

*Comments on “How Much Snow Falls on the Antarctic Ice Sheet?”*

*Authors: C. Palerme, J.E. Kay, C. Genthon, T. L’Ecuyer, N.B. Wood, C. Claud*

*MS No.: tcd-8-1279-2014*

General Comments

The authors provide estimates of precipitation over Antarctica based on CloudSat data. This data source seems to me to be the best hope we have with current-generation observational systems. In general I think the authors have done an excellent job with this difficult subject, but I have several important points to raise about how the results should be characterized. In general the English is good, but I note several specific points, and I’d suggest one more pass to specifically make the text as standard as possible.

Specific Comments

1. *Title* The paper doesn’t actually answer the question in the title. The authors tell us the estimate in the CloudSat domain (i.e., north of 82°S). This is indeed the scientifically careful thing to do, but I think that the authors have enough information that they could make a reasonable estimate over all of Antarctica, which is what the non-specialist community really needs to know (and what the title promises).
2. *What does CloudSat miss?* The authors point out that diamond dust is the dominant precipitation type on the high plateau. I’m not sure that they are as clear as necessary about how much diamond dust CloudSat actually sees, although P.1287,L.15-16 and P.1288,L.25-26 raise the issue after the fact. One result is that the analysis potentially conflates the notion of deposition (P.1289,L.3-6) with very light precipitation. I can believe that deposition occurs, but the calculated value, although reasonable, could well be missed diamond dust, right?
3. *“flags”* The terminology of “flags” usually seems to be what we would call “overpasses” or “samples”.
4. *P.1282,L.12* Presumably “sixth bin” is following a DEM? Readers aren’t experts on this.
5. *P.1283,L.20-25* I’d say authors should point out that this approach, while reasonable, invariably inflates the fractional coverage by precipitation occurrence. The same is true in P.1284,L.1-3 for the “mixed” class.
6. *P.1284,L.10* Please state what the remapping scheme is to take the ERA-I grid to the 1°x2° analysis grid.
7. *P.1284,L.15* I’d like to see the authors go on to be clear about what this means in terms of the parameterized microphysics, parameterized sub-grid-scale creation of precipitation mass, and explicit grid-scale creation of precipitation mass.
8. *P.1284,L.22-24* I realize that the study is being done at the 1°x2° scale, but I think it’s highly relevant at this point to also report the fractional coverage on the original CloudSat footprint scale. In part, this is important information related to the typical sizes of precipitation systems over Antarctica.
9. *P.1285,L.9* I think you need to add “in the area observed by CloudSat”.
10. *P.1286,L.8* I think you need to be explicit about the limitations, something like “for 4.5 years of curtain data accumulated on 1°x2° grid boxes”. Also, in the following sentence you should probably say “relative uncertainty”.
11. *P.1286,L.14* I do not understand “the part of”.

12. *P.1286,L.27* You have not motivated why a threshold is necessary. I suspect it's because ERA-I drizzles most of the time.
13. *P.1287,L.11* I don't understand the "likely lower" statement.
14. *P.1289,L.14-15* New information shouldn't be introduced in the conclusions – it belongs back in the main body of results.
15. *P.1289,L.27* This statement is so general, I'm not sure it's useful.
16. *Fig.3* is pretty low in information content; could it be integrated with Fig.1?

#### Technical Corrections

17. *P.1281,L.17* "did not give quantities" is "was not quantitative", I think.
18. *P.1281,L.20* "measure" is "estimate" – this is remote sensing.
19. *P.1282,L.3* "cloud particles and hydrometeors" – cloud was the point of CloudSat.
20. *P.1285,L.3* "if" should be "on whether".
21. *P.1285,L.16* "A lot of" should be "Relatively more".
22. *P.1287,L.20* "due to" should be "as good as" – it's not the forecasts that are chance, it's their skill.
23. *P.1289,L.9* "was still lacking so far" isn't correct English; maybe "has yet to be established".
24. *Fig.2 caption* "flags sorted as" isn't correct English; maybe "cases of".
25. *Fig.5* The vertical axis requires a label.