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Projections of Extreme Weather in a Changing Climate: Balancing Confidence and Uncertainty

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Future changes in the average climate virtually guarantee that changes in extreme weather events will follow. Such rare events are best described statistically as it is difficult, but perhaps not impossible, to directly link individual disasters to human-induced climate change. Examples of extreme weather events with severe consequences to society that are amenable to projection include heat waves, cold spells, floods, droughts and tropical cyclones. Confidence in projections of future changes in the severity and frequency of such events is increased if the mechanisms of change can be identified and understood. Equally important, however, is the rigorous quantification of the uncertainties in these projections. In this presentation, existing multi-model projections of changes in extreme events are reviewed and the sources of uncertainty in them discussed. The limitations in climate model fidelity as well as the statistical methods used to analyze their output are examined. A particular focus will be on high-resolution global climate models and their simulation of the weather phenomena associated with extreme precipitation, including tropical and extra-tropical storms. Results from past and future simulations of the Community Atmospheric Model (CAM5.1) run globally at a 25km resolution will be presented and subject to an analysis based on time dependent generalized extreme value theory formulations.