



Understanding hydrological extremes in the Anthropocene

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Hydrological extremes, from floods to droughts, pose one of the greatest challenges of the 21st century. Many of these challenges are associated with societal interactions with water, as people control or impact hydrological systems in a multitude of ways while they are also being affected and shaped by hydrological extremes, depending on their response to drought and flood events. However, the fact that the human and natural components of freshwater systems interact and co-evolve over time is often not taken into account. There is a need to study the two-way coupling between hydrology and society within a more comprehensive framework for hydrological extremes to anticipate future trajectories in a rapidly changing world. We present an interdisciplinary framework (and concepts) to identify internal controlling variables, processes and feedbacks, and the external system drivers and disturbances of the coupled human-water system with regard to hydrological extremes. To achieve this, the study (i) synthesizes existing research on coupled human-water system focusing on floods and droughts, (ii) analyzes hydrological extremes that have already occurred and their spatiotemporal patterns to investigate what patterns are observed in different regions of the world, and (iii) systematically describe the observed hydrological extremes, their causes and the interactions and feedbacks between hydrology and society. Advancing our understanding of mechanisms and feedbacks driving hydrological extremes is essential to better anticipate how the coupled human-water system will respond to future environmental change.