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Ocean Science
Discussions

# *Interactive comment on* "Technical note: A sensitivity analysis from 1 to 40 GHz for observing the Arctic Ocean with the Copernicus Imaging Microwave Radiometer" *by* Lise Kilic et al.

**Lise Kilic et al.**

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-First, we thank the reviewer for reading our paper and for his/her comments.

This technical note presents a sensitivity analysis of geophysical parameters relevant to the frequencies and viewing geometry anticipated for the arctic-focused CIMR mission. The focus of the work is a more quantitative reproduction of the classic Wilheit 1979 figure using more up-to-date information including RTM and inclusion of the atmospheric contribution. The note finishes with anticipated single channel TB sensitivity to the CIMR precision range for desired retrievables. The paper is well written and the results reasonably well presented. The information is highly useful for the CIMR team



and future users of the data. The paper is lacking in scientific novelty for a publication. Suggestions are given below for some possible expansions that could add to the contribution of this work.

-We are aware that this paper does not present fondamental novel results. It is a practical update of the Wilheit figure that has been widely used by the community. This is why we chose to submit this result as a technical note and not as a regular paper.

Specific Comments: Line 65: What are some of the uncertainties and sources of error associated with this?

-The sea ice emissivity varies upon different parameters the main one are the ice type, the ice thickness, and the snow depth. In the figure attached (Fig 1.) you can see the standard deviation of the ice brightness temperature (black rectangle) derived from the round robin data package that is cited in the paper.

Line 96: I understand the desire to present a single case here with explanation before diving in to the comparisons, but using the midlatitude case seems an odd choice here. I suggest reorganizing this section and either presenting 3 versions of Figure 2 (one for each of midlatitude/arctic/tropical) or (perhaps more in line with the original idea) leave the first section as "a general case" but average all areas together, making it truly general for this discussion, then next presenting Figure 3 teasing them all apart and discussing the latitudinal differences.

-We would like to keep Figure 2 close to the Wilheit initial figure for an easier comparison, before changing the geophysical condition.

Lines 106-109: Is this the best place for this discussion? May be better placed in the introduction?

-Yes, it has been moved to the introduction.

Section 3 - General: Please add a sense of the variability in these parameters, and how this variability differs for each of tropical/mid-lat/arctic. This is an important piece

that is missing to make this more robust.

-Yes we added sentences to explain the variation of the parameters: "The TCWV and the SST vary globally between roughly 5 to 60 kg/m2 and 273 to 305K, respectively, with mean values that strongly depend upon the latitude. The OWS and SSS vary globally between roughly 0 to 20 m/s and 32 to 38 psu with mode values around 7 m/s and 34 psu, respectively."

Section 3 - General: More discussion of differences from the Wilheit figure and how the changes are related to the updated technique and inclusion of the atmospheric contribution (more than the quick mention at line 101) would be a nice addition to this work.

-Yes, we added the following sentence: "Note that with this updated version of the Figure of Wilheit1979 taking into account the sensitivity to the atmosphere, we can see that the sensitivities to the other parameters, such as SST or OWS, are decreased at higher frequencies (>18 GHz), and especially near the water vapor absorption line at 22 GHz."

Please also note the supplement to this comment:
https://os.copernicus.org/preprints/os-2020-92/os-2020-92-AC3-supplement.pdf

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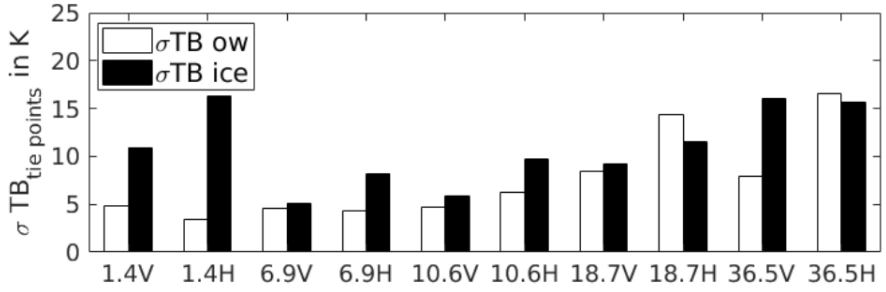


**Fig. 1.**