Can we understand the variability in flood-induced displacement using process-based global flood modelling?

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Every year, disasters force millions of people around the world to leave their homes. Disaster-induced displacement often leads to humanitarian hardship and imposes substantial costs on vulnerable, low-income societies in the Global South. With anthropogenic climate change increasing the intensity and number of extreme events in many regions globally, understanding and projecting disaster-induced displacement becomes increasingly important. Floods are among the main causes of disaster-induced displacements. However, the causes of variability in flood displacement over time and space are not well understood. Therefore, it is not known to what extent climate change has already affected displacement in the past, making it difficult to produce reliable estimates of future displacement risk.

In our study, we address the question of how much of the observed variability can be explained on the basis of process-based flood hazard modeling. We use the output of state-of-the-art global hydrological models forced with observational climate and direct human forcings to derive flood extents from the global hydrodynamic model CaMa-Flood. We first assess how well modelled flood hazards can explain annual variations in past displacement as recorded by the Internal Displacement Monitoring Center at a global as well as national scale, before also accounting for different vulnerabilities of communities by applying spatially-disaggregated vulnerability factors derived from comparing the simulated number of people affected by flooding to observational displacement data. We hence provide a comprehensive assessment of the explanatory power of the process-based fluvial flood hazard component concerning displacement.

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