Modeling daily rainfall with Generalized Pareto Distribution

R. Deidda and M. Puliga

Universit\'a di Cagliari - DIT Sezione Idraulica, Piazza d'Armi, Cagliari, Italy
(rdeidda@unica.it)

The generalized Pareto distribution (GPD) is a thee-parameter distribution that contains uniform, exponential and Pareto distribution as special cases. The three parameters account for the threshold, scale and shape of the distribution. GPD has application in a variety of fields, including the analysis of hydrological extremes. Under some conditions, the yearly maxima extracted from a continuous series described by a GPD follow a generalized extreme value distribution. Also for these reasons GPD has been naturally applied in the analysis of partial duration series of flood observations, since it allows to keep a major information than classical distribution of yearly maxima. Due to the strong auto-correlation in discharge time series, the choice of an appropriate threshold is particularly crucial in flood frequency analysis: Claps and Laio (2003) proposed an efficient methods useful at this scope. Looking at yearly maxima in rainfall data collected at different durations, Salvadori and De Michele (2001) proved also some scale invariance properties to hold for GPD parameters.

In this work we apply the GPD to daily rainfall observed by the rain gauge network of the Sardinian Hydrological Survey. Parameters of GPD are estimated with all the estimation methods presented in the published literature in order to evaluate the performances in different conditions (i.e., accordingly with the different shape and sample size of observed data). Finally, we present the results of some investigations that are aimed at the understanding if there exist an optimal threshold for the application of GPD to daily rainfall observations.