Reply on RC1 - correction (first response was for RC2)
Annett Bartsch et al.

Author comment on "Towards long-term records of rain-on-snow events across the Arctic from satellite data" by Annett Bartsch et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-899-AC3, 2022

Please apologize the mixing up with comments to RC2.
Also thanks to you for your valuable comments!

Please find our response to your main comments below:

RC1: ... 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.

Reply: It is unfortunately not possible to infer from the snowpit records what the reason for formation of hard layers was. It is very common that wind compaction leads to hardness 4 and 5 at the sites with the snow pits. An error of commission omission can therefore not be derived. We agree that this should be explained in more detail in the manuscript for clarification.

RC1: I would also propose to compare to another passive ROS detection algorithm to evaluate the benefit of the method. ... 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.

Reply: Other algorithms for ROS detection from passive microwave L-band have not been published yet to our knowledge. ROS retrieval results from passive microwave records in general have (to our knowledge) so far only documented with figures in publications and datasets of events not published. One event was however documented by one of our co-authors (Sokolov et al. 2016) with passive microwave (AMSR-E) previously. We discuss this on lines 395 and 510. We fully agree that comparisons to other passive microwave records/frequencies would be useful and specifically exploitation of SSMI/I records in order to be able to go more back in time (see lines 474ff), but this is beyond the scope of this study. The advantage of using radar is however (1) the potential to analyse the severity of the event (e.g. figure 12c) and (2) the option to go to higher spatial resolution with SAR. Current SAR missions do not allow for operational circumpolar retrieval, but it might become feasible in the future. Note that in a preceding study results from fusion of Ku-band backscatter change with AMSR-E detection are documented in Semmens et al. (2013). It was found that many events found over Alaska were due to fog instead of ROS: "... fog occurrence is viewed as a proxy for warm air mass intrusion which creates condensation on the snow surface resulting in melt that is detected by the passive
microwave" (Semmens et al. 2013, page 9). We briefly discuss this on lines 475-477.

Regarding the suggested considerations of Dolant et al. (2016) and Pan et al. (2018): Note that I contributed a review of ROS retrieval methods in Serreze et al. (2021), Table 1, which also provides some basic details of the two papers. Pan et al. is commented there also on page 12, left column. Dolant et al. focused for validation (community observations of ROS from three settlements close to each other) on one winter, 2010/11, which is excluded from our ASCAT/SMOS analyses due to issues in the SMOS records at the beginning of the mission. Pan et al. focus on Alaska and combine passive microwave observations with MODIS to identify if snow is on ground or not. Validation was based on precipitation proxies. These differences in validation strategy across existing studies could be added to the introduction and discussion. Pan et al. included a figure for one specific example for a ROS in 2013, which we could extract from our records for comparison.

References


