

Interactive comment on “Analysis of long-term precipitation pattern over Antarctica derived from satellite-borne radar” by L. Milani et al.

Anonymous Referee #1

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The paper deals with the analysis of two products that use CloudSat data to estimate precipitation rate. These products are then compared to precipitation estimates from model reanalysis data and from some snow depth measurements from 6 surface stations. The paper addresses relevant scientific questions within the scope of this forum.

Originality (Novelty): Fair

The paper does not really present novel concepts, ideas, tools, or data. It is making use of existing satellite, model, and surface products. The analysis performed is quite standard treatment. The new aspect is the application of this data to the Antarctic. However, the results do not provide any particularly new insight to the treatment of these sources of data. That the CPR on CloudSat can retrieve snowfall rates on a single event temporal scale is not new. Other studies quoted in the references have

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established this. As an example, the last paragraph of the manuscript reiterates or perhaps confirms the findings of similar studies but offers nothing remarkably original.

Scientific Quality (Rigour): Good

The paper does present the information in a straightforward and understandable manner. The scientific methods and assumptions are valid and clearly outlined. The description of data and the calculations are sufficiently complete to be followed and would allow their reproduction by fellow scientists. This is the strength of the paper.

Significance (Impact): Poor

The paper does not really accomplish is stated goal, namely to show how CloudSat in conjunction with other supplementary information can improve the mass balance over Antarctica. Factors that influence this mass balance are discussed and many scientific hurdles identified. The paper claims to evaluating the potentials of CPR for snowfall retrieval in Antarctica – but there is no quantitative evaluation done. Only “possible” explanations that could be applied to evaluations are offered. On balance, there is no significant conclusion reached relative to earlier studies that apply CloudSat information to high latitudes (generally northern hemisphere).

Comments within the manuscript such as:

Further studies dedicated to systematic comparisons between different snowfall retrieval algorithms are currently being undertaken ... this comparison is affected by several shortcomings Further investigation is necessary to assess the effective contribution of wet snowfall or mixed phase to the precipitation This study is not intended for suggesting the best algorithm for precipitation estimation over the Antarctic region, but for ...

are exactly the things that need to be carried out to enable this work to be credible.

The other issue is that many of the things mentioned that are supported by the analysis are just not that significant. Some examples are:

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Sec. 3.3 last paragraph: not a compelling argument that the objectives of the paper have been achieved.

Sec. 3.4: effect of coastline: very qualitative and speculative. The length analysis had a difference of 36 km vs 39 km for the two CloudSat algorithms in the seasonal analysis. This was described as “slightly different behaviour”. Hardly significant.

The relation between cloud cover and snowfall frequency highlights the impact of coastal orography in enhancing the snowfall occurrence – again hardly significant

Presentation Quality: Good

The mathematical formulae, symbols, abbreviations, and units are correctly defined and used. There are no superfluous figures. The number and quality of references is appropriate and gives proper credit to related work.

The overall presentation is well structured and clear generally. However, the abstract is not very concise and could be reworked. Specific comments are listed below:

The last two paragraphs of introduction are devoted to previewing results later in the paper. These paragraphs could be reduced as much of it is mentioned later in the paper.

sec 2.1 pg. 147, l 24: more information on the CloudSat data quality flag would be helpful.

Sec 2.1.1 pg. 149, l 18-24: long awkward worded sentence. Split into 2 or 3 separate sentences.

Sec. 2.1.2 pg. 152, l 6: seems strange to include station 08915 in the monthly analysis as well (Fig. 9).

I suggest replacing the term rain gauges with precipitation gauges.

Sec 3.1 pg 154 l 13-25: very poor, ambiguous worded paragraph.

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Sec 3.1 pg 154 l 17: define “significant”.

In the discussion of Tables 12 and 3, listing standard skills scores like CSI could reduce the wording in the text and make the results more discernible.

Interactive comment on The Cryosphere Discuss., 9, 141, 2015.

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