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A Novel Method to Generate Global Multi-Hazard Event Sets

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While the last decade saw substantial scientific advances in studies aimed at improving our understanding of natural hazard risk, research and policy commonly address risk from a single-hazard, single-sector perspective. Thus, not considering the spatial and temporal interconnections of these events. Single-hazards risk analyses are often inaccurate and incomplete when multi-hazard disasters occur, as the interaction between them may lead to a different impact than summing the impacts of single events.

A key first step to reduce this inaccuracy is to create greater understanding of realistic multi-hazard event sets that better examines statistical dependencies between hazard types. Therefore, it is important to understand the spatial and temporal aspects of each individual hazard in order to evaluate when multiple coinciding hazards are a multi-hazard event. To do so, single hazards datasets for meteorological, geological, hydrological and climatological events are explored with the use of a decision tree. The decision tree accounts for varying intensities and time-lags between hazards to better address the dynamics of vulnerability. This paper provides a decision tree that enables realistic multi-hazard event sets to be created based on varying assumptions (such as, the time-lag, the time between two individual hazards). By generating a, first of its kind, global multi-hazard event set database, spanning from 2004 to 2016, we achieve a greater knowledge of the different types of multi-hazards, such as triggering, amplifying, compound and consecutive events, as well as their interconnections. This global dataset provides practitioners and other stakeholders with insights on the frequency of different multi-hazard events and their hotspots. The methods provided in this paper is opensource and can be used by other researchers to conduct a more comprehensive multi-risk assessment.