



Lagged coincidence in global floods and droughts over the past 60 years

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Droughts and floods are two of the most common and devastating natural hazards, impacting on a wide range of sectors including water, agriculture and food security, energy production, infrastructure, and ecosystem health. There have been numerous studies investigating the changing behavior of these two extremes and their societal impact, yet they are generally treated separately. The intersection between the two, especially the rapid transition from drought to flood (we call this the “drought-flood seesaw”), deserves more attention as it can lead to greater impact than the sum of each individual type of extreme because of the increase in vulnerability of populations and ecosystems. For example, the 2017 California floods occurred on the back of the state’s multi-year (2011-2016) drought, leading to even more challenges for the state’s multiple water dependent sectors. In this study, we investigate how often droughts have been followed by floods in the past seven decades through a novel yet mathematically simple event coincidence analysis applied to land surface model simulations for the past seven decades (1950-2016). We find that about 11 percent of droughts have been followed by at least one flood in the following season, although over a small percentage of the global land surface. Although this global frequency pattern is modest, the occurrence of drought-flood see-saw has become more frequent than either droughts or floods alone in the last three decades, with regional hotspots mainly occurring over the sub-tropics and mid-latitudes, which may indicate greater variability in weather with climate change.