

## ***Interactive comment on “Estimating Snow Depth on Arctic Sea Ice using Satellite Microwave Radiometry and a Neural Network” by Anne Braakmann-Folgmann and Craig Donlon***

### **Anonymous Referee #1**

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This is a well written paper that introduces a novel approach to estimating snow-on-sea-ice thickness using multi-frequency passive microwave data. The authors go on to show how better snow thickness estimates impact the further calculation of sea ice thickness. The paper is well organized, the references complete, and the figures generally clear.

The authors discuss several previous snow thickness algorithms in some detail. They compare results against OIB data to test RMSE and correlation. I think it would be useful to add additional description about the physical basis for the different algorithms. In most cases at least in so far as I recall, the algorithms are largely empirical and are

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validated against in situ data. However the authors seek to use this analysis as a guide for the CIMR mission. Without more detail on the physical basis, it is hard to say how well the algorithm will perform or serve to continue as a long term record given differences between the CIMR instrument parameters and earlier sensors. See for example Zabel and Jezek, 1994, Consistency in Long Term Observations of Oceans and Ice From Space, JGR Oceans, Vol 99, p. 10109.

In several of the tables, the authors quote precision to the mm level. Given that the OIB data are at best accurate to 1 cm for snow thickness and maybe 5 cm for ice thickness, the precision in the table should be changed to reflect that. It might also be interesting to think about the accuracy of the algorithm derived snow thickness and SIT. There is uncertainty in the accuracy of the OIB data but there is also algorithmic uncertainty the arises from the assumptions in the algorithm. What might be the later and what might be the total uncertainty in the results presented here?

I recommend publication after the authors have reviewed my comments.

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Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2019-50>, 2019.

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