

Reply to Referee #1

We thank Referee #1 for the constructive review and for the positive assessment of the manuscript's structure. We address each comment below and describe the corresponding clarifications, analyses, and proposed revisions.

Specific comments

- 5 1. *Estimation of Tweedie distribution, in particular the power parameter p : Please give more details. In Abstract is mentioned (line 13) “using ordinary least squares”, and similarly in Section 3.1 (from line 140). What software was used? In the R package tweedie, developed by Dunn, estimation is performed by profile likelihood. The numerical work can sometimes lead to problems in the maximisation routines as pointed out by Dunn and Smyth (2018), Section 12.3.2). Please discuss briefly in more detail the numerical framework applied.*

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We thank the referee for pointing this out. Instead of using profile-likelihood estimation in the R package, p was estimated empirically from Eq. (3) by regressing the logarithm of block variance against that of block mean. This regression-based approach is also described by Dunn and Smyth (2018, Sect. 12.3.2), before they introduce profile likelihood. The calculation and its standard error were calculated directly in Python using NumPy. Since our
15 procedure does not involve numerical likelihood maximization, the numerical issues associated with profile-likelihood estimation discussed by Dunn and Smyth (2018) do not arise here. We will revise Sect. 3.1 to clarify the estimation method and its numerical implementation.

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2. *Section 4.2, line 204: The site Kuusiku is chosen as a representative station, with illustrations in Figures 4-5. Did the authors check the behaviour at sites nearby, so tha it is truly representative? Moreover, could the location of this be marked in Figure 1 with a certain symbol, or colour? (At line 205, the text says, perhaps vague, “lies between the two radar sites”).)*

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We inspected the corresponding distributions at nearby stations and found broadly similar behaviour, although the detailed shapes vary slightly between sites. Kuusiku was selected as an illustrative station because of its location between the two radar sites and its relatively flat inland setting. We agree that describing it as “representative” may imply a quantitative assessment that was not performed. We will therefore revise the wording accordingly and mark Kuusiku separately in Fig. 1.

- 30 3. *Section 4.2, line 221: The text says “The JJA distribution is more broadly spread . . .”. I had to check Figure 5 in quite detail to verify that. Perhaps a somewhat less strong statement could be done: “The JJA distribution is somewhat more broadly spread . . .”.*

35 We agree that the wording here might not be precise enough. Our intention was to focus on the two ends of the distribution, where JJA has a larger relative frequency of zeros and very low totals, while also extending further into the upper tail compared with DJF. We will revise the sentence to state these differences more directly.

- 40 4. *Section 4, line 298: “...indicating that p estimated from the radar composite at station locations is higher . . .”. Indeed, Tables 2 and 3 show that. However, taking the spreading, in form of IQR, into account, are they “significantly” higher? The IQR values are not negligible in its magnitude, compared to the median values. It would be of interest if the authors consider a suitable statistical test.*

45 We agree that the positive medians and their IQRs alone do not establish statistical significance. We will therefore supplement the comparison with an appropriate statistical test of whether the station-wise differences differ from zero for each season and accumulation length reported in Tables 2 and 3. The test results will be summarized in Sect. 4.4, with the corresponding adjusted P-values provided in the Supplementary Information.