Warming temperature showed already sign of increased extreme events such as Rain on snow (ROS) in the Arctic. ROS event occurs from a rain event usually with temperature around the melting point and results in ice crust after temperatures goes down and the liquid water on the surface refreezes. The study presents a way of detecting such events by using a novel method from combined satellite C-band radar and L-band passive observations to detect liquid water. They evaluate the retrieval of several events in the Arctic. The usage of high-resolution SAR imagery from Sentinel 1 is particularly interesting and novel since such events can occur locally. However, I believe this added benefit could be more highlighted. I also think this work lacks a quantitative validation of the ROS retrieval from ice layer I snowpits, maybe % of commission/omission from the algorithm could be calculated. I would also propose to compare to another passive ROS detection algorithm to evaluate the benefit of the method. The combined method of C and L band is interesting. I think the focus of the paper could be narrowed, it is a bit broad and makes the paper harder to understand. I would aim to present the method, then evaluate and not try to make a broad-scale statement on ROS event since it is not properly evaluated yet. Overall, I think this article should be published once modifications are made.

Specific comments:

L35. I would not use the term "*aging of snow*" since it is not accurate. Please refer to the vapour flux from temperature gradient.

L38. "The mapping of snow changes afterwards instead of wet snow circumvents", I'm not sure what is meant in the sentence. Please consider modification for improved clarity.

L40. Include citation on wavelength and snow grain size.

l65. Do you mean "*With ROS, associated*"

L77-80. Perhaps the objective should be modify or addressed more clearly in the conclusion. Were you able to correctly answer (1) with this method? How was (3) evaluated?

L150. Consider adding a statement on how these data can be subjective and what was done to avoid this.

L207. Please clarify this sentence "ROS using wet snow from C-band". Do you mean wet snow detection?

L.246. Please reword the beginning of the sentence.

L248. Algorithms for ROS detection using 37 and 19 GHz are also sensitive to dry snow surface change into ice crust and ice layer. Consider using does to improve the algorithm since L band is useless when no liquid water is present.

L306. Revise figure reference.

L310. Consider comparing your method to a passive-based ROS (Dolant et la., 2016, Pan et al., 2018) retrieval to show the improvement your method could deliver.

L324. Revise table reference.

L521-523 Can you provide a quantitative validation of the method to detect ROS events?

L527. the phrasing with the comma is confusing, do you mean ... "*play a role on what should be considered"*

L526. Maybe consider using a passive observation with 19 and 37 GHz to improve sensitivity to ice crust and dry snow surface change. Once the liquid water is frozen and the temporal timing of the ROS event could not be detected with SMOS, those frequencies could help to detect surface change while C-band can provide info at high resolution.

L529. "*The magnitude of specific extreme events can be documented by the use of ASCAT alone, without fusion with SMOS*." I thought you showed you need wet snow detection and ASCAT alone cannot detect ROS.

Figure 6. This figure is hard to understand. what are H4 1, H4 2 and H4 3? Why not add all layers so we have a better understanding of the whole snowpack?

Figure. Overall, the labels are hard to read since the font is so small. Consider increasing font.

Dolant, C., Langlois, A., Montpetit, B., Brucker, L., Roy, A., & Roy, A. (2016) Development of a rain-on-snow detection algorithm using passive microwave radiometry. Hydrological Processes, 30, 3184-3196. DOI: 10.1002/hyp.1082

Pan, C. G, Kirchner, P. B, Kimball, J. S, Kim, Y. & Du, J. (2018). Environ. Res. Lett. 13 075004, DOI : 10.1088/1748-9326/aac9d3