

## **Assessing Compound Impacts of Natural Hazards in Miami-Dade County, Florida**

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### **Abstract**

Natural hazards cause significant economic losses and notable counts of fatalities. While natural hazards are often considered to be caused by a single climatic driver, they can be associated with the combined occurrence of multiple drivers (e.g., coastal flood driven by storm surge and precipitation). Defining whether the climatic drivers (precipitation, temperature, or wind) are extreme enough to turn the hazards into disasters is crucial for estimating disaster risks. To date, extreme events are often defined using the block maxima or peaks over threshold methods ignoring the effects of the built environment and socio-economic conditions. However, a hazard with the same magnitude can cause very different impacts in regions with varying built environments and socio-economic conditions. Additionally, when multiple climatic drivers are involved, traditional methods of defining extreme events are challenging to apply.

In previous studies, compound extreme events are assessed based on climate drivers information, being extremes events defined by using different statistical criteria. In this research, we developed an impact-based approach for identifying critical thresholds of climatic drivers for different hazards and assess their possible compounding effects based on historical socio-economic impact data. Thus, we implicitly account for the built environment and socio-economic conditions of each region. We use SHELDUS database (CEMHS, 2020) to identify historical hazard events that caused socio-economic losses (property and crop damage) across the U.S. Informed by this database, we obtain time series for 12 climatic drivers from historical observations and reanalysis datasets from 1979 to 2019. Preliminary results for Miami-Dade County show that hazards resulting in higher socio-economic impact are all compound events having driven by multiple climate drivers. We also found that the threshold at which hazard generates impact is reduced when combined with other drivers. Our results highlight the relevance of socio-economic impacts when assessing compounding effects of natural hazards.