

## ***Interactive comment on “Marked decrease of the near surface snow density retrieved by AMSR-E satellite at Dome C, Antarctica, between 2002 and 2011” by Nicolas Champollion et al.***

### **Anonymous Referee #2**

Received and published: 25 January 2019

In this paper, the authors present a retrieval algorithm for inferring surface density variations from satellite passive microwave observations. Their retrieval indicates that there has been a decrease in surface density in Antarctica, at Dome C. They back this up by comparing to in situ density, QuickScat, and EnviSat RA.

### Minor Comments

1. Page 4, line 23: Are you using the Ice-1 retracked data, or something else? 2. Page 4, line 27: More common to say “spatial resolution in the along-track direction is 330 m”. More broadly though, I think these comments are a little misleading. The true size of the area measured by the RA-2 (while confusing over ice sheets) is probably closer

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to 10 km. The footprint separation along track should not be referred to as “resolution”, as it will easily mislead readers. 3. Page 4, line 28: This precision seems far too high. Please give a reference and say how exactly this number was computed. Additionally, can you please provide a range of references of those who have measured ice sheet elevations from radar altimeters? 4. Page 5, line 13: The measurement corresponds to the top 5 cm of the snowpack, whereas the retrieval corresponds to the top 3 cm. I didn’t see if these were ever reconciled. Please address. 5. Page 5, line 15: Should be “The second dataset. . .” 6. Page 5, line 24: Should be “datasets” 7. Page 5, line 25-28: This is confusing. Are these data being presented for the first time, or part of an existing analysis? Please add citations. These values of course cannot be thought to always represent the quantities as they are named, so this must be a very specific analysis. 8. Page 6, line 9-11: No references are cited, and no justification is given for this analysis. Please either cite a reference for how this was done, and what uncertainty is associated with it, or provide some supporting material in an appendix. 9. Page 6, lines 11-12: What is the ECMWF surface air temperature precision over Antarctica? 10. I found the presentation of the 19 GHz data a bit confusing. If (as indicated Page 12, lines 1-2) the 19 GHz data are not used in most of the study, why present them here? I think it makes the story much more confusing for readers to try to absorb. 11. Page 13, Figure 6. So as I understand the paper, the 37 GHz PR is more-or-less being inverted for surface density. So (in a simplistic reading) we should expect to see a correspondence between Figure 3 and Figure 5. Is that correct? Please comment.

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-265>, 2018.

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