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Probabilistic evaluation of flood risk in urban areas using Monte Carlo simulation (with uncertainty)

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The goal of the presented research is the derivation of flood risk maps, using Monte Carlo simulation of flood propagation in a urban site in the UK, specifically the area of the city of Glasgow. A hydrodynamic model describing the propagation of flood waves, based on the De Saint Venant equations in two dimensional form capable of accounting for the topographic complexity of the area (preferential outflow paths, buildings, manholes, etc.) and for the characteristics of prevailing impervi-ousness typical of the urban areas has been used to derive hydrodynamic characteristics of flood event (i.e, water depths and flow velocities). The knowledge of the water depth distribution and of the current velocities derived from the propagation model along with the knowledge of the building/social characteristics of urban areas from digital map data allowed for the production of risk maps based on properly defined risk indexes. These indexes are evaluated in a probabilistic framework to overcome the classical problem of single deter-ministic prediction of flood extent for the design event and to introduce the concept of the likelihood of flood-ing at a given point as the sum of data uncertainty, model structural error and parameterization uncertainty.