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Detecting temporal extreme clusters in long-term precipitation records

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The temporal clustering of extremes has long been a blurred phenomenon to researchers concerned with investigating natural climate variability. There is also a growing concern that in addition to the clustering of the extreme events, anthropogenic forcing may exacerbate the extremes. The detection of the likelihood of clustering will not only enhance our understanding of the climate extreme variability but also reduce potentially severe impacts. An empirical statistical approach for the detection of temporal clustering of extremes has been developed and tested on a unique type of rainfall series. The approach was used to assess variability in rainfall extremes using a long-term (1898-2004) high quality 10 minute resolution rainfall record from Belgium. The statistical significance of periods of rainfall extremes was assessed through a suite of methods including extreme value analysis, regression and Monte Carlo bootstrapping. Rainfall intensities were aggregated at levels ranging from 10 minutes to the monthly scale, and defined for different seasons and block lengths between 5 and 15 years using sliding windows. Perturbations in rainfall extremes were derived, which represent the empirical quantile changes. Significant deviations in rainfall quantiles were found, which persisted for periods of 10 to 15 years. In the winter and summer seasons, high extremes were clustered in the 1910s-1920s, the 1960s and recently in the 1990s. This temporal clustering highlights the need for alternative studies for attributing ‘change’ in climate series other than anthropogenically induced global warming.

References

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