Review of "Using ground radar overlaps to verify the retrieval of calibration bias estimates from space-borne platforms" by Irene Crisologo and Maik Heistermann

Summary: This study uses ground radar overlaps, in Philippines, to verify the retrieval of calibration bias estimates from the TRMM PR. It extends the concept of quality-weighted averaging by including path integrated attenuation, in addition to beam blockage, as a quality index for an effective radar reflectivity comparison. While the concept of relative calibration is not new, the reviewer is much interested in the extended approach and verification using overlaps and think that this would be a useful contribution to radar calibration and TRMM/GPM literature. My suggestions on developing the manuscript are listed below.

Major Comments

The following major point needs to be addressed by the authors:
1. The line numbers are preferred to be continuous and clear in the entire manuscript otherwise referencing becomes difficult (see for example page 1, 2 and 3).
2. Figure 2 quality seems to be compromised which could be improved
3. In Section 4.3, line 5 "..the value of mean difference amounts to -4.6 dB" and the authors suggest this deviation possibly due to "..systematic sources.." (line 10). I was wondering if the inherent behaviour of analysing a subset of data from the wider data has been examined here. The overlap data is a subset of the wider SUB/TAG radar data and the bias estimates are obtained from the wider GR-SR data (and not just the overlap data). Maybe highlighting the overlap region data in the SUB-TRMM and TAG-TRMM before and after correction in Figure 6 could help in understanding this deviation, which means adding two more panels similar to (a) and (b) but for GR-SR bias corrected (highlighting the overlap region data). This would show the relative positon of the overlap data about the 1:1 line after the bias correction. While this would be an eyeball analysis, a better approach would be to do some statistical analysis for the overlap data after correction. The authors should check this for all the other cases.
4. The authors could also examine the nature of the precipitation types studied here (fraction of convective or stratiform) as this could significantly affect the bias correction estimates (underestimation or overestimation: for more detail see studies such as Park et al 2015 and Deo et al 2018). This could help particularly to explain lines 13 -15 (sec. 4.4) "……17 out of 121 days, …. an increase of more than 1dB in the absolute mean differences" (as given in Figure 7 also).
5. Use of abbreviations such as SUB, TAG, GR, SR, PIA and etc. needs to addressed- use it consistently throughout the manuscript otherwise it distracts a reader: As an example, in lines 13 – 18 (sec. 3.6) there is a combination of SUB, TAG, Subic, Tagaytay in just one paragraph.


A list of minor comments/suggestions is as follows:


1. Change "spaceborne" to "space-borne" throughout the manuscript

Section 1

2. Line 1 "…observations are the key…" remove "the". Same line add article "a" before "large" and "high".
3. Line 3, change "errors" to "error" in "The estimation errors.."
4. Two lines before line 5: change "..- let it be.." to "..be it.."
5. Line 5, introduce PIA abbreviation here and "On top..." is confusing, please rephrase.
6. Line 10, remove "…maybe surprising to some…"
7. Line 32, change "finally" to "recently" in "…and finally by Warren..."
8. Page 3, line 16, change "latter" to "last" in "The latter item…"
9. Rephrase line 24-27 (Page 3). Remove " : " add a "and" before "section 3" in "…data sets: section 3…". Line 26, add full stop after "… "bias estimation" and then "Section 4 will present…results followed by the conclusion in section 5".

Section 2

10. Line 29 (page 3), Rephrase to "The Philippine weather agency, known as Atmospheric….(PAGASA), maintains…"
11. Line 32-33 (page 3-4), replace "at" with "with" and "inhabitants" with "population" in "…area at approximately 13 Million inhabitants."
12. Figure 1: Make the x and y label fonts consistent.
13. Page 4 line 5, define "a.s.l" or use long format "above sea level" in "…532 m a.s.l"
14. Page 4, line 8, change "available" to "given".
15. Page 4, line 11, "Band" should be lower case in "..C-Band..."
16. Page 4, line 12, change to "…sits on"
17. For sec. 2.1. and 2.2, see comment 5 in "Major comments"
18. Page 5, line 11, rephrase "…collected..."
19. Page 5, line 12, remove "The" from "The data…"
20. Page 5, line 12, "..same as specified…" should be "…same as those specified.."

Section 3

21. Page 5, Line 3, "(see 2)" should be "(see section 2)"
22. Page 5, Line 7, remove bold emphasis of words or sentences which also applies to other sections.
23. Page 6, lines 22-23, check the usage of brackets.
24. Line 23, remove italicised emphasis of words or sentences which also applies to other sections. Could place them in quotation marks if explicitly required.
25. Section 3.4, page 7, line 7, "dual-pol"?
26. Page 8, line 13, delete repeated "copolar cross-correlation"
27. Page 8, line 14, delete "and" in "…and differential propagation phase …"
28. Page 8, line 18, define $K_{DP}$.
29. Page 8, line 30, define DEM.
30. Page 8, last sentence, add "a" before "total" in "… corresponds to total.." and also before "complete" at the end of the sentence
31. Figure 3, I believe "...corresponding elevation angle." should have been "…corresponding sweep angle.)
32. Page 9, line 17, add "a" before "…very high beam..".
33. Page 9, line 17, state which "…higher elevations.." Is it > 0.5 or 1.5?
34. Page 10, Equation 5, define $K_{r,s}$

Section 4 and 5

35. Page 11, line 28, define how much is sufficient in "…sufficient radar bins".
36. Page 11, line 28, is the time LT or UTC?
37. Page 12, line 9, rephrase to "…underestimation by the TAG…"
38. Page 12, line 15.Rephrase "Remembering item (2)…" to " Considering component (2)…"
39. Page 12, Line 19, remove brackets in "… (SR-GR or GR-GR)…
40. Page 12, line 27, delete "is" from "The first panel is corresponds…"
41. Page 12, line 28, "Section 3.2" instead of "Section III.2"
42. Page 12, line 33, change "drastic" to "severe"
43. Figure 4, panel d, what do the dashed lines represent? Also add article "a" before "low" and "high"
44. Page 14, line 6 define "sufficient number". Also add "In" before "That" in "That way, we…"
45. Page 14, line 8, change "item (2)" to "component (2)". Also replace "…in which…" with "where".
46. Page 14, line 10, replace "…took place right…" with "occurred"
47. Page 14, line 11, rephrase "according to Figure 6" to "see Figure 6" and put in brackets. Also add "during" before "…the so called Habagat…".
48. Table 2, define Npts.
49. Page 15, line 7, replace "massive" with large. This also applies to other sections.
50. Page 15, line 20, rephrase to "The question now is…"
51. Page 15, line 25, add "a" before "…few examples".
52. Figure 6, is time LT or UTC? Also include a colour bar to show the scale density and add "respectively for" after "consistencies" in (c) and (d)
53. Page 18, lines 11-12, rephrase.
54. Page 18, line 16, I believe you meant "unacceptable" rather than "acceptable".
55. Page 15, line 19, check referencing format i.e. for Schwaller and Morris.
56. Page 19, line 31, could use "…main finding" instead of "…main lesson"
57. Page 19, line 35, use full form in "single-pol"
58. Page 19, line 36, may be use numerals (i,ii and iii) to list the approaches
59. Page 19, last line, replace "any" with "all" in "On average, any.."
60. Page 20, line 8, delete one of the "also".
61. Page 20, line 10, replace "Altogether" with "Hence".
62. Page 20, line 13, replace "hard" with "difficult"
63. Page 20, lines 16-17 please rephrase the sentence after the website link as it is confusing.
64. Page 20, line 18, "..in periods" should be ("...during periods…"
65. Page 20, line 22, replace "…estimating…" with "estimate"