

pyRADMAN: A flexible Python Framework for radar adjustment using CML and rain gauge data

M. Wenzel^{*1}, C. Vogel¹, M. Graf², C. Chwala³, T. Winterrath¹

1 Deutscher Wetterdienst - Hydrometeorologie, Offenbach am Main, Germany

2 Institute of Geography - University of Augsburg, Augsburg, Germany

3 Institute of Meteorology and Climate Research - Karlsruhe Institute of Technology, Garmisch-Partenkirchen, Germany

*Corresponding author: Malte.Wenzel@dwd.de

Abstract

Adjusting weather radar data with ground-based precipitation observations is an established way to overcome radar-specific uncertainties. For this purpose rain gauge data are most commonly used to improve the radar data quality. Commercial microwave links (CMLs) used in telecommunication networks offer another data source to estimate rainfall at ground level. In collaboration with Karlsruhe Institute of Technology, University of Augsburg and Ericsson we set up a system to perform almost real-time radar adjustment using CML and rain gauge data at DWD.

As input data we use radar data from 17 locations in Germany, ~1500 rain gauge data accessible by DWD and attenuation data of ~4500 CMLs covering Germany. For latter data a continuous data flow from Ericsson to DWD within 2 minutes was successfully implemented.

For sensor combination we developed a python framework called pyRADMAN. It offers the possibility to select and combine the ground-based precipitation observations used in radar adjustment while keeping the aggregation times flexible. Due to the high temporal resolution of most rain gauge and all CML data the minimal aggregation time is given by the radar measurement interval of 5 minutes.

pyRADMAN can be driven in routine mode or recalculation mode. In routine mode pyRADMAN provides adjusted radar precipitation estimates (QPEs) for customers. The recalculation mode can be used to study the quality of adjusted radar QPEs or develop new adjustment procedures. The currently most stable adjustment procedure was adapted from the well known and tested software RADOLAN [1] running at DWD.

pyRADMAN has now been continuously operating at DWD in real time since August 2023 to provide input data for HoWa-Pro's [2] flood risk warning system. We will introduce the system of pyRADMAN and show quality analyzes of adjusted radar OPEs using different ground sensors and aggregation times.

References

- [1] <https://www.dwd.de/DE/leistungen/radolan/radolan.html>, accessed in April 2024
- [2] <https://www.wasser.sachsen.de/howa-pro.html>, accessed in April 2024