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# Compound impact of rainfall, tidal level and storm surge on flood risk from tropical cyclones in the coastal area of shanghai

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Catastrophic flooding resulting from extreme tropical cyclones has occurred more frequently and drawn great attention in recent years in China. Coastal cities are particularly vulnerable to flood under multivariable conditions, such as heavy precipitation, high sea levels, and storms surge. In coastal areas, floods caused by rainstorms and storm surges have been one of the most costly and devastating natural hazards in coastal regions. Extreme precipitation and storm tide are both inducing factors of flooding and therefore their joint probability would be critical to determine the flooding risk. Usually, extreme events such as tidal level, storm surges, precipitation occur jointly, leading to compound flood events with significantly higher hazards compared to the sum of the single extreme events. The purpose of this study is to improve our understanding of multiple drivers to compound flooding in shanghai. The Wind Enhance Scheme (WES) model characterized by Holland model is devised to generate wind "spiderweb" both for historical (1949-2018) and future (2031-2060, 2069-2098) tropical cyclones. The tidal level and storm surge model based on Delft3D-FLOW is employed with an unstructured grid to simulate the change of water level. For precipitation, maximum value between tropical cyclone events is selected. Following this, multivariate Copula model would be employed to compare the change of joint probability between tidal level, storm surge and heavy precipitation under climate change, taking into account sea-level rise and land subsidence. Finally, the impact of tropical cyclone on the joint risk of tidal, storm surge and heavy precipitation is investigated.