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Raising the ambition of climate action in the age of global emergencies

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POSTE

Spatio-temporal correlation of extreme climate indices and river flood discharges

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The occurrence of floods is strongly related to specific climatic conditions that favor extreme precipitation events. Although the impact of precipitation and temperature patterns on river flows is a well discussed topic in hydrology, few studies have focused on the rainfall and temperature extremes in their relation with peak discharges. This work presents a comparative analysis of Climate Change Indices (ETCCDI) annual time series, calculated using the NorthWestern Italy Optimal Interpolation (NWIOI) dataset, and annual maximum flows in the Piedmont Region. The Spearman's rank correlation was used to determine which indices are temporally correlated with peak discharges, allowing to hypothesize the main physical processes involved in the production of floods. The correlation hypothesis was verified with the Spearman's rank correlation test, considering a Student's t-distribution with a 5% significance level. Moreover, the influence of climate variability on the tendency of annual maximum discharges was examined by correlating trends of climate indices with trends of the discharge series. These were calculated using the Theil-Sen slope estimator and tested with the Mann-Kendall test at the 5% significance level. The results highlight that while extreme precipitation indices are highly correlated with extreme discharges at the annual timescale, the interannual changes of extreme discharges may be better explained by the interannual changes of the total annual precipitation. This suggests that projections of the annual precipitation may be used as covariates for non-stationary flood frequency analysis.



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