Radar-based ADDF curves: can we trade space for time?

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Precipitation extremes are space-time phenomena and traditionally such occurrences have been treated merely as point events from a statistical point of view. Many of the consequences of such events like floods are related to the water volume, hence the spatial aspect of them cannot be neglected. Using Areal Depth-Duration-Frequency (ADDF) curves based on radar rainfall data or merged radar and station rain fields is one of the possible approaches to introduce the area in the Extreme Value Analysis (EVA) of the precipitation. However, the radar-based rainfall data have the disadvantage of short observation periods, although they offer a high resolution in space and time and cover large areas. For a robust EVA of precipitation, series of annual maxima with at least 50 to 60 years are needed, whereas the radar-based rainfall data offer only around 20 years. Hence, this study aims to assess the possibility of resampling the maxima in space in order to compensate for the short length of the series of annual maxima, and thusly evaluating the possibility of exchanging the space for time in the EVA of precipitation events. The study region is the Hannover radar circle in Germany with an area of about 50000 km^2. For sampling in space independence of events and stationarity of the rainfall data in space are considered. Various experiments are carried out ensuring these conditions. Space-time split sampling is applied to validate the estimates of extreme precipitation quantiles obtained from multiple locations, i.e., by dividing the full period in n subperiods and sampling from n locations instead a single point. It is expected to discover the basic requirements for trading space for time.