate models (RCMs) to dynamically downscale 4 coupled atmosphere-ocean global climate models (AOGCMs), and two 50-km atmosphere-only global climate model (AOGCM) time slice simulations. Projections from these simulations are made for a 30-year, mid-century period. The goal is to find a meaningful subset of models with credible simulations. Biases are examined and the effect those biases have on projections is discussed. In this case, it is clear that the skill of the different regional climate models (RCMs) is largely governed by the skill of the forcing or “parent” atmosphere-ocean couple global climate model (AOGCM) in the historical period, and the inherited biases can be near fatal for the RCMs in some cases. Similarly, the magnitude of the precipitation changes in the RCM projections can be grouped, for the most part, by strength of their precipitation bias and by driving AOGCM. Specifically, the RCMs with the strongest changes are often the most biased and potentially the least credible. So, while there is strong agreement across the full ensemble of NARCCAP simulations regarding a decrease in total NAM system precipitation and precipitation frequency, the strength of the decrease varies greatly when the models are grouped instead by perceived skill.