



Analysis and identification of historical trend of rainfall extremes over northern Italy

Luigi Cesarini (1), Mario Martina (1), Gabriella Petaccia (2), and Giuseppe Barbero (2)

(1) IUSS di Pavia, Science, Technology and Society , (2) Università degli studi di Pavia, Department of Civil engineering

In recent years, climate change and the consequences attached to it are gathering increasingly attention in the scientific community. The influence of climate change on temperature is vastly discussed, meanwhile, the effects on other hydrometeorological variables are still to be thoroughly studied. The impact of climate change on extreme rainfall is reason for concern since change in the frequency and intensity of these extremes may lead to flood events, landslide or simple malfunctioning of urban drainage system. The comprehension of this phenomenon could lead to a better design of infrastructures and more appropriate risk mitigation strategies.

The purpose of this study is to identify any statistically significant trend in extreme rainfall and its spatial and temporal patterns and detect which morphological and climatic variables are the main drivers of the variation in the frequency and intensity of extreme rainfall events. The study was carried out in the northern part of Italy over six regions, namely Piemonte, Lombardia, Veneto, Emilia-Romagna, Trentino and Friuli Venezia Giulia. Inside this area, which comprises the alpine arch, the Po valley and part of the Apennines, were selected 250 meteorological stations that provided annual maximum rainfall series for different durations, 1,3,6,12 and 24 hours over the period spanning from 1950 to 2017.

For each duration, the presence and the significance of trends was investigated through a modified version of the non-parametric test Mann-Kendall [Hamed, Rao] that takes into account the effect of autocorrelation in the time series. The magnitude of the trend is instead quantified with the Theil -Sen estimator, a reliable method insensitive to outliers.

A qualitative assessment of the results returned by the Mann-Kendall test displayed an overall larger presence of stations exhibiting increasing trend rather than decreasing, this is especially true in the north-eastern region (i.e. Trentino-Alto Adige, Veneto). Moreover, the difference between the number of statistically significant increasing and decreasing trends seems to grow with the duration.