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Uncertainty assessment in climate change simulation of Ganges basin

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The assessment of hydrological responses to the change in climate at river basin scale is very essential for the proper planning and management of water resources. For studying the changes in land surface hydrology with climate, various hydrological models coupled with climate models were developed. However, modeling of the regional hydroclimate involves uncertainty at multiple levels. Generally, GCMs, downscaling methods and parameterization are the main sources of uncertainty. The major challenge in hydrological modeling is the calibration of parameters which demands very accurate observed data. The inter comparison of various uncertainties can be done by modeling the uncertainties. If the major source of uncertainty in modeling is identified, the level of accuracy required in the model calibration can be studied. Our objective is to assess future hydrological scenario in the Ganges basin considering multiple GCMs, scenarios and parameter uncertainty model and to identify and compare different sources of uncertainties in assessing the hydrological impacts of climate change. Variable Infiltration Capacity (VIC) model which is a semi-distributed macro scale hydrological model is used for the present study. The model is run for a historic period 1979-2005 using the observed and reanalysis data and is evaluated using soil moisture data. The Monte Carlo simulation (MCS) method is carried out for the four calibration parameters in VIC and the model is run for future scenario using different GCMs and downscaling methods. The probability distribution of the output is used for modeling the uncertainties. The present analysis shows that accuracy in climate change simulations can be achieved by modeling the uncertainty, which will certainly improve the future regional hydroclimate projection.
Keywords: uncertainty, Variable Infiltration Capacity model, Monte Carlo simulation