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The relationship between Urbanisation and changes in flood regimes: the British case.

Ilaria Prosdocimi, James Miller, and Thomas Kjeldsen
Centre for Ecology and Hydrology, Wallingford, United Kingdom

This pilot study investigates if long-term changes in observed series of extreme flood events can be attributed to changes in climate and land-use drivers. We investigate, in particular, changes of winter and summer peaks extracted from gauged instantaneous flows records in selected British catchments. Using a Poisson processes framework, the frequency and magnitude of extreme events above a threshold can be modelled simultaneously under the standard stationarity assumptions of constant location and scale. In the case of a non-stationary process, the framework was extended to include covariates to account for changes in the process parameters. By including covariates related to the physical process, such as increased urbanization or North Atlantic Oscillation (NAO) Index levels, rather than just time, an enhanced understanding of the changes in high flows is obtainable. Indeed some variability is expected in any natural process and can be partially explained by large scale measures like NAO Index. The focus of this study is to understand, once natural variability is taken into account, how much of the remaining variability can be explained by increased urbanization levels. For this study, catchments are selected that have experienced significant growth in urbanisation in the past decades, typically 1960s to present, and for which concurrent good quality high flow data are available. Temporal change in the urban extent within catchments is obtained using novel processing of historical mapping sources, whereby the urban, suburban and rural fractions are obtained for decadal periods. Suitable flow data from localised rural catchments are also included as control cases to compare observed changes in the flood regime of urbanised catchments against, and to provide evidence of changes in regional climate. Initial results suggest that the effect of urbanisation can be detected in the rate of occurrence of flood events, especially in summer, whereas the impact on flood magnitude is less pronounced. Further tests across a greater number of catchments are necessary to validate these results.