Reinitialized Versus Continuous Simulations for Regional Climate Downscaling

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ABSTRACT

The methodology for dynamical climate downscaling is studied by using a regional climate model RegCM2. Different from climate sensitivity studies, downscaling is an information recovery rather than a force-response problem. Therefore, a question is, in order to recover high-resolution details as accurately as possible, what strategy should be taken: continuous long-term integration in climate prediction mode or consecutive short-term integrations in weather forcasting mode? To investigate this problem, the model was run for five months over South America in three different ways, (1) a five-month continuous simulation, (2) monthly reinitialized, and (3) ten-day reinitialized simulations. Compared to the observed precipitation, the ten-day reinitialized simulation results in smallest errors, while the continuous run shows larger error. Analysis shows that the long-term continuous simulation is contaminated by the systematic errors associated with the steep Andes Mountain and the uncertainties in the moisture processes in the planetary boundary layer near the coast. The method of ten-day reinitialization effectively mitigates the problem of climate drift in the regional climate model and improves the accuracy in dynamic downscaling.