

Interactive comment on “The development of rainfall retrievals from radar at Darwin” by Robert Jackson et al.

Anonymous Referee #3

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General Comments

This manuscript presents a study of polarimetric relationships to estimate rainfall rates at Darwin, Australia, based on radar retrievals from the C-band dual-polarization radar (CPOL). The retrieved relationships are validated against a co-located two dimensional video disdrometer (VDIS) via statistical metrics. I find the manuscript relevant for publication in AMT but I suggest the authors to perform major revisions related mainly to the organization of speech and clarity of explanation throughout the manuscript.

1) For instance, in the Introduction, many of the sentences need a fundamental reorganization (more specifics are presented in the Technical Comments). The overall meaning is understandable but often words are missing or displaced and the flow of the speech is negatively affected.

C1

2) It is mentioned in the manuscript that the VDIS is co-located with the CPOL radar but no picture of the area where the two sensors are located nor their coordinates are provided by the authors. I suggest to clarify this and include a picture of the field of study in Darwin.

3) I have some issues with the description of a couple of Figures. In paragraph 3.1 is described Figure 1. A mention is missing of the dashed and solid lines that separate two types of precipitation, even though the selection criteria for convective-stratiform precipitation are described later. Similar remarks apply to Figure 3 and its description in paragraph 3.2. It would be good for a better reader understanding to mention which curve (and in which panel) represents the data fit.

4) In Section 4.1, it is stated that the Ah-based estimators give the lowest spread for $R < 10 \text{ mm/hr}$ and Kdp-based estimators give the lowest spread for $R > 10 \text{ mm/hr}$. This is true only if a combination of different moments is not taken into account but this is not mentioned in the text.

Specific Comments/Technical Corrections

1) Page 1, line 17. Please define ‘VDIS’.

2) Page 2, line 4-5. Please reformulate: ‘is that the phase and magnitude the diurnal cycle of precipitation are not adequately resolved due to the parameterization of convection’.

3) Page 2, line 12-14. Please reformulate the sentence.

4) Page 2, line 15. ‘Similar summary’?

5) Page 2, line 20. Please replace ‘this’ with ‘a’.

6) Page 2, line 22. Please define ‘R’ in the Introduction.

7) Page 3, line 1. Please replace ‘found in the limits of’ with ‘in’.

C2

- 8) Page 3, line 5. Please replace with 'with DSD observations subject to comparable limitations'.
- 9) Page 3, line 7. Please insert 'the' before 'aforementioned'.
- 10) Page 3, line 12. Please define 'DOE ARM'.
- 11) Page 3, line 19. Please define 'MC3E'.
- 12) Page 3, line 24. Please define 'RMSE'.
- 13) Page 3, line 25. Please remove 'and' before 'using'.
- 14) Page 3, line 32-33. I don't understand this sentence. Do you want to state the aim of this research? What are the challenges?
- 15) Page 3, line 34. 'Efforts' don't have access to data.
- 16) Page 4, line 7. Please replace 'for' with 'in'.
- 17) Page 4, line 7. No need to say 'rainfall rate R'. Either 'rainfall rate' or 'R' but make sure you defined 'R' previously.
- 18) Page 4, line 7. Please use present tense: 'This study uses'.
- 19) Page 4, line 11. 'on these quantities' is superfluous.
- 20) Page 4, line 21. Please remove 'a' before '250 m' and '1°'.
- 21) Page 4, line 30. Please define 'Z-PHI method' and include a reference.
- 22) Page 5, line 4. Are JW disdrometers less optimal for assessing dual-polarization radar efforts in lighter rain and/or small-drop conditions than? And, once again, 'efforts' are not a measurable variable. The authors mean 'radar moments' or 'meteorological quantities'.
- 23) Page 5, line 16. Please rephrase as 'After the application of these thresholds'.

C3

- 24) Page 5, line 21. Incorrect reference to Wang et al. (2018) and Giangrande et al. (2019).
- 25) Page 6, line 3. I would not use the verb 'stratify' in a sentence where 'stratiform' is referred to the type of precipitation. Please use 'separate' or 'divide'.
- 26) Page 6, line 13-14. 'other datasets around the world' is too generic.
- 27) Page 6, line 17-18. Please finish the sentence starting with 'Prior studies find that tropical-oceanic cloud behaviors do not solely drive most of the surface rainfall here'. They drive what else then?
- 28) Page 6, line 26. Please define 'W'.
- 29) Page 6, line 34. The authors mean 'T15' here.
- 30) Page 7, line 16. Please add ',' after 'Therefore'.
- 31) Page 7, line 32-33. The sentence starting with 'A bootstrap' is a bit convoluted and needs rephrasing.
- 32) Page 7, line 33 – page 8, line 1. 'The width of the 95% confidence intervals of a, b, and c of each fit (Table 2) are less than 5% of the mean a, b, and c for each randomly generated fit'. Please mention some numbers in the text for a better understanding.
- 33) Page 8, line 6. Please define 'p.d.f.'.
- 34) Page 8, line 6,7,9. Be consistent with the use adverbs: 'firstly', 'secondly', and then 'finally'.
- 35) Page 8, line 26. Please remove one instance of 'only'.
- 36) Page 8, line 29. Please remove 'use of'.
- 37) Page 9, line 28. Please replace 'possible' with 'possibly'.
- 38) Page 10, line 3. It is valid for X-band radar only based on the figure.

C4

39) Page 10, line 23. I suggest to mention, for clarity, that the estimator is represented by the dashed line.

40) Page 11, line 8. Incorrect reference to 'Thompson et al. (2018)'.

41) Page 11, line 10. Please insert a coma after 'previous studies' instead of after 'here'.

42) Page 12, line 4. 'Algorithms using Ah' for what?

43) Page 12, line 6. Please replace 'based off of' with 'based on'.

44) Page 12, line 7. 'Therefore' between comas.

45) Page 12, line 8. Please use the past tense here: we 'used' instead of 'use'. Check through the manuscript that the tenses are consistent.

46) Page 12, line 13. 'The applicability' to what?

47) Page 12, line 17. Please replace 'fitted' with 'modeled' or a more exhaustive explanation of the way the fit was performed.

48) Page 12, line 18. Please replace 'similar' with 'similarly'.

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