The Cryosphere

Discussions

Open Access

EGU

TCD

Interactive
comment

Interactive comment on "Surface-Based Ku- and Ka-band Polarimetric Radar for Sea Ice Studies" *by* Julienne Stroeve et al.

Nathan Kurtz (Referee)

nathan.t.kurtz@nasa.gov

This is a well written paper which describes in-situ measurements from a Ku/Ka band radar during a portion of the MOSAiC field campaign. The results are highly relevant and represent a very good data set needed for better understanding of radar returns from sea ice and the snow layer. From a technical perspective I believe the methods and data are quite sound and thoroughly described in the paper. However, the paper stops short of providing information that would be of most use as a reference to understanding or improving retrieval techniques from satellite or airborne altimeters. What would be most useful here would be some results and discussion showing the observed difference in backscatter between the snow-air and snow-ice interfaces as well as the variability that was seen. Tying these to some of the physical properties

measured in-situ such as salinity would also be useful. It is mentioned that this paper represents a first data set and that further studies will follow, from that perspective I do think the paper is indeed quite useful and should be published. But it would be nice to have the results placed in a bit better context towards how they could specifically be used in understanding satellite or airborne radar returns.

Some specific comments are below:

Line 280: The MOSAiC floe description seems a bit simplistic with declarations about the floe properties which ignore some of the variability within the floe itself. I would suggest referencing the paper by Krumpen et al. on the floe description and history. Some additional description of the ice properties beneath the radar site would also be helpful here and in other sections of the text such as Line 290 when it is brought up that the radar was moved.

Krumpen, T., Birrien, F., Kauker, F., Rackow, T., von Albedyll, L., Angelopoulos, M., Belter, H. J., Bessonov, V., Damm, E., Dethloff, K., Haapala, J., Haas, C., Harris, C., Hendricks, S., Hoelemann, J., Hoppmann, M., Kaleschke, L., Karcher, M., Kolabutin, N., Lei, R., Lenz, J., Morgenstern, A., Nicolaus, M., Nixdorf, U., Petrovsky, T., Rabe, B., Rabenstein, L., Rex, M., Ricker, R., Rohde, J., Shimanchuk, E., Singha, S., Smolyanitsky, V., Sokolov, V., Stanton, T., Timofeeva, A., Tsamados, M., and Watkins, D.: The MOSAiC ice floe: sediment-laden survivor from the Siberian shelf, The Cryosphere, 14, 2173–2187, https://doi.org/10.5194/tc-14-2173-2020, 2020.

Line 900-905: What does it mean that "the power that comes from above the air/snow interface within a few cm of the peak is simply the impulse response of the radar"? I'm not sure why the peak is shifted several cm, and if it is the impulse response of the radar then why does it look so different than the metal plate and calibration examples? Perhaps instead it reflects the surface height distribution and scattering characteristics of the surface.

Figure 7 and other figures: Does the Range from Antenna represent the range assum-

ing a speed of light in free space or in snow?

Figure 9 and Line ∼440: This figure and discussion are very interesting and is highly relevant for assumptions about the radar backscatter from the snow-air and snow-ice interfaces from altimeters. However, this is very qualitative and hard to put the results in a useful context as presented here. It would be useful to show at the least the backscatter difference between the snow-air interface from the algorithm and the value from the magnaprobe location.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2020-151, 2020.