Improving the Treatment of Extremes in the Generation of Climate Change Scenarios

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Abstract

Stochastic weather generators are commonly used to generate scenarios of climate variability or change on a daily timescale. So the realistic modeling of extreme events is essential. Presently, parametric weather generators do not produce a heavy enough upper tail for the distribution of daily precipitation amount, whereas those based on resampling have inherent limitations in representing extremes. Advanced statistical tools from ultimate and penultimate extreme value theory are used to model the extremal behavior of precipitation intensity (i.e., nonzero amount). Within a weather generator framework, several possible approaches are proposed, none of which resolves the problem completely, but at least one of them (i.e., a "hybrid" technique with a gamma distribution for low to moderate intensities and a generalized Pareto distribution for high intensities) can lead to a substantial improvement. An alternative approach, based on fitting the stretched exponential (or Weibull) distribution to either all or only high intensities, is found difficult to implement in practice.

The need for improved treatment of temperature extremes, particularly hot spells (or "heat waves"), by stochastic weather generators is also briefly addressed.

REFERENCE

Furrer, E.M., and R.W. Katz, 2008: Improving the simulation of extreme precipitation events by stochastic weather generators. *Water Resources Research*, **44**, W12439 (27 December).