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Systematic errors in precipitation measurements with different rain gauge sensors

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Ground-level rain gauges provide the most direct measurement of precipitation and therefore such precipitation measurement datasets are often utilized for the evaluation of precipitation estimates via remote sensing and in climate model simulations. However, measured precipitation by means of national standard gauge networks is constrained by their spatial density. For this reason, in order to accurately measure precipitation it is of essential importance to understand the performance and reliability of rain gauges.

This study is aimed to assess the systematic errors between measurements taken with different rain gauge sensors. We will mainly address extreme precipitation events as these are connected with high uncertainties in the measurements. Precipitation datasets for the study are available from WegenerNet, a dense network of 151 meteorological stations within an area of about 20 km $\times$ 15 km centred near the city of Feldbach in the southeast of Austria. The WegenerNet has a horizontal resolution of about 1.4-km and employs 'tripping bucket' rain gauges for precipitation measurements with three different types of sensors; a reference station provides measurements from all types of sensors.

The results will illustrate systematic errors via the comparison of the precipitation datasets gained with different types of sensors. The analyses will be carried out by direct comparison between the datasets from the reference station. In addition, the dependence of the systematic errors on meteorological conditions, e.g. precipitation intensity and wind speed, will be investigated to assess the feasibility of applying the WegenerNet datasets for the study of extreme precipitation events. The study can be regarded as a pre-processing research to further studies in hydro-meteorological applications, which require high-resolution precipitation datasets, such as satellite/radar-derived precipitation validation and hydrodynamic modelling.