EGU2020-7753
https://doi.org/10.5194/egusphere-egu2020-7753
EGU General Assembly 2020

Spatio-temporal mapping of floods of record across Europe

Simone Persiano[1], Fabio Arletti[1], Miriam Bertola[2], Juraj Parajka[2], Günter Blöschl[2], and Attilio Castellarin[1]

[1]Department of Civil, Chemical, Environmental and Materials Engineering (DICAM), University of Bologna, Bologna, Italy (simone.persiano@unibo.it)

[2]Institute of Hydraulic Engineering and Water Resources Managament, Vienna University of Technology, Vienna, Austria

Given the steady increase of economical losses and social consequences caused by extreme flood events over the last decades in many European countries, the scientific community is making an effort to better understand recent flood dynamics and their evolution in space and time.

In this context, our study considers a large dataset of annual maximum series of peak flow discharges for more than 3400 catchments across Europe. The dataset covers the period 1820-2016, with an average record length of 53 years. On the basis of this extensive dataset, our study focuses on an issue which has never been addressed at European scale: we analyse the behaviour of the specific flood of record (i.e. the largest flood observed in the time interval of interest divided by the drainage area of the corresponding catchment, hereafter also referred to as SFOR) in space and time across the European continent. In particular, we consider the spatial variability of SFOR computed for the entire observation period, and for two additional sub-samples, including observations collected in the last three decades (i.e. 1987-2016) and in the three previous ones (i.e. 1957-1986), respectively. For the selected different timespans, we then analyse the spatial variability of the year in which SFOR was observed, and the number of times in which a new record was observed at each and every gauge, also evaluating their relationship with catchment area and outlet elevation.

We also provide a continuous spatial representation of SFOR values by interpolating them at elementary catchments identified by the Joint Research Centre (JRC) of the European Commission. In particular, for each elementary catchment included in the JRC dataset, we interpolate empirical SFOR values through two different procedures: (1) a geostatistical procedure (i.e. top-kriging), and (2) a linear regression with drainage area on the basis of the SFOR values observed at the closest catchments. Both the interpolation procedures account for nesting between catchments and are applied so as to ensure for the interpolated SFOR values a monotonic decrease from upstream to downstream.

The analysis of the maps produced in our study provides useful information on the spatio-temporal evolution of flooding potential across Europe, enabling a visualization of significant changes and shifts of the flood of record occurred during the last decades. In particular, we observe that: (1) years of occurrence of SFOR values are mainly concentrated in the last thirty

years (i.e. 1987-2016), especially in the area of Central Europe; (2) smaller catchments show higher sensitivity to changes in flood dynamics.