Statistical postprocessing of heavy precipitation

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Heavy precipitation rates of more than 15 mm per hour are captured only about once a year at each rain gauge within Germany. More extreme events are even less frequent. Point by point verifications show that forecasts of heavy precipitation of the ensemble system COSMO-D2-EPS of DWD can be improved by statistical postprocessing. This is done in a MOS approach using long time series of synoptic observations and numerical forecasts that are required in order to gather a significant number of heavy precipitation events for reliable statistical modelling.

Highest precipitation rates of convective events usually realise more likely in the surrounding of rain gauges rather than exactly above their small funnels. Statistical forecasts modelling these point observations usually underestimate maximal rain rates and result in low probabilities for the occurrence of heavy precipitation at a given location.

Point processes of stochastic geometry can be used to model area probabilities that provide the probability that precipitation occurs anywhere (at least at one point) within that area. Verifications with gauge adjusted radar data reveal that point probabilities are representative for very small areas, but area probabilities are significantly larger already for areas of 20*20 km^2.

The use of radar data as area observation system allows to statistically generate calibrated precipitation forecasts for arbitrary areas. However, the question remains, which size of area is most relevant for the public and most suitable for weather warnings.