

SST prediction methodologies and verification considerations for dynamical mid-summer rainfall forecasts for South Africa

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ABSTRACT

Seasonal-to-interannual hindcasts (re-forecasts) for December-January-February (DJF) produced at a 1-month lead-time by the ECHAM4.5 atmospheric general circulation model (AGCM) are verified after calibrating model output to DJF rainfall at 94 districts across South Africa. The AGCM is forced with SST forecasts produced by (i) statistically predicted SSTs, and (ii) predicted SSTs from a dynamically coupled ocean-atmosphere model. The latter SST forecasts in turn consist of an ensemble mean of SST forecasts, and also by considering the individual ensemble members of the SST forecasts. Probabilistic hindcasts produced for two separate category thresholds are verified over a 24-year test period from 1978/79 to 2001/02 by investigating the various AGCM configurations' attributes of discrimination (whether the forecasts are discernibly different given different outcomes) and reliability (whether the confidence communicated in the forecasts is appropriate). Deterministic hindcast skill is additionally calculated through a range of correlation estimates between hindcast and observed DJF rainfall. For both probabilistic and deterministic verification the hindcasts produced by forcing the AGCM with dynamically predicted SSTs attain higher skill levels than the AGCM forced with statistical SSTs. Moreover, ensemble mean SST forecasts lead to improved skill over forecasts that considered an ensemble distribution of SST forecasts.