EGU24-2125, updated on 08 Mar 2024
https://doi.org/10.5194/egusphere-egu24-2125
EGU General Assembly 2024

Reclassifying historical disasters: from single to multi-hazards

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Multi-hazard events, characterized by the simultaneous, cascading, or cumulative occurrence of multiple natural hazards, pose a significant threat to human lives and assets. This is primarily due to the cumulative and cascading effects arising from the interplay of various natural hazards across space and time. However, their identification is challenging, which is attributable to the complex nature of natural hazard interactions and the limited availability of multi-hazard observations. This presentation, focused on a recently published article in Science of the Total Environment (https://doi.org/10.1016/j.scitotenv.2023.169120), presents an approach for identifying multi-hazard events during the past 123 years (1900-2023) using the EM-DAT global disaster database. Leveraging the 'associated hazard' information in EM-DAT, multi-hazard events are detected and assessed in relation to their frequency, impact on human lives and assets, and reporting trends. The interactions between various combinations of natural hazard pairs are explored, reclassifying them into four categories: preconditioned/triggering, multivariate, temporally compounding, and spatially compounding multi-hazard events. The results show, globally, approximately 19% of the 16,535 disasters recorded in EM-DAT can be classified as multi-hazard events. However, the multi-hazard events recorded in EM-DAT are disproportionately responsible for nearly 59% of the estimated global economic losses. Conversely, single hazard events resulted in higher fatalities compared to multi-hazard events. The largest proportion of multi-hazard events are associated with floods, storms, and earthquakes. Landslides emerge as the predominant secondary hazards within multi-hazard pairs, primarily triggered by floods, storms, and earthquakes, with the majority of multi-hazard events exhibiting preconditioned/triggering and multivariate characteristics. There is a higher prevalence of multi-hazard events in Asia and North America, whilst temporal overlaps of multiple hazards predominate in Europe. These results can be used to increase the integration of multi-hazard thinking in risk assessments, emergency management response plans and mitigation policies at both national and international levels.

How to cite: White, C., Adnan, M., Lee, R., Douglas, J., Mahecha, M., O'Loughlin, F., Patelli, E., Ramos, A., Roberts, M., Martius, O., Tubaldi, E., van den Hurk, B., Ward, P., and Zscheischler, J.: Reclassifying historical disasters: from single to multi-hazards, EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-2125, https://doi.org/10.5194/egusphere-egu24-2125, 2024.