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Areal rainfall construction and estimation of extreme quantiles.

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Areal rainfall estimation and extrapolation to extremes is a key issue for catchment flood study. It is a tricky problem which deals with spatial interpolation (to build an estimate at the catchment's scale based on few rain gauges only), and probabilistic extrapolation (for extreme values estimation).

In this study, several methods to build an areal rainfall estimation are compared. The first method is the commonly used Thiessen polygons. A second way to build an areal rainfall relies on the SPAZM method [Gottardi, 2012], in which daily rain fields are reconstructed at a $1\,km^2$ resolution, with an interpolation scheme integrating the altitude of the pixel and the weather type of the day. These two methods are compared to the stochastic rain field simulator SAMPO [Leblois et Creutin, 2013], which is an adaptation of the turning band method allowing to generate over 50 years of realistic rain fields.

Several questions are tackled in this study:

- In a Thiessen estimation, how many rain gauges should be selected ? Which weighting scheme should be used ?
- SPAZM is an interpolator designed to produce unbiased mean annual precipitation (MAP) at a catchment's scale. So if a Thiessen areal rainfall is scaled to fit the MAP given by SPAZM, how does it affect its extreme rainfall estimation ?
- If a virtual rain gauges network is extracted from the rain fields generated by SAMPO, how do behave the Thiessen and SPAZM areal rainfall estimations based on these point values ?

At the end, some abatement functions are obtained, showing the influence of the catchment's area and the options chosen to build the areal rainfall estimations.

References:

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