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Intercomparaison of models and estimation techniques of extreme value in hydrology

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Extreme events are more and more of great societal concern due to the heavy damages that they cause. Moreover the mutual interaction of the various nonlinear processes that drives them at different scales increases the difficulty in modeling their dynamics. A statistical approach for the choice of the appropriate probabilistic model to apply for the extreme phenomena prediction is thus strongly needed. Even though the extreme value theory and the practical analysis of extreme value got in recent past wide attention; some issues are still open and some problems remain unsolved. Drastic differences in quantile estimations and in frequency predictions obtained by various institutions result from the fact that there is not uniform probabilistic model of the extremes nor a uniform statistical procedure to estimate their parameters. Therefore, we test and compare several tail estimators (Hill estimator and some variants), sampling techniques (peak over a threshold and annual maxima) and extreme value models (Gumbel (GEV type 1), Fréchet (GEV type 2), multifractal models); on a large dataset of rainfall and runoff in the Mediterranean region of France. The resulting extreme value index estimates exhibit regional patterns that we discuss. These patterns are used to define a regional risk index that could be particularly useful for ungauged basins and to improve the debate on the physics that drive these extreme phenomena, i.e. rain variability vs. basin response.