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## Influence of flood frequency on residential build losses

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**Abstract.** For the purpose of flood risk analysis, reliable loss mode indispensable need. The most common models use stage-damage functions relating damage to water depth. They are often derived from empirical flood loss data (i.e. loss data collected after a flood event). However, object specific loss data (e.g. losses of single residential buildings) from recent flood events in Germany showed higher average losses in less probable events, regardless of actual water level. The models that were derived from such data tend to overestimate losses caused by more probable events. Therefore, it is the aim of the study to analyse the relation between flood damage and recurrence interval. We propose a method for considering recurrence interval in flood loss modelling. The survey was based on residential building loss data ( $n=2158$ ) of recent flood events in 2002, 2005 and 2006 in Germany on-site recurrence interval of the respective events. We discovered a highly significant positive correlation between loss extent and recurrence interval for classified water levels as well as increasing average losses for longer recurrence intervals within each class. The application of principal component analysis revealed the interrelation between factors that influence the damage extent directly or indirectly, and recurrence interval. No single factor or component could be identified that explained the influence of recurrence interval, which led to the conclusion that recurrence interval cannot substitute, but complement other damage influencing factors in flood loss modelling approaches. Finally, a method was developed to include recurrence interval in typical flood loss models to make them applicable to a wider range of flood events. Validation and statistical error analysis showed that the modified models improve estimates in comparison to traditional approaches. The proposed parameter model FLEMOps+r performs particularly well.

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