

EGU21-7591, updated on 19 Jan 2022

<https://doi.org/10.5194/egusphere-egu21-7591>

EGU General Assembly 2021

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Prediction capabilities of GeoFlood for the delineation of flood-prone areas: the Tiber River case study

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Land use and delineation of flood-prone areas require valuable and effective tools, such as flood mapping. Local authorities, in order to prevent and mitigate the effects of flood events, need simplified methodologies for the definition of preliminary flooded areas at a large scale. In this work, we focus on the workflow GeoFlood, which can rapidly convert real-time and forecasted river flow conditions into flooding maps. It is built upon two methodologies, GeoNet and the HAND model, making use only of high-resolution DTMs to define the geomorphological and hydraulic information necessary for flood inundation mapping, thus allowing for large-scale simulations at a reasonable economical and computational cost. GeoFlood potential is tested over the mid-lower portion of the river Tiber (Italy), investigating the conditions under which it is able to reproduce successful inundation extent, considering a 200-year return period scenario. Results are compared to authority maps obtained through standard detailed hydrodynamic approaches. In order to analyze the influence of the main parameters involved, such as DTM resolution, channel segmentation length, and roughness coefficient, a sensitivity analysis is performed. GeoFlood proved to produce efficient and robust results, obtaining a slight over-estimation comparable to that provided by standard costly methods. It is a valid and relatively inexpensive framework for inundation mapping over large scales, considering all the uncertainties involved in any mapping procedure. Also, it can be useful for a preliminary delineation of regions where the investigation based on detailed hydrodynamic models is required.