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Seamless flood risk estimation across spatial scales

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In 2016 the overall losses due to hydro-meteorological hazards came to 110 billion US Dollar globally. Most likely, these losses are going to increase in the future, especially in view of the current development of the climate system and society. This leads to the need of adaptation in all parts of the society. Comprehensive risk assessments representing the uncertainties associated with the estimation of the impacts are needed for an effective natural hazard management at any spatial scale. At the same time exposure data sets, such as openstreetmap data, around the world get more detailed and available at small scales down to the object level, yet most state-of-the-art method are not taking this information into account.

We present a novel object-based method enabling the exploitation of the newly available exposure data sets for hydro-meteorological damage estimation, allowing for risk assessments, consistent at all spatial scales, with a quantification of uncertainties associated with the hazard, exposure and vulnerability. The results are probability distributions, which can be summarized for any number of objects, making our approach independent of inaccurate land use data sets. Furthermore, the distributions inherently reflect the reliability of the estimations. We apply the method to estimate the direct economic impacts to companies in Germany caused by the flood event in the year 2013 using openstreetmap data sets. The application and validation shows that our method works reliably at all spatial scales. The successful post-event application and the inclusion of uncertainties makes the method also suitable for the analysis of future risks facilitating risk management, optimal decision making and climate change adaptation.