

Error Growth in Regional Climate Simulation Using RSM

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A perfect model experiment for global to regional modeling has been developed for theoretical investigation for the dynamic downscaling issues of regional climate simulation and forecast. The regional component consists of the NECP regional spectral model (RSM). RSM is constructed within the framework of NCEP's global spectral model (GSM) with identical physics, but with perturbation and spectral methods which are slightly different than GSM. The purpose of this development is to further understand the ability and the limitation of RSM's regional climate simulation when forced by the GSM.

We first integrated the T126 resolution of GSM forced with observed sea surface temperature for the period of November 1, 1997 till present date. While we do not expect it to be a perfect match with reality, this GSM can be used as the high resolution "observation" for our modeling experiment. A series of RSM climate integrations, forced with complete or spectrally truncated GSM fields, are examined against the "observation". Since RSM has identical model physics to the GSM, it is reasonable to consider that the regional model has "perfect" model physics. Thus, in the regional modeling systems, only the dynamic framework of the model and modeling strategies would introduce error in the regional simulation. We will show how the error grows in these simulations, in terms of their spatial and temporal characteristics. Special attention is given to analyzing how modeling strategies -- such as selection of regional domain size, model resolutions, initialization frequency, and geographical dependence -- affect the model error growth in the regional model.