

## ***Interactive comment on “Melt in Antarctica derived from SMOS observations at L band” by Marion Leduc-Leballeur et al.***

### **Anonymous Referee #2**

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The authors have performed a study to detect the melt occurrence in Antarctica using SMOS observations. Authors have compared the SMOS detection results to those obtained using 19.7 GHz passive observations. This study provides very good results – showing the usefulness of SMOS observations for melt occurrence detection. Theoretical analysis explains well the differences between the L-band and 19.7 GHz observations and provided very nice basis on understanding the importance on having observations at both frequencies to better monitor the melt occurrences. The manuscript is well written and structured, it is easy to read and understand. The aim of the study is clearly explained, and conclusions are well provided. Scientifically, the paper is solid, it provides interesting and important new information on how to better detect and monitor the ice melt on Antarctica. I recommend this paper to be published and have only some

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minor comments to be considered before publishing: The comments are listed below.

- 1) Line 46: I assume the authors are using CATDS data from 50 to 55 degrees.
- 2) Lines 120-121: The selected temperature profile is a little strange: From surface to 10 m: 273 K, then constant 263K to 500m depth. Are the authors really using this, or should it be from surface to 10 m dropping from 273K to 263 K?
- 3) Figure 5: Based on the model results, the selected density profile has a large impact.  $T_b$  as a function of the liquid water content is totally different if a smooth density profile is applied. Daily winter SMOS observations are compatible with the third density profile (20 kg/m<sup>3</sup>). How much the density profile varies in real life, may there be an additional source of uncertainty for the SMOS based estimations?
- 4) Line 138: Odd sentence, maybe “have been selected” should not be there.
- 5) Line 162: Maybe, to clarify the readers, the authors could use: “The wet layer thickness” instead of “The layer thickness”
- 6) Line 174: The sentence is a bit confusing starting from words “or if the event was produce a lot . . .”
- 7) Figure 6: The caption text is not as informative as it could be. “as a function of the wet snow depth” => how about: “as a function of the wet snow layer depth”. By adding word layer, it is easier to understand that the simulation is done using constant layer thickness but in different depths. Also, consider adding the layer thicknesses here.

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