

CMIP5 Multimodel ensemble evaluation in present climate over Pakistan

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This study investigates the performance of Coupled Models Inter-comparison Phase 5 (CMIP5) General Circulation Models (GCMs) over the region of Pakistan. The purpose of investigating this multimodel ensemble performance is the utilization of their data in climate impact based studies. The initial analysis has been done at monthly timescale for the present climate (1981-2005) with AgMIP climate forcing dataset based on the NASA Modern-Era Retrospective Analysis for Research and Applications (AgMERRA). The performance of all the models is assessed using root mean square errors of three meteorological parameters, maximum temperature, minimum temperature and precipitation relative to AgMERRA dataset. The performance metrics involve relative and standardized multimodel median RMSE of both seasonal and annual climatologies in order to check individual model relative to the rest of the multimodel ensemble as well as to assess the magnitude of model errors as compared to spatial variations of the parameter. An index has been defined as seasonality index for both average temperature and precipitation. The performance metrics show multimodel mean and median tend to outperform the individual models for the meteorological parameters, however, the performance of mean is not satisfactory for the seasonality representation in the models. Results of initial analysis show models are in good agreement with the observation for maximum and minimum temperature whereas for precipitation, some of the models show better performance over the others. Further in the study, comparison of simulations will be made with two gridded reanalysis/ observational datasets, AgMERRA and APHRODITE-2 products for the period 1998-2010, in order to calculate the discrepancies between the two reanalysis and observation datasets over the region. This part of the analysis utilizes daily data of both AgMERRA and APHRODITE-2 datasets to further check the models bifurcated in the monthly analysis as good or bad. The selected models will further be classified based on the temperature and precipitation extremes indices.

Keywords: Relative RMSE, standardized multimodel median RMSE, seasonality index, mean model, median model, ensemble