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Extreme rainfall statistics from weather radar

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Rain gauge data are often utilized to estimate the probabilities of extreme rainfall. However, the number of rain gauge records of short-duration rainfall, such as 5 minutes, is sparse. The obvious advantage of radar data with respect to most rain gauge networks is their higher temporal and spatial resolutions. Further, the current quality of quantitative precipitation estimation with radar and the length of the available time series make it feasible to calculate radar-based extreme rainfall statistics. In this paper a 10-year radar data set of precipitation depths for durations of 5 min to 24 hour is derived for the Netherlands ($3.55 \cdot 10^4$ km^2). The radar data are adjusted by combining an hourly mean-field bias adjustment using an automatic rain gauge network with a daily spatial adjustment employing a dense manual gauge network. A regional frequency analysis, assuming a GEV distribution, is used to describe the distribution of the annual radar rainfall maxima. Regional variability in extreme rainfall statistics is studied. Further, radar rainfall depth-duration-frequency (DDF) curves are derived and compared with those based on rain gauge data. DDF curves describe rainfall depth as a function of duration for given return periods or probabilities of exceedance.

Key words: Rainfall, DDF curves, radar, GEV distribution