Applications of extreme value theory in climate science

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Extreme value theory is used increasingly in climate science to describe historical changes in the intensity and frequency of extremes, in the evaluation of climate models, for climate change detection and attribution, and to assess the impacts of projected climate change on changes in the far tails of the distribution of daily temperature and precipitation amounts. Published research includes the application of both the peaks-over-threshold and block-maximum approaches, although the latter dominates. A relatively large number of studies attempt to account for non-stationarity in the behaviour of extreme values by including covariates in fitted extreme value distributions. The latter has provided opportunities to provide greater insight into the causes of historical variations of extremes, and also creates the potential to predict short term variations in the likelihood of specified extreme events. A limited number of studies have also explored ways in which to account for spatial dependence between extremes. Arguably less progress has been made in describing “compound” events that lead to extreme impacts. This talk will briefly describe several studies that have contributed to this development, focusing primarily on some recent advances in research on precipitation extremes.