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Propagation of Flood and Drought through the Hydrologic Cycle in Global Major River Basins

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In this study, we utilize the statistical crossing theory to investigate the propagation of flood and drought through the hydrologic cycle over selected global largest river basins. Crossing theory deals with the properties of excursions of random processes above and below certain threshold values (i.e. quantification of anomaly magnitude, frequency and duration), hence is suitable for studying the propagation of flood and drought through the hydrologic cycle. We study from the perspective of combined land-atmospheric interaction to understand how the meteorological flood and drought occurred due to anomalous atmospheric vapor convergence and precipitation are propagated through terrestrial water storage, and finally realized in streamflow after amplification or attenuation of their characteristics over the selected basins. The global-scale data from the GRACE, reanalysis, and hydrologic model simulations are jointly used. This study has significant implications to predict hydrologic responses under future climate change conditions, in particular the projected increased occurrence of flood and drought due to the intensification of global hydrologic cycle.