EGU24-955, updated on 20 May 2024
https://doi.org/10.5194/egusphere-egu24-955
EGU General Assembly 2024

A European Perspective on Joint Probabilities of Multi-Hazards

Judith Claassen[1], Philip Ward[1,2], Wiebke Jäger[1], Elco Koks[1], and Marleen de Ruiter[1]
[1]Vrije Universiteit Amsterdam , Institute for Environmental Studies, Water & Climate Risk, Amsterdam, The Netherlands (j.n.claassen@vu.nl)
[2]Deltares, Delft, The Netherlands

Natural hazards rarely occur in isolation. Frequently, one hazard triggers another, such as an earthquake triggering a tsunami. Likewise, the likelihood of a hazardous event can be amplified by the occurrence of a previous event, such as a drought amplifying the likelihood of a wildfire to occur. However, two extremes can also co-occur as a compound event, leading to even higher combined impacts.

While the field of compound events is advancing rapidly, studies often focus solely on climatic extremes occurring at the same time, excluding non-climate-related hazards or previous triggering and amplifying conditions. Therefore, this research aims to better understand the dependencies between different (pre-conditioning) hazard magnitudes, geographic features, and historic natural hazard footprints accounting for both climatic and geological hazards.

With the use of statistical tools, such as vine copulas, we model the relationships within two different hazard groups. The first group consists of drought, heatwave, and fuel indicators to calculate the risk of wildfires. The second group includes earthquakes, precipitation, and slope data to calculate the risk of landslides. While the first group is considered a compound event, the second group can be classified as a multi-hazard, with different triggering or amplifying relationships. For both groups, we attempt to use the same method to model stochastic events that include a potential hazard footprint for wildfires and landslides on a local to European scale. This model allows users to evaluate potential hazard combinations and footprints in their regions, enabling better preparedness for potential multi-hazard events.