The Cryosphere

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Discussions

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**Interactive
comment**

Interactive comment on "Evaluation of single-band snow patch mapping using high resolution microwave remote sensing: an application to the Maritime Antarctic" *by* C. Mora et al.

Anonymous Referee #1

Received and published: 28 September 2016

1   General comments:

The manuscript presents an approach to map snow patches in the Maritime Arctic using high-resolution SAR data. The authors examine different classification approaches and have conducted an extensive field campaign in order to evaluate the obtained results. They find a SVM-based classification approach suitable for mapping wet snow patches within their study region. The paper is clearly structured, the scientific methods are described in detail and the results are well presented. Nevertheless, the following points need to be addressed by the authors.

2 Specific comments:

There is an incidence angle dependency of the backscattered signal. Depending on the local incidence angle of your terrain (SAR scene incidence angle + terrain slope), this can become significant. You cite this effect in the introduction, and you also observe it at steeper terrain slopes, where your classification fails. If your method is intended for wider use (and in your abstract, you mention a possible operational application), how can you handle incidence angle dependency?

You found the HH scene to be better suited than the VV scene acquired on the following day. Do you have an explanation for this observation?

The water bodies you observed show very low backscatter. How would your classification approach handle wind-roughened water which can become very bright due to Bragg scattering?

1 Introduction:

In line 24-25, you state that "Most applications have been developed for regional scale mapping, but for higher resolution approaches they lack quality." This is a very strong remark, please elaborate on that.

3.1 Field characterization of the snow cover:

First of all, I think it is a very good idea to comment on the failed temperature measurements and to give a detailed analysis of the possible cause. Still, I am missing a description of the other methods of measurement. How did you measure grain size and how do you define grain size in the first place? How did you measure snow density?

3.2 SAR imagery classification:

This section does not actually describe the classification method, maybe you should rename it to "SAR image processing" or something similar.

4.2 Snow patch temperatures:

Did you consider using external temperature measurements, e.g. from AWS or Reanalysis data, for your study? Given the narrow range of temperatures for your test site, it would have been also interesting to have temperatures available for the September image.

4.4 Wet snow patch backscattering characteristics:

On page 8, lines 4-5, you state that "Figure 9b shows that at HH polarization a weak positive correlation exists...". I cannot see any correlation in the figure and suggest to rephrase this sentence.

5.3 Classification using an object oriented algorithm:

Here, you use a set of morphological filters to suppress speckle and to obtain more homogeneous regions. If the quality of your threshold-based classification suffers from the same noise characteristics, then why didn't you use that set of filters for all classifications?

3 Tables and Figures:

- Table 3: There is something seriously wrong with this table. From column 7 on, it does not make any sense.

- Table 4: What do you mena by prod. acc. / user acc.? Please explain the abbreviations.

- Figure 12: The legend is very hard to read, please make it bigger. If you have 4 classes in the image (white, light and dark gray, black), why do you only have 3 of them in the legend?

- Figure 14b: This figure is very hard to interprete, since it looks just like Fig 14a tinted red. Maybe a zoomed-in region could provide a higher level of detail?

4 Technical corrections:

- page 3, lines 20-22, "Mapping of the later...": This sentence got a bit lost, it seems.

- page 4, lines 14-16, "... geocoding of the TerraSAR-X scenes and ground.": There is something missing here.

- page 4, line 30, "Pervasive moisture...": This sentence appears to be a bit out of context, maybe shift it up a bit, after "Each of the snow pits...".

- page 8, lines 15-16, "Given the best quality...": This sentence is a bit confusing, please rephrase. The next sentence is missing a "the".

- page 8, line 24, "thresholds b": If you use uppercase on the other scenarios, use it here as well.

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- page 8, line 29, Fig. 10: should probably be Fig 12.

- page 10, line 25: "snow patches showed rare ice layers": I suggest rephrasing to "...snow patches rarely showed ice layers"

- page 11, lines 26-27, "The acquisition mode is very relevant...": I don't really understand what you mean to convey with this sentence.

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