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Fast Flood damage estimation coupling hydraulic modeling and Multisensor Satellite data

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Damage estimation requires a good representation of the elements at risk and their vulnerability, the knowledge of the flooded area extension and the description of the hydraulic forcing.
In this work a simplified two dimensional hydraulic model constrained by satellite retrieved flooded areas is analyzed.
The main features of such a model are simple start-up, with no need to insert complex information but a subset of simplified boundary and initial condition, and computational speed.

Those characteristics allow the model to be fast enough to be used in real time for the simulation of flooding events.
The model fills the gap of information left by single satellite scenes of flooded area, allowing for the estimation of the maximum flooding extension and magnitude. The static information provided by earth observation (like SAR extension of flooded areas at a certain time) are interpreted in a dynamic consistent way and very useful hydraulic information (e.g., water depth, water speed and the evolution of flooded areas)are provided.
The model has been tested in many scenarios, both for large flooded areas (Polesine 1951 flood, Albania 2011 flood) and extremely urbanized areas (Genova 1970) in about ten different real scenarios.

These information are merged with satellite identification of elements exposed to risk that are characterized in terms of their vulnerability to floods in order to obtain fast estimates of Food damages. The outputs of the model like water depth scalar fields, and water speed vector fields, can be easily used to feed a chemical or physical transport model to estimate areas of impact of chemical or physical components carried by the water.

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