Geophysical Research Abstracts
Vol. 13, EGU2011-8266-1, 2011
EGU General Assembly 2011

Effects of different spatial interpolators on the estimate of extreme precipitation

Sarann Ly (1), Eléonore Beckers (1), Catherine Charles (2), and Aurore Degré (1)

(1) University of Liege, Gembloux Agro-Bio Tech, Unit of Hydrology and Agricultural Hydraulic, Gembloux, Belgium (sarann.ly@doct.ulg.ac.be), (2) University of Liege, Gembloux Agro-Bio Tech, Unit of Applied Statistics, Computer science and Mathematics, Gembloux, Belgium

The design values of the areal precipitation are needed for engineer to manage vital elements of our infrastructure. The areal precipitation can be generated by different interpolation methods. The problem involves choosing the interpolation method that we should use to estimate the extreme event.
This work aimed at analyzing the effects of different interpolation methods on the estimate of extreme events of daily areal precipitations at catchment scale.
The extreme rainfalls were estimated using areal daily rainfall interpolated by several interpolation methods (Thiessen polygon, Inverse Distance Weighting, Ordinary Kriging, Universal Kriging, Kriging with an External Drift and Ordinary Cokriging). We used thirty-years-long daily time series and different density of rain gages (from 4 to 70 rain gages). Our study is located in the Ourthe and Ambleve catchment area (2908 km^2) in the southern part of Belgium). Spatial interpolation with the geostatistical and Inverse Distance Weighting algorithms outperformed considerably interpolation with the Thiessen polygon. Kriging with an External Drift and Ordinary Cokriging presented the highest Root Mean Square Error between the geostatistical and Inverse Distance Weighting methods. Ordinary Kriging and Inverse Distance Weighting were considered to be the best methods, as they provided smallest Root Mean Square Error for nearly all cases. However, it's not really the case of extreme estimates for particular return period.
The extreme daily rainfall, corresponding to return periods of 25, 50 and 100 years, were computed by fitting of a statistical model to the series of maximum annual precipitation. These estimates were conducted using HYFRAN which allows us to fit 16 different statistical models, in 2 or 3 parameters. The most known are the models of Gumbel, Gamma, Weibull, exponential, Pareto, lognormale, Pearson III and GEV.
Our results showed that the behaviour of extreme daily areal rainfall in this area was best described via the Gumbel and lognormal distributions. Using 70 rain gages, little differences in extreme rainfall were observed between the interpolation methods. The estimates from these methods were in the area of 95% confidence intervals of the estimates using the Thiessen polygon.
However, when the number of rain gages diminishes, the Universal Kriging and Kriging with External drift methods produced extreme estimates outside the area of 95% confidence intervals of the estimates using the Thiessen polygon with all available stations. The analysis described here provides a means to choose the interpolation method in view to calculate extreme events. It shows to engineers or hydrologists the need for a particular care when working in the regions of sparse data.