

# Review of hess-2023-122: "Merging with crowdsourced rain gauge data improves pan-European radar precipitation estimates"

## 1 General comments

The article evaluates how a pan-European quantitative precipitation estimation (QPE) based on OPERA radar rain rate adjusted with personal weather station (PWS) rain gauge observations compares with (1) a QPE based on OPERA radar rain rate adjusted with ECA&D rain gauge observations called EURADCLIM, (2) a QPE based on OPERA radar rain rate unadjusted with observations, when evaluated against ECA&D rain gauge observations.

The article is well-written and of good quality, I recommend this manuscript to be published after technical corrections and, if the authors find them useful, taking into account my two specific comments.

## 2 Specific comments

- L150 and L300: "the NMHSs that generally operate their rain gauges in open rural areas (following World Meteorological Organization regulations)." and "Hence, to comply with World Meteorological Organization regulations, NMHSs typically measure in areas with few or lower obstacles. Hence, the (automatic) weather stations are typically located outside city centres, often in more rural areas.". These two sentences suggest that the WMO's installation rules force NMHSs to install their stations outside urban centres. I'd like to qualify this statement: first, even if it is more complicated than in the countryside, it is possible to find open areas (for example in parks, sports complexes, etc.) in the urban centres of many towns and cities. Secondly, the installation of NMHS stations is historically linked, in the 20th century, to the needs of the aeronautical industry, and so near the big cities, the stations are often installed on airports. Finally, the densification of many European networks was often carried out to ensure regular coverage of countries, and the city centres represent negligible fractions of the area of many countries.
- L265: "Rain gauges are generally expected to have either a heating device (in case of automatic gauges) or instructions to melt precipitation (in case of manual gauges)." Also, NMHS rain gauges often have a larger reception cone volume than Netatmo rain gauges, enabling them to collect more solid precipitation, which gradually melt after falling, even if they are not heated.

### 3 Technical corrections

- 25 – L5 and following: "1-year" should be "1 year". Consider following the HESS submission guidelines (<https://www.hydrology-and-earth-system-sciences.net/submission.html>) for hyphens.
- L68 and following: "September 1, 2019" should be "1 September 2019". Consider following the HESS guidelines for date and time.
- L117: "and coauthors" -> "et al."?
- 30 – L146 and following: "Figure 1c–d" -> "Fig. 1c–d". According to the HESS guidelines: "The abbreviation "Fig." should be used when it appears in running text and should be followed by a number unless it comes at the beginning of a sentence."
- L274 and following: I find the word "extreme" a bit too much for the examples given. "Heavy rainfall" is sufficient. The threshold of 150 mm in 1 day is the usual threshold in the Mediterranean basin for what is known in the literature as a heavy precipitation event (HPE).
- 35 – L277 and following: (panel c) -> (Fig. 8c)?
- L484 and L526: consider providing Digital Object Identifier (DOI) for these two articles that have one.
- L535: "<https://doi.org/https://doi.org/>" should be "<https://doi.org/>".
- L543: "<https://www.netatmo.com/en-gb/weather/weatherstation/specifications>" should be updated to "<https://www.netatmo.com/en-eu/smart-weather-station#specifications>".
- 40 – L569: "<https://knmi-ecad-assets-prd.s3.amazonaws.com/documents/atbd.pdf>" is not working.