Reply on RC1

Dear Editor and Reviewers,

Thank you for the comments.
We gratefully thank the editor and all reviewers for their time spent making their constructive remarks and useful suggestions, which has significantly raised the quality of the paper and has enabled us to improve the paper. Each suggested revision and comment brought forward by the reviewers was considered and incorporated. We will be happy to edit the text further based on helpful comments from the reviewers.
The text style for revision is as follows:

- All comments are in **black**.
- All responses to the comments are in **blue**.
- All pages and line numbers refer to the revised manuscript.
- All revised contents in the manuscript are highlighted in **red**.

General Comments

The manuscript describes a method, based on the analysis of surveillance camera observations, to estimate surface precipitation type conditions. Overall the topic is well suited to AMT and the methodology seems also adequate for the purpose of the study. However, I think there are substantial clarifications and some corrections to be made to further consider this manuscript for publication.

First the text should clarify that the focus is the precipitation type falling at ground level, i.e. close to the surface. In some parts seems that ground level conditions, i.e. snow on ground, is also considered.

Reply:

Thank you for your reminder. Our method primarily focuses on the process of precipitation particles falling, as captured by surveillance video, rather than the snow or water accumulation on the ground. We have emphasized this point in multiple sections of the revised manuscript based on your suggestions.

Second, authors should check carefully the terminology used, particularly considering that the journal is specialized in meteorological observational techniques. A precise terminology is essential to avoid confusions. For example, regarding the 3 hydrometeors considered in the analysis (for example in Fig. 3), rain, snow and

graupel, I'm wondering if graupel is really considered or they mean a mixture of snow and rain, as other studies which simplify the wide variety of hydrometeor types considering only 3 precipitation phase types: liquid, solid and mixed. I include below some references to studies mentioning graupel, which in general, is far less frequent than mixed (solid and liquid) phase types (of course other studies in the literature can also be considered).

Reply:

We also greatly appreciate the recommended references.

It is important to emphasize that in this study, graupel refers specifically to the solid state, and the mixed-phase state is not considered. Therefore, if we refer to the classification methods in existing studies, our study considers the solid and liquid states, but the mixed-phase state is not included. We have highlighted this point in the article, as seen in line 226-227.

Finally, a number of formal corrections, language checking, etc. should also be performed in some parts. I indicate below some items as a reference but I don't intend to be exhaustive here.For all the above I think major reviews are necessary to improve the current manuscript.

Specific Comments

1. Page 1, title, line 10-11 and elsewhere. When first used please clarify the meaning of GHP, refered to near surface precipitation type, not to ground conditions.
2. Page 1, line 28. Suggest: Hydrometeors -> Precipitating hydrometeors
3. Page 2, line 37. Suggest: rainfall phase -> liquid precipitation / solid snowfall -> solid precipitation
4. Page 2, line 38. Please reconsider: interchange -> alternate?

Reply:

The authors have accepted the above suggestions and made the necessary revisions in the revised manuscript.

5. Page 3, last line and elsewhere. Suggest looking for an alternative term to 'generalized visual data'

Reply:

Thank you for your reminder. We have replaced " user-generated visual data " with " generalized visual data."

6. Page 4, first paragraph: ‘is primarily attractive to professional meteorological researchers’. I think the AMT journal audience could be defined generally as ‘professional meteorological researchers’ so I would rewrite this paragraph accordingly. I think in this journal the term ‘hydrometeor’ should be preferred if you consider only precipitation phase partitioning. If you want to include precipitating hydrometeors and other phenomena such as haze or fog then perhaps you can use ‘weather conditions’.

Reply:
Thank you for your valuable feedback. We appreciate your suggestion to revise the phrase "is primarily attractive to professional meteorological researchers." We agree that the AMT journal's audience can be broadly defined as "professional meteorological researchers" and will modify the wording to reflect that. Please see lines 93-95.

7. Page 4, section 2.1. Authors should clarify if “indirect measurements’ are intended to provide precipitating hydrometeor types or ground conditions: for example it is not the same to distinguish if there’s snow on the ground or if it’s snowing.
8. Page 5, line 130. Haze is not a precipitating hydrometeor.
9. Page 5, line 133. Suggest: weather -> weather conditions
10. Page 6, line 162. Suggest: includes -> may include
11. Page 8, Table 1. The term ‘sandy’ does it mean that you recognize ‘ground’, ‘bare soil’ or it means really ‘sandy’ (as in the case of a beach).
12. Page 9, line 226: shrapnel particles refer to graupel particles? This term was not used before, unlike graupel.
13. Page 11, beginning of last paragraph. ‘Figure 6’ refers to Figure 5? Please check.
14. Page 13. Please provide reference(s) for terminal velocity formulas used for different hydrometeors.

15. Page 14, line 342. The rainfall rate values given (in mm/h) were recorded over which time periods, hourly? Note that it is not the same 195 mm/h during 10 min than during 1 h.
16. Page 15, Table 2. Please indicate in the table the units used of the values listed. Are they events of different time duration?
17. Page 18, Table 6. Please indicate the meaning of values in bold, best scores?
18. Page 22, Table 8. Which score is used in the table? Please indicate explicitly in the table title.
19. Page 26, Table 9 and 10. Please indicate meaning of bold and underscored values.

Reply: Thank you for your suggestion.

For Question 7, we have added the necessary information, please see lines 107-108.

For Question 13, after checking, we confirm that Figure 6 is correct.

Question 15, the precipitation intensity values are calculated every minute. Therefore, the values in Table 2 refers to the precipitation intensity during a 1-minute period, not an hourly intensity. Please see 373-375.

Question 16, Yes, these video data was collected during a long period of observation (starting from March 2023 and ending in July 2024). (please see lines)

We have accepted the other suggestions provided by the reviewer and made the corresponding revisions. Please see the revised manuscript.

Technical Comments

1. Page 1, line 29 (and elsewhere). Please check citation style, shouldn't it be Pruppacher et al. (1998) (when there are more than two authors et al. should be used)?
2. Page 3, lines 74-75: duplicate: 'during daytime and nightime'
3. Page 3, line 86: as follows: Following -> as follows. Following
4. Page 4, line 111. Typo: labeled -> label

5. Page 5, line 127. Please rephrase: have the disadvantage of needing to be quicker
6. Page 7, and elsewhere: Table.1 -> Table 1
7. Page 8, Table 1. Please rewrite the references: (Zhao et al. 2011) -> Zhao et al. (2011), etc.
8. Page 8, line 221 (and page 9, line 234). Suggest: graupel -> graupel particles
9. Page 9, line 235. Correct : rain -> rain drops
10. Page 9, line 240. Please check meaning and correct : rain -> raindrop trajectories
11. Page 13, after equation 4 (and elsewhere after other equations). Where -> where [in lower case]
12. Page 16, line 387. Correct: follows -> listed in Table 3.
13. Page 18, line 419 (and also Fig. 10 caption). Suggest: a violin plot … quantifies -> violin plots … quantify
14. Page 21-22, Fig. 12. X-axis labels hard to read.
15. Page 23, line 504. Do you mean: As analyzed in Section 3?
16. Page 25, please check the size of the delta symbol.
17. Page 28, line 628. Typo: please add blank space after ‘footage’

Reply:

We would like to express our sincere gratitude to the reviewer for their insightful comments. The above issues have all been thoroughly addressed and corrected. We have carefully reviewed the relevant sections and made the necessary adjustments to ensure accuracy and clarity. Your feedback has been invaluable in improving the quality of our work.