Multi-variable bias correction of RCMs for Climate Change Impact Studies

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Climate change (CC) may have considerable influence on hydrology, forestry and other environmental management. Therefore, appropriate climate change inputs should be used for impact assessment conducted at regional and local scale. A main source for climate projections at high spatial resolutions is made available through Regional Climate Models (RCMs). However, although RCMs have improved over past years, their remaining systematic biases often constrain their direct use for impact studies. A distribution-based scaling (DBS) approach has been developed as a post-processing tool to adjust systematic biases in multiple variables in climate modelling outputs. The variables to be adjusted include primary hydrological inputs, precipitation and temperature, relative humidity, wind speed, short-wave solar radiation and long-wave solar radiation. The variables statistical properties (i.e. mean and standard deviation) and their distribution (i.e. PDF) are proved to be considerably improved after bias correction. Also, the DBS is found to better preserve the variability of the future climate produced by the RCM. The bias-adjusted variables are subsequently used as inputs to the Forest Weather Index (FWI) system at a number of locations in Sweden. The resulting FWIs show clear outperformance when compared to those calculated using raw climate model outputs in past and present climate, in particular, under extreme climate. The DBS is therefore thought to be helpful to provide realistic climate change inputs to impact modelling in CC impact studies.