In this manuscript "Towards long-term records of rain-on-snow events across the Arctic from satellite data" the authors have presented an approach to mapping ROS events by combining observations from C-band scatterometer, which are indicative of snow structure change and L-band passive microwave radar, which is sensitive to the presence of wet snow. The results highlight the added value of using L-band observations to filter out false detections from the ASCAT C-band data which can occur as a result of temperature drops. In addition the authors have made use of additional data sources to support the remote sensing detections, including snow pit data, AWS measurements and caribou data. The use of C-band Sentinel-1 SAR observations was also described and presented, but in my opinion these data played a much smaller role in the data analysis than what I was expecting from earlier on in the manuscript. Overall the method is convincing and the datasets produced are valuable in providing a better understanding of ROS occurrence across the Arctic. However, I have a few general and specific comments which should be straightforward to address before the manuscript is published.

1. Area of study: it is apparent from the figures that the authors have applied the approach to not only the entire Arctic but also to land areas extending much further south (eg., Figure 5). However, it is stated in the conclusion that the approach is only recommended for regions north of 66 deg due to coverage issues with SMOS. Perhaps the authors should revise the boundaries of the areas for which ROS detections are presented, or comment on how representative the ROS data are for the lower latitude areas shown in Fig.5?
2. The authors have described and presented a wide range of different types of observations, but I think that some of the datasets used do not really add much to the overall goals and conclusions of the study. While I see the need for observations to validate/support the remote sensing data, I think the use of too many different observations, each with their own considerations for ROS detection, makes it at times difficult to follow the main objectives of the study. I would for example recommend reconsidering whether the use of the caribou data are really necessary. While I think the presentation of Sentinel-1 observations is interesting, I don't think it featured enough in the results to be worth including in the data descriptions/method. Perhaps the authors might consider a follow-up study which focuses primarily on Sentinel-1 instead of including it here?

Specific comments

Line 175: why were different terms/hardness scales used at Yamal compared to the Scandinavian sites? Why not just use a standard scale for all sites?

Line 296: "location specific threshold" - does this mean that a threshold is determined for individual pixels, or for regions?

Table 2: Events represent November 2021 to February 2022; why are values from only 1 year/winter of observations used?

Figure 1: missing?

Figure 2: Please consider splitting into 2 figures as it is very difficult to see the circles showing the reference sites

Figure 4: Could the authors comment on the event confirmed by SMOS occurring in the start of December 2016? Here the AWS data show very low temperature (approx. -15 deg.C), no

precipitation and increasing snow depth in the following days. What could be the reason for detection of wet snow?

Figure 5: Consider splitting into 2 figures; the pan-Arctic maps showing ROS frequency are quite small but show very interesting data. Also consider increasing the symbol size in the legend.

Figure 8: Legend symbols are far too small. Also move the legend for ASCAT backscatter change closer to the actual figure showing backscatter change (right panel of Fig. 8b)

Figure 10: Increase the symbol and text sizes in the legend

Figure 11: Missing labels (a) and (b)

Figure 12: Consider removing the caribou observations (panel c) and increase legend/symbol sizes elsewhere

Figure 13: I didn't find that this figure showed any useful information, consider removing it

Technical corrections

Line 38: change "afterwards" to "following a ROS event"

Line 42: change "ROS events" to "ROS event"

Line 99: Change "production if" to "production of"

Line 129: Define EASE2

Line 130: Define RFI

Line 161: Change "University Tromso" to "University of Tromsø"

Line 162: "information is collected" -> "information has been collected"

Line 163: "is used since" -> "has been used since"

Line 170: "First snow pits" -> "The first snow pits"

Line 181: recommend changing "instrumented" to "equipped"

Line 199: "what is reflected to a certain magnitude depending on" -> "which is reflected to a certain degree by"

Line 202: "is increasing in" -> "increases"

Line 204: "is significantly decreasing" -> "decreases significantly"

Line 208: "investigated for Norway" -> "investigated for the Svalbard archipelago"

Line 209: "alter" -> "alters" and "even ice layers are forming what allows" -> "the formation of ice layers allows"

Line 226: "found independent" -> "found to be independent"

Line 232: "real part" -> "the real part"

Line 235: "The attenuation of dry snow layer" -> "The attenuation by dry snow layers"

Line 247: "Band rations" -> "Band ratios"

Line 257: "towards south" -> "towards the south"

Line 300: Figure 4 should be referred to after Figure 3

Line 306: something missing: "?"

Line 307: "the finally determined date" -> "the final date determined"

Line 309: Figure 11 is referred to too early? Figure 5 should come after Figure 4

Line 324: Table ?? - missing number

Line 331: outlined in ? - missing a section number

Line 398: Missing word after "in the following" - winter/summer?

Line 435: "what leads to" -> "which leads to"

Line 439: "In same regions" -> "In the same regions"

Line 440: "Problematic are also" -> "Also problematic are"

Line 441: "change is decreasing" -> "change decreases"

Line 449: "what underlines" -> "which underlines"

Line 464: "Near coastal" -> "Coastal"

Line 481: "Both from Senintel-1" -> "Both Sentinel-1"

Line 482: "as ASCAT" -> "to ASCAT"

Line 483: "In cases" -> "In some cases"

Line 500: "In case of" -> "In the case of"

Line 507: "what is an issue" -> "which is an issue"

Line 513: "what might explain to" -> "which might explain"

Line 514: "in case of" -> "in the case of"

Line 516: "what corresponds" -> "which corresponds"

Line 527: "what should be" -> "which should be"

Line 533: "what allows" -> "which allows"