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Non-stationary flood frequency analysis: case study in the Po river basin

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Traditional regionalization methods allow estimating hydrological variables in stationary conditions: in the context of climate change new techniques are sought, which take into account the non-stationarity of climate variables. As part of a project in collaboration between universities and the Po basin authority, different approaches including regionalization procedures are used to characterize the hydrological extremes in the Po River basin. In particular, we use the Spatially Smooth Regional Estimation method, which is based on multiregressive estimation of L-moments that do not require the definition of homogeneous regions. The regression models are based on morpho-climatic descriptors including climate variables such as the mean annual precipitation, and the coefficients of a model for the IDF curves. By analyzing the multi-year variability of the climatic variables in each basin, with this work we aim at: (i) comparing the trends of the climatic variables and the trend of discharges associated with different return periods, (ii) analyzing the sensitivity of the regression equations to changes in time of these variables. Moreover, we compare the rainfall and flood quantiles for each sub-basin, to evaluate the percentage change of the standardised flood discharge for the percentage change in extreme rainfall. This approach allows us to investigate the effects of rainfall mechanisms and catchment characteristics on flood probabilities in the Po River basin.