

EGU24-5437, updated on 20 May 2024

<https://doi.org/10.5194/egusphere-egu24-5437>

EGU General Assembly 2024

© Author(s) 2024. This work is distributed under the Creative Commons Attribution 4.0 License.



Using personal weather station data for improving precipitation estimates and gauge adjustment of radar data

Jochen Seidel¹, Thomas Einfalt², Markus Jessen², András Bárdossy¹, Abbas El Hachem¹, and Adrian Treis³

¹University of Stuttgart, Institute for Modelling Hydraulic and Environmental Systems, Stuttgart, Germany

(jochen.seidel@iws.uni-stuttgart.de)

²hydro & meteo GmbH, Lübeck, Germany

³Emschergenossenschaft/Lippeverband, Essen, Germany

Personal Weather Stations (PWS) are simple, low cost meteorological instruments that can be set up by private persons or companies. In Central Europe, the number of PWS has increased significantly over the last years, in the meantime clearly outnumbering the number of rain gauges operated by national weather services and other authorities. However, the data from PWS suffer from many drawbacks since these stations are not set up and maintained according to professional standards. Apart from this, there are additional sources of errors and uncertainty originating from data transmission errors and incorrect information about the location of a PWS. Hence, the precipitation data from PWS has to be filtered and corrected before this information can be used e.g. for improving precipitation interpolation. Such algorithms have been developed e.g. by de Vos et al. (2019) and Bárdossy et al. (2021).

In the area of the water boards Emschergenossenschaft and Lippeverband (EGLV), investigations were carried out to determine whether data from private weather stations (PWS) can improve the interpolation of rainfall fields and if PWS can be used for the gauge-based adjustment of radar data. The area of the EGLV is located in a densely populated area in the federal state of North Rhine-Westphalia, where there is also a large number of PWS available. Furthermore, the EGLV operates a dense rain gauge network which is required for the quality control (QC) algorithm by Bárdossy et al. (2021) which was used in this study.

The results show that the additional information from PWS can capture the spatial structures of precipitation better than a standard measurement network alone. However, the spatial resolution and the maxima of the radar data are not achieved, especially in areas with low PWS density. Another aspect that was investigated is the question whether individual PWS can be used for the gauge adjustment of radar data. In principal, individual quality controlled PWS can be used for this purpose, there are however issues due to data gaps and the underestimation of hourly precipitation maxima, which currently limits the use of PWS for commonly used gauge-adjustment procedures.

References

Bárdossy, A., Seidel, J., and El Hachem, A. (2021), The use of personal weather station observations to improve precipitation estimation and interpolation. *Hydrol. Earth Syst. Sci.*, 25, 583–601.

de Vos, L., Leijnse, H., Overeem, A., and Uijlenhoet, R. (2019), Quality control for crowdsourced personal weather stations to enable operational rainfall monitoring. *Geophysical Research Letters*, 46, 8820–8829.