Critical rainfall thresholds for urban pluvial flooding inferred from citizen observatories

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The use of citizen observatories in urban flood management has gained momentum in recent years. Knowing how difficult and expensive it can be to collect professional long-term flood data in urban areas, it is worth looking at alternatives such as citizen observatories. The latter can provide valuable spatiotemporal information during and after flood events. In this study, ten years of citizen flood reports collected in the city of Rotterdam were analyzed. The dataset is comprised of about 70,000 flood reports received via telephone, mobile app, email, and webpage. These reports were compared with high-resolution rainfall observations from national weather radars and the results were used to train a binary classification tree for predicting the number of flood reports based on maximum rainfall intensities across different temporal scales. The result shows that the occurrence of urban pluvial flooding can be best predicted by using a combination of short and long-duration rainfall intensities (e.g., 5-min rainfall > 1.76 mm and daily rainfall > 7.64 mm). By contrast, predictions based on rainfall intensities at a single time scale did not result in acceptable performance. Apart from the fact that accurate flood prediction requires multiscale rainfall data, our study suggests that citizen observatories can be a very valuable source of information for filling the current gap in urban hydrological records.