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# Comparison of different techniques for streamflow-related extremes estimation in ungauged catchments

Giuseppe Rossi, Enrica Caporali, and Valentina Chiarello
University of Firenze, Dipartimento di Ingegneria Civile e Ambientale, Firenze, Italy (giuseppe.rossi@dicea.unifi.it)

High and low flows and associated floods and droughts are natural phenomena caused by opposite meteorological extremes, affected by various, but similar catchment processes. Knowledge of peak flow and low flow discharges is fundamental in all water-related studies and infrastructures design. They are estimated starting from measurements of river discharges at stream gauging stations. The lack of observations at the site of interest as well as the inaccuracy of the measurements, however, bring inevitably to the necessity of developing predictive models. Regional analysis is the classical approach to estimate river flow characteristics at sites where little or no data exists. Once the homogeneous regions are defined, specific interpolation techniques are needed to regionalize the hydrological variables. Particularly, two different techniques are chosen here for estimating streamflow-related variables: the top-kriging and the multivariate analysis. Top-kriging is chosen because it is directly connected to the hydrographic network structure and geometric organization, while the Multivariate analysis, based on natural logarithms of seven geomorphoclimatic characteristics, is able to take into account the catchment properties. These methods are applied over the geographical space of Tuscany Region, in Central Italy. The results are validated using a cross-validation procedure, and are compared even with classical interpolation approaches (e.g. the ordinary kriging). With the aim to define the most suitable procedure for streamflow extremes estimation, the results are compared through different error measurement methods (mean square error, mean relative error, etc.).