Estimation of the design rainfall in ungauged sites using novel regionalization approaches: an application over Thessaly region, Greece

Paola Mazzoglio[1], Pierluigi Claps[1], Theano Iliopoulou[2], Panayiotis Dimitriadis[2], Nikolaos Malamos[3], Ilaria Butera[1], and Demetris Koutsoyiannis[2]

(1) *Department of Environment, Land and Infrastructure Engineering (DIATI), Politecnico di Torino, Torino, Italy*
(2) *Department of Water Resources and Environmental Engineering, School of Civil Engineering, National Technical University of Athens, Zographou, Greece*
(3) *Department of Agriculture, University of Patras, Amaliada, Greece*

In this work we apply two different rainfall regionalization techniques over Thessaly region (Greece), an area of about 13,700 km^2 with different topographic and climatological characteristics, to estimate design rainfall in ungauged sites.

The first methodology is the Patched Kriging technique (Libertino et al., 2018), a year-by-year application of the ordinary kriging, followed by a bias-correction procedure developed to restore the variance of the sample distribution reduced during the spatial interpolation step. The hypothesis of stationarity of the second order must be satisfied to apply the ordinary kriging: it is therefore necessary to remove, from the measured values, any dependencies on the elevation via a detrending operation. The second methodology is instead based on a bilinear surface smoothing method (Malamos and Koutsoyiannis, 2016). Elevation is incorporated into the model as an additional explanatory variable, being available with a denser sampling compared to that of the rainfall one. In both cases, rainfall quantiles are estimated using the method of K-moments (Koutsoyiannis, 2019), an advanced estimation framework that allows reliable high-order moment estimation considering space dependence.

Both methodologies differ from the classical rainfall regional frequency analysis being developed to take advantage of all the information available for the area under investigation, even those included in short and fragmented time series.

References

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