Assessment of the daily areal reduction factor of precipitations with distributed rainfall data: a means of improvement of a prediction method of extremes events in France.

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We have addressed the statistical variability of precipitations at different spatial scales in France via the study of the areal reduction factors (ARF) of daily rainfalls. The aim of this study is to develop a methodology to estimate the quantiles of catchment rainfall using maps of rainfall quantiles provided at the spatial resolution of 1 km^2 over France by the SHYREG method which implements a regionalized stochastic hourly rainfall generation model (Arnaud, et al., 2008).

Two kinds of distributed rainfall data, provided by Météo-France, the French National Weather Service, are used in this study. The first kind consists of maps of daily rainfall available throughout southern France from 1994 to 2009. These maps derive from the spatial interpolation, at the spatial resolution of 1 km^2, of daily raingauge data. The second kind of data consists of maps of daily rainfall at the spatial resolution of 64 km^2, resulting from the SAFRAN methodology and available throughout mainland France from 1970 to 2008.

These data enable us to compute point rainfall quantiles and areal rainfall quantiles and eventually the statistical ARF of daily rainfall for spatial scales ranging from 25 to 11000 km^2. The seasonal variability of our statistical ARF seems in agreement with the typology of rainfall events occurring in mainland France: convective events in late summer and autumn and more frontal events in winter and spring. The regional validity of our statistical ARF has been assessed in the Cevennes area, in southern France, where it shows close similarities with the statistical daily ARF computed by Neppel et al. (2003) with a different methodology.

The statistical daily ARF assessed in this study enables us to estimate the quantiles of daily rainfall for any catchment in mainland France using the maps of rainfall quantiles of the SHYREG method. Our next objective will be to assess, thank to the methodology developed here and to hourly rainfall radar data available shortly for a 10-year period (1997-2006), the statistical ARF for smaller durations (1-hour, 2-hour, 3-hour rainfalls . . .). A better knowledge of the statistical ARF of precipitation should help us to better assess the statistical ARF of discharge (D-ARF). This D-ARF is needed, in the SHYREG method, to calculate the runoff estimate at the outlet of any catchment, for a given return period and duration, knowing the specific runoff estimates for the same return period and duration, on each 1-km^2 of France.

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