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Enhancing Flood Modeling: Unveiling the Role of Hazard Parameters in Building Vulnerability

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Abstract : Following the devastating summer 2021 floods in Germany, catastrophe modelers realized that hazard parameters, such as flow velocity, flood duration, and debris flow, play a significant role in capturing the overall damage potential of such events. Accounting for the location-specific static depth as the only hazard intensity metric may lead to a substantial underestimation of the vulnerability of building stock and, eventually, the loss potential of such catastrophic events. As the flow velocity increases, the hydrodynamic forces acting on various building components are amplified. Longer flood duration leads to water permeating porous components, incurring additional cleanup costs that contribute to an overall increase in damage. Debris flow possesses the power to erode extensive sections of buildings, thus substantially augmenting the extent of losses. This paper introduces four flow velocity classes, ranging from no flow velocity to major velocity, along with two flood duration classes: short and long, in estimating the vulnerability of the building stock. Additionally, the study examines the impact of the presence of debris flow and its role in exacerbating flood damage. The paper delves into the effects of each of these parameters on building component damageability and their collective impact on the overall building vulnerability.

Keywords : catastrophe modeling, building vulnerability, hazard parameters, component damage function
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