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Mapping community exposure to extreme heat and flood hazards in the Carolinas

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Recent extreme weather events have drawn attention to how multiple climate disasters can combine to create negative social and economic consequences across sectors. Perhaps the most concerning of these multi-hazard scenarios, is the combination of heat stress, characterized as high temperature and humidity, and severe flooding, which can result in devastating socioeconomic and health consequences for communities. For example, heat stress may *precede* a flood event, amplifying its impact (e.g., British Columbia (2021)) and leading to increased fatalities and injuries from the event; on the other hand, infrastructure outages caused by severe flooding may increase the vulnerability of individuals to heat stress *following* the event, as is often the case after tropical cyclones (e.g., Hurricanes Ike (2008) and Maria (2017)). Managing future climate risks will require a better understanding of the frequency of occurrence of compound heat and flood stress and the space and time scales over which they interact. As a case study, this research develops a framework for measuring community exposure to flood and heat extremes applied to North Carolina, USA. Leveraging parcel-scale records of insured flood damage, we generate a spatially- and temporally-explicit database of historical flood extents since 1970, and couple it to a reanalysis of extreme heat events measured in terms of Wetbulb index. We then identify spatial and temporal clusters of extreme heat and flood events in North Carolina. This work will enable improved vulnerability and climate risk assessment and enable community to identify more resilient pathways to climate adaptation. The work is part of a larger Carolinas Collaborative on Climate, Health and Equity (C3HE) project which focuses on the cooccurrence of extremes and aims to measure the socioeconomic and health outcomes in partnership with Carolina communities.