

EGU2020-19499

<https://doi.org/10.5194/egusphere-egu2020-19499>

EGU General Assembly 2020

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Using Data From Personal Weather Stations to Improve Precipitation Estimation and Interpolation

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The number of private meteorological stations with data available online through the internet is increasing gradually in many parts of the world. The purpose of this study is to investigate the applicability of these data for the spatial interpolation of precipitation for high intensity events of different durations. Due to unknown biases of the observations, rainfall amounts of the secondary network are not considered directly. Instead, only their temporal order is assumed to be correct. The crucial step is to find the stations with informative measurements. This is done in two steps, first by selecting the locations using time series of indicators of high precipitation amounts. The remaining stations are checked whether they fit into the spatial pattern of the other stations. Thus it is assumed that the percentiles at the secondary network accurate. These percentiles are then translated to precipitation amounts using the distribution functions which were interpolated using the weather service data only. The suggested procedure was tested for the State of Baden-Württemberg in Germany. A detailed cross validation of the interpolation was carried out for aggregated precipitation amounts of 1, 3, 6, 12 and 24 hours. For each aggregations, nearly 200 intense events were evaluated. The results show that filtering the secondary observations is necessary, the interpolation error after filtering and data transformation decreases significantly. The biggest improvement is achieved for the shortest time aggregations.