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Swift delineation of flood-prone areas over large European regions

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According to the European Environment Agency (EEA Report No 1/2016), a significant share of the European population is estimated to be living on or near a floodplain, with Italy having the highest population density in flood-prone areas among the countries analysed. This tendency, tied with event frequency and magnitude (e.g.: the 24/11/2016 floods in Italy) and the fact that river floods may occur at large scales and at a transboundary level, where data is often sparse, presents a challenge in flood-risk management. The availability of consistent flood hazard and risk maps during prevention, preparedness, response and recovery phases are a valuable and important step forward in improving the effectiveness, efficiency and robustness of evidence-based decision making.
The present work aims at testing and discussing the usefulness of pattern recognition techniques based on geomorphologic indices (Manfreda et al., J. Hydrol. Eng., 2011, Degiorgis et al., J Hydrol., 2012, Samela et al., J. Hydrol. Eng., 2015) for the simplified mapping of river flood-prone areas at large scales. The techniques are applied to ∼25m Digital Elevation Models (DEM) of the Danube, Po and Severn river watersheds, obtained from the Copernicus data and information funded by the European Union – EU-DEM layers. Results are compared to the Pan-European flood hazard maps derived by Alfieri et al. (Hydrol. Proc., 2013) using a set of distributed hydrological (LISFLOOD, van der Knijff et al., Int. J. Geogr. Inf. Sci., 2010, employed within the European Flood Awareness System, www.efas.eu) and hydraulic models (LISFLOOD-FP, Bates and De Roo, J. Hydrol., 2000). Our study presents different calibration and cross-validation exercises of the DEM-based mapping algorithms to assess to which extent, and with which accuracy, they can be reproduced over different regions of Europe.
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Keywords: flood hazard, data-scarce regions, large-scale studies, pattern recognition, linear binary classifiers, basin geomorphology, DEM.