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Review of Downscaling Methods in Climate Change and Their Role in Hydrological Studies

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Abstract : Recent perceived climate variability raises concerns with unprecedented hydrological phenomena and extremes. Distribution and circulation of the waters of the Earth become increasingly difficult to determine because of additional uncertainty related to anthropogenic emissions. According to the sixth Intergovernmental Panel on Climate Change (IPCC) Technical Paper on Climate Change and water, changes in the large-scale hydrological cycle have been related to an increase in the observed temperature over several decades. Although many previous research carried on effect of change in climate on hydrology provides a general picture of possible hydrological global change, new tools and frameworks for modelling hydrological series with nonstationary characteristics at finer scales, are required for assessing climate change impacts. Of the downscaling techniques, dynamic downscaling is usually based on the use of Regional Climate Models (RCMs), which generate finer resolution output based on atmospheric physics over a region using General Circulation Model (GCM) fields as boundary conditions. However, RCMs are not expected to capture the observed spatial precipitation extremes at a fine cell scale or at a basin scale. Statistical downscaling derives a statistical or empirical relationship between the variables simulated by the GCMs, called predictors, and station-scale hydrologic variables, called predictands. The main focus of the paper is on the need for using statistical downscaling techniques for projection of local hydrometeorological variables under climate change scenarios. The projections can be then served as a means of input source to various hydrologic models to obtain streamflow, evapotranspiration, soil moisture and other hydrological variables of interest.

Keywords : climate change, downscaling, GCM, RCM
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