Impact of Choice of Ensemble on Long-range Forecasting of Monsoon Rainfall
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For short or even medium-range forecasting, a primary source of dispersion in the forecasts is the inherent uncertainties in the initial fields. Ensemble averaging of forecasts from different initial conditions provides an efficient way of assessing and handling uncertainties in the forecasts due to inherent uncertainties in the initial conditions. An ensemble forecasting, however, should be able to (non-linearly) filter errors for it to be considered good, or useful for forecasting. A critical issue in ensemble forecasting is thus how to create a good ensemble, that is, how to create a set of initial states that would result in a better forecast. A number of techniques and methodologies have evolved since early nineties to generate perturbations for creating an ensemble, especially for short-range forecasting. However, it is now well known that changes in initial conditions can give rise to significant changes in the forecasts even at long range; however, the methodology for generating ensemble for long range forecasting has been less explored so far. The procedure for generating an ensemble of forecasts has to be based on careful consideration. In particular, the ensemble initial states should optimally sample the space of initial states. In case of the Indian summer monsoon, it is characterized by a number of intraseasonal oscillations (ISO) whose phases can significantly affect the monsoon and which can be adequately sampled only using initial states spread over time scales comparable to characteristic time scales of these ISO. We have explored whether use of initial states spread over a longer period (such as April 1-May 1) results in better ensemble average for long-range forecasting of Indian summer monsoon than that from an ensemble of closely packed states with shorter lead. We adopt an optimized configuration for long-range forecasting of monsoon using a variable resolution general circulation model, which can provide higher resolution over a selected area (zoom). The lower boundary forcing (SST) is prescribed as climatological monthly mean to examine our hypothesis primarily in terms of atmospheric internal dynamics. We then compare 5-members wide-lead (April 1-May 1) ensemble average forecasts with 5-member compact-lead (April 27-May 1) ensemble average forecasts for 24 (1980-2003) hindcasts. Our results show that the skill with the wide-lead ensemble average is superior to that with the compact-lead ensemble.