Time series reconstruction of floods in Southern Italy

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In the last few years, an increasing number of studies have identified changes in the rainfall regime and annual maxima. There is evidence of a modification of rainfall extremes of short durations in specific regions. Rainfall amplification may consequently impact on the river flow regime and floods (e.g., Tabari, 2020) and, therefore, it may be necessary to adapt flood estimation methods to the observed changes.

In this study, we attempt to construct a detailed description of extreme flow patterns and trends in Southern Italy in the period 1928-2020. For this reason, the dataset of annual maximum discharges was constructed using all available records and extended using indirect measurements (water levels). The data before 1980 were collected in the Special Publication No. 17 published by the SII/SIMN, which provides the annual maximum flow rates and the annual rating curves. Recently, flow rate reconstruction is very rare and the only data available is represented by the water level measurements. In order to extend the available database of historical series of annual maxima of floods, we integrated the annual floods exploiting the annual maxima flow rating curve derived for most of the monitored cross sections of Southern Italy. Such rating curve is quite stable over time as demonstrated by Claps et al. (2003 and 2010) and it was verified using also hydraulic numerical models. In addition, the database was also integrated exploiting mean daily maxima which have been transformed into peak flow values by a conversion factor proposed by Taguas et al. (2008). The assembled database represents an attempt to reconstruct the hydrological time-series in Southern Italy that are significantly fragmented and incomplete. To verify the reliability of the implemented approaches for data reconstruction, the Kolmogorov-Smirnov test was carried out to assess the homogeneity between observed and reconstructed data.

Then, the assembled series were statistically analysed in order to detect possible trends. In addition, the correlation with observed rainfall and flood trends (Avino et al., 2021; Caloiero et al., 2018; Piccarreta et al., 2004) is investigated. The flood dynamics show contrasting outcomes which vary significantly over the studied territory.

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