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European-wide validation of riverine flood-prone areas derived from a geomorphological index

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The present work aims at validating (and cross-validating) at the European scale (131 major basins) a pattern recognition technique (Degiorgis et al., J Hydrol., 2012) applied to a geomorphologic index (Samela et al., Adv Water Resour., 2017), for the classification of riverine flood-prone areas and their simplified mapping over large-scales. The geomorphological flood index is computed on a ∼25 m Digital Elevation Model (DEM) of Europe, obtained from the Copernicus data and information funded by the European Union – EU-DEM layers. The calibration of the employed pattern recognition technique and the validation of flood hazard extent is produced taking as reference the Pan-European flood hazard maps, available for six return periods (10, 20, 50, 100, 200 and 500-year), of Alfieri et al. (Hydrol. Proc., 2013), derived 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). A discussion will be put together based on the validation results, particularly emphasizing the generalization and transferability of the method and its parameters. To the best of our knowledge, at this European scale, at ∼25 m resolution and for six different return periods, no such comprehensive riverine flood hazard maps are available; nor have such maps ever been validated.

Keywords: classification algorithms, DEM, geomorphology, large-scale studies, linear binary classifiers, machine learning, pattern recognition, river flood hazard, supervised learning, watershed characteristics