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A framework to consider non-equal reliability of GCM climate variables in climate change impact assessment

Sajjad Eghdamirad, Fiona Johnson, and Ashish Sharma
University of New South Wales, Randwick, Australia (s.eghdamirad@unsw.edu.au)

General Circulation Models (GCMs) simulate a range of atmospheric, oceanic and land surface variables representing different model structures, Representative Concentration Pathways (RCPs) and initial conditions. This research investigates the differences in the uncertainty associated with simulations of alternate atmospheric variables representing the future climate, with the aim of understanding how this uncertainty is manifested in the statistically downscaled precipitation that is derived using these atmospheric variables. A framework is purposed to consider uncertainty of GCM climate variables in climate change impact assessment. The proposed method uses a Taylor series expansion in order to quantify the truncated error of ignoring uncertainty of climate variables in statistical downscaling. An application of this approach to statistically downscale rainfall in Australia is presented.