

Author Response to the referee comments on “Citizen rain gauge improves hourly radar rainfall bias correction using a two-step Kalman filter”

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Responses to Editor

RC: Referee comment

AR: Author response

Minor comments

RC (1): Lines 94-95. Please convert the coordinates to decimal degrees.

AR: The coordinates were converted to decimal degrees according to the comments.

RC (2): Equation 1 can be deleted as it is already mentioned in the introduction.

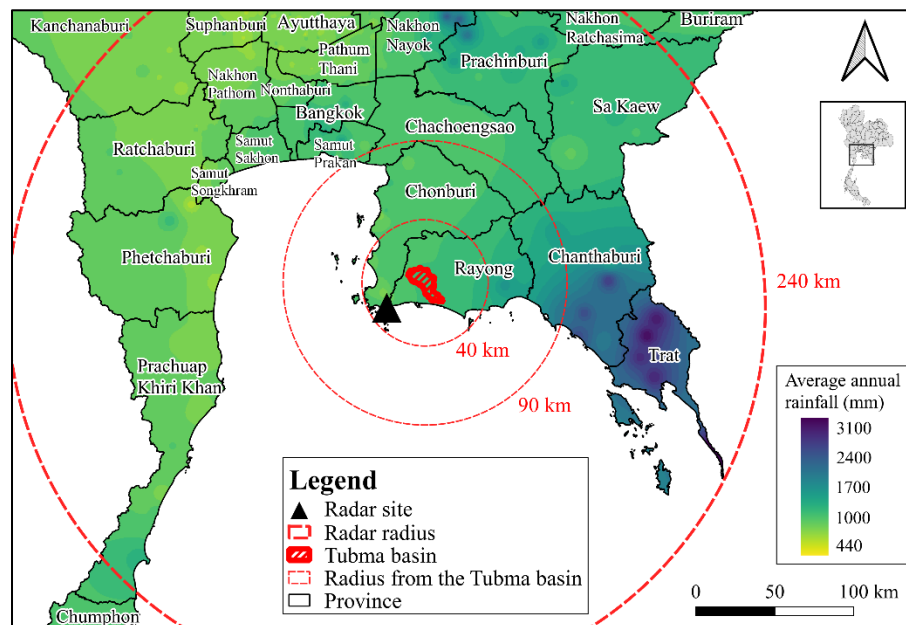
AR: Equation 1 was deleted in the revised manuscript.

3. Same for equations 21 and 22. You mentioned RMSE earlier to the mention of the equation and both equations are well known.

AR: Equations 21 and 22 were removed in the revised manuscript.

4. Consider plotting the circle presented in Figure 2 also in Figure 1 (maybe to replace the current circles).

AR: Figure 1 was modified by adding the circle for 240 km in the revised manuscript as shown below.



5. Section 4.1.2 and Figure 5 - can be moved to the SI? What essential information is provided in this subsection?

AR: We agree with the editor to move Section 4.1.2 and Figure 5 to SI.

6. Figure 9. Consider moving to SI.

AR: Figure 9 and related content between lines 493 to 502 in the old manuscript were moved to SI as the comment.

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Responses to referee #5

RC: Referee comment

AR: Author response

General comments

RC: Thank you for the revision of this manuscript. This is significant work and hence the article should be published. I have one small comment that could be addressed before the article is being published:

- line 123-124: Regarding the hail correction, i.e., the truncation of the reflectivity at 53 dBZ: you have inserted a reference (Fulton et al. (1998)) to justify the limitation to 53 dBZ. However, in the cited article it is written that "The nationwide default setting of the hail cap is currently 104 mm/h (53 dBZ), but a number of radar sites in more tropical environments along the gulf coast use higher values such as 150 mm/h".

With Z-R relationship you are using ($251 * Z * R^{(1.5)}$), 150mm/h per hour would correspond to almost 57~dBZ of radar reflectivity. I understand that it is difficult to find that right value to eliminate hail from the measurements without eliminating too much rain signal. However, it might be worthwhile to add a sentence or two on this subject to clarify that this is a somehow subjective choice and that maybe a higher value could have been chosen for a tropical environment.

AR: Thanks for your valuable comments. To clarify this issue, we added two sentences between lines 126 and 128 in the revised manuscript as explained below.

“The hail cap can be seen as an adaptable threshold representing the maximum expected instantaneous rain rate which is unfortunately quite difficult to determine for a particular storm. Note that in tropical environments also slightly higher values have been reported as hail threshold.”