The Cryosphere
Discussions

Open Access

EGU

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.

G. Vieira

vieira@campus.ul.pt

Dear Mr Marco Jorge,

Thanks for your comments on the manuscript. Concerning your questions, please find the answers below. We will review the manuscript and clarify the issues you have raised.

Question: Section 3.3 is titled "Production and validation of snow cover maps" but does not explain how the validation was done. I think it would be beneficial to separate classification algorithms ("Production of snow cover maps") from validation. Only after the results (section 4), in section 5, is it explained that the ground truth data was divided

into classification and validation sets. I would additionally suggest explaining how the separation between classification and validation sets was performed (e.g., random?) as well as adding considerations on the representativeness of the samples (different configurations will significantly affect computed performance). Considering the small size of the reference dataset, for a minimum-bias assessment, the performance of the preferred classifier should be trained and evaluated using multiple training and validation sets (from multiple, different partitions). As is, it would be useful to have the classification and validation polygons discriminated in one or all of the results' maps; or, maybe, just remove the patches used for classifier development from those maps. Answer: We understand your comments, but prefer maintaining both production and validation under 3.3. However, we agree that the validation text, which was presented in 5. is better placed in 3.3 and we will move it there. We will also clarify the explanation of the validation procedure, e.g. random selection of the training and validation sets and explaining the validation procedure. Plotting both sets would not be feasible, since the procedure is based on the random selection of pixels and not polygons, which will show scattered in the figures and will not really add-up to the contents.

Question: The study area is quite small (< 1.5 sq. km?), yet the reference data is significantly spatially restricted; although it could be difficult to analyze snow properties for all snow patches, it is clear that wet-snow conditions are widespread – why only some patches were mapped in the field? Answer: the timing of surveying had to match by not too much time the satellite overpass and therefore, we have selected a small area with snow patches showing different aspects. The selection was made a priori in a first field survey and only then, dataloggers were installed, snow pits dug and limits of snow patches were mapped. It is a procedure that takes time and involves using different instruments and relatively complex field logistics under difficult weather conditions in short time. A few days after the overpass, there were snow fall events that covered the terrain.

Question: Additionally, since the presented method for snow mapping involves classify-

ing non-snow land covers, having more extensively field-mapped the non-snow classes would have enabled a more reliable performance assessment independently of the snow cover mapping. Answer: see above.

Question: My concern is that the presented values of Kappa, etc., though encouraging, do not properly convey the performance of the classifications. For example, in Fig. 15, in two instances, the snow ground-truth polygons (the northernmost and southernmost polygons) are much smaller than the SAR-image derived snow patches they overlap. Do those (red) polygons represent the actual extent of the snow patches? If so, it means that the overmapping for the snow class is much more significant than the performance measures suggest, and thus actual performance is lower than the computed performance; i.e., the geometry and distribution of the ground-truth areas would have been a strong determinant of measured performance. If not, what was the rationale for mapping only a portion of the snow patch? Answer: Small snow patches with well-defined boundaries were fully delineated with the DGPS surveying. The two snowpatches which you mention are large ones and they were only mapped close to the sites where we have installed the dataloggers. In cases where too much slush was present, we excluded the slush from the snowpatch boundary, since in some sites close to valley floors there was really more water than snow already. In synthesis, the results do not show overmapping in the two cases you have pinpointed and our knowledge of the terrains indicates that the mapping results agree with the snow patch extent, although we cannot quantify it.

Question: It would be more effective to describe the used statistics (evaluation of the different polarizations for land cover class discrimination; comparison of the classification algorithms; automated classification evaluation) under methodology. Currently, they are essentially referred for the first time in or after the results section. Answer: That could have been an approach. However, reviewer #1 considered the manuscript well-structure and we prefer to keep it as is, since the reader becomes aware of the rationale behind the application of the different methods while reading the manuscript.

C3

If needed, we can also easily accommodate such a change.

Question: In line with a comment from reviewer #1, section 3.2 deals with data and data (pre)processing, not with image classification as suggested by the respective title; ideally, there would be a correspondence between the 3 items highlighted in the text right after section 3 header (Methodology), and section 3 level-2 headers. Answer: We will change it following the suggestions of reviewer #1.

Question: Section 5 is composed of results and thus should be under the results section (section 4). The method descriptions under section 5 would move to the methodology section. Answer: You are right. We will include section 5 under results.

Interactive comment on The Cryosphere Discuss., doi:10.5194/tc-2016-190, 2016.