Seasonal forecast skill of Indian summer monsoon in the ENSEMBLES coupled models

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The seasonal forecast skill of multimodel seasonal prediction system developed in the frame work of the ENSEMBLES EU project was evaluated over the Indian summer monsoon region for the period, 1960-2005. The hindcast results of five participating coupled models with nine ensemble members each with May initial conditions were considered for the analysis.

 ENSEMBLES multimodel ensemble (MME) results show systematic biases in the simulation of mean monsoon seasonal rainfall over the monsoon region with excess rainfall over the equatorial Indian Ocean and dry bias over the Indian land mass. However, the skill of the seasonal forecasts of Indian summer monsoon rainfall (ISMR) by the ENSEMBLES MME has improved significantly compared to the MME of DEMETER. ENSEMBLES MME shows an improved skill in the prediction of ISMR with a correlation coefficient of 0.45 compared to 0.28 (DEMETER MME).

The ENSEMBLES coupled models show an excessive oceanic forcing on the atmosphere over the equatorial Indian Ocean with large positive correlation between SST and precipitation. Similarly, MME does not simulate realistically the SST-evaporation relationship and precipitation-evaporation relationship over the Indian Ocean. The ENSEMBLES MME also does not capture the recent weakening of the ENSO-Indian monsoon relationship. But it correctly captures the north Atlantic-Indian monsoon teleconnection, which is independent of ENSO. Perfect and actual models skills are calculated separately during two periods: 1960 to1979 and 1980 to 2005. The perfect model skill of ENSEMBLES MME is 0.7 during the period 1960 to 1979. The perfect model skill for the recent epoch (i.e., 1980 to 2005) has slightly reduced to 0.6. The actual skill in predicting the inter-annual variability of ISMR during the first epoch was close to 0.3 and it reduced to 0.1 during the recent epoch. These results highlight that the state-of-the-art coupled models have still limitations in seasonal prediction of Indian summer monsoon rainfall, even though the model skill has improved over the years.