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Downscale climate change scenarios over the Western Himalayan region of India using multi-generation CMIP experiments

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Assessing climate change information over the Western Himalayan Region (WHR) of India is crucial but challenging task due to its limited numbers of station data containing huge missing values. The issues of missing values of station data were replaced the Multiple Imputation Chained Equation (MICE) technique. Finally 22 numbers of rain gauge stations having continuous data during 1901-2005 and 16 numbers stations having continuous temperature data during 1969-2009 were considered as " reference stations for assessing rainfall and temperature trends in addition to evaluation of the GCMs available in the Coupled Model Intercomparison Project, Phase 3 (CMIP3) and phase 5 (CMIP5) over WRH. Station data indicates that the winter warming is higher and rapid (1.05oC) than other seasons and less warming in the post monsoon season in the last 41 years. Area averaged using 22 station data indicates that monsoon and winter rainfall has decreased by -5 mm and -320 mm during 1901-2000 while pre-monsoon and post monsoon showed an increasing trends of 21 mm and 13 mm respectively.

Present study is constructed the downscaled climate change information at station locations (22 and 16 stations for rainfall and temperature respectively) over the WHR from the GCMs commonly available in the IPCC's different generations assessment reports namely 2nd, 3rd, 4th and 5th thereafter known as SAR, TAR, AR4 and AR5 respectively. Once the downscaled results are obtained for each generation model outputs, then a comparison of studies is carried out from the results of each generation. Finally an overall model improvement index (OMII) is developed using the downscaling results which is used to investigate the model improvement across generations as well as the improvement of downscaling results obtained from the empirical statistical downscaling (ESD) methods. In general, the results indicate that there is a gradual improvement of GCMs simulations as well as downscaling results across generation.

Key words: MICE Techniques, CMIP3, CMIP5, ESD and OMII