

Statistical Downscaling Methods (II)

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This talk follows the overview presented previously, and considers some of the primary issues surrounding the application of downscaling. As reviewed in the recent IPCC third assessment report, empirical/statistical downscaling is very widespread among the community, yet little has been done to systematically evaluate the large number of permutations of techniques, nor address the fundamental attributes that need to be incorporated in an application.

Two key aspects are addressed here. The first aspect is the dependencies and constraints of a downscaling implementation resulting from choices made in the application of a methodology. There are numerous downscaled regional climate change scenarios in the literature, however, many of these represent only a partial solution due to the means employed to downscale. In many cases this is not recognized in the study, and as a result the scenarios presented may well be misleading. Foremost of the concerns that need to be addressed in a climate change application are the choice of predictor, the dependencies on predictor temporal and spatial resolution, and the predictand spatial and temporal resolution. Using a transfer function downscaling technique, the implications of these dependencies are illustrated.

The second issue is that of stationarity of cross scale relationships, which is also to some degree pertinent to the parameterizations used in global and regional models. For climate change applications a basic assumption is that the relationships remain valid under a future climate. For empirical/statistical downscaling this primarily relates to whether the data set used to establish the downscaling effectively represents the characteristics of a future climate state. In other words, is the future climate characterized primarily by changes in the frequency, intensity, or persistence of existing events, or is it dominated by unprecedented events. This question is investigated in the context of daily synoptic forcing with a data from a CSM global model simulation.

The results to these questions would indicate that given some fundamental principles, empirical/statistical downscaling is a viable means of scenario generation. In addition, it addresses a niche not covered by regional models, and is complementary to modeling approaches. Furthermore, it is computationally very appropriate for application in many of the most vulnerable (third world) regions of the globe.