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Flood risk assessment in France: comparison of extreme flood estimation methods (EXTRAFLO project, action 7)

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In flood risk assessment the methods can be divided in two families: deterministic methods and probabilistic methods. In the French hydrologic community the probabilistic methods are historically preferred to the deterministic ones. Presently a French research project named EXTRAFLO (RiskNat Program of the French National Research Agency, <https://extraflo.cemagref.fr>) deals with the design values for extreme rainfall and floods. The object of this project is to carry out a comparison of the main methods used in France for estimating extreme values of rainfall and floods, to obtain a better grasp of their respective fields of application.

In this framework we present the results of Action 7 of EXTRAFLO project. Focusing on five French watersheds, we compare the main extreme flood estimation methods used in French background: (i) standard flood frequency analysis (Gumbel and GEV distribution), (ii) regional flood frequency analysis (regional Gumbel and GEV distribution), (iii) flood frequency analysis improved by historical information (Naulet et al., 2005), (iv) simplify probabilistic method based on rainfall information (i.e. Gradex method (CFGB, 1994), Agregee method (Margoum, 1992) and Speed method (Cayla, 1995)), (v) flood frequency analysis by continuous simulation approach and based on rainfall information (i.e. Schadex method (Paquet et al., 2006, Garavaglia et al. 2010), Shyreg method (Lavabre et al., 2003)) and (vi) multifractal approach.

The main result of this comparative study is that probabilistic methods based on additional information (i.e. regional, historical and rainfall information) provide better estimations than the standard flood frequency analysis. Another interesting result is that, the differences between the various extreme flood quantile estimations of compared methods increase with return period, staying relatively moderate up to 100-years return levels. Results and discussions are here illustrated throughout with the example of the Ardeche watershed (South of France).

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