Atmospheric
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Discussions

Interactive comment on "A cloud identification algorithm over the Arctic for use with AATSR/SLSTR measurements" *by* Soheila Jafariserajehlou et al.

Anonymous Referee #1

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This paper identifies the need for good cloud detection algorithms over Polar Regions specifically for the purpose of aerosol retrievals, but this is also true of any atmospheric/surface retrieval in these areas. It is more difficult to identify cloud and classify the surface type in Polar Regions, and therefore the topic of this paper is of relevance to the scientific community. There are some things that I would like to see addressed before publication that I have included in the general comments section below. My technical comments are the more minor things that should be addressed such as typos.

General comments

1. Line 97: If you apply your algorithm to AATSR, clouds can change significantly in a period of 2 days quoted here as the return time. 2. Line 162: What about continuity in the data record? There is a ∼4 year gap between the failure of AATSR and the launch of SLSTR. 3. Line 250: The 11 micron BT although closest to surface temperature is not the 'real surface temperature' as it includes atmospheric effects. To give an example, LST or SST is never equal to BT in the 11 micron channel. If it were, we wouldn't need to retrieve surface temperature. 4. Line 312: Are you including all measurements within the block in the PCC calculation? This isn't clear in the text. If you are then your PCC is based on ∼25x25 pixels (x2 for two scenes?). I would think in this scenario that most of the information is coming from the spatial variability rather than the temporal variability? If you are using a block average, this seems like too few observations to make a valid PCC calculation. 5. Line 335: New ice is also dark and I think you would find it hard to distinguish from open water. It would be good to mention this here too. 6. Making comparisons with SYNOP using a 45-minute time window for validation could be problematic? Clouds can move across a scene within minutes? 7. *Please check the use of English throughout. The manuscript is readable but often the sentence structure isn't quite right and this makes it more difficult to understand. To give an example (line 222): o Manuscript: 'One major contributors of error in aerosol retrieval is misclassifying heavy aerosol loads with clouds.' o Correct English: 'One of the major contributors to error in aerosol retrievals is misclassification of heavy aerosol loads as cloud.' 8. The structure of the text within the various sections of the manuscript could be improved/tightened up in places, particularly in the introduction. 9. Figures 1-2, 5-13: It would be good to enlarge all of these figures so that they are more readable and cloud/surface features can be identified. 10. Figures 1-2, 5-13: It is far more intuitive for the reader if cloud is white and clear-sky is black. Colours should also match between algorithms. For example in one plot you have black=cloud, white=clear, and in another white=snow. This can become quite confusing for the reader to interpret. 11. Table 4: The use of the terms 'correct' and 'incorrect' here assumes that there is no uncertainty in the SYNOP data. Is this really true? How are the okta's determined

from this data? Does it involve human input? Is misclassification possible? I would be inclined to use the terms 'agreement' and 'disagreement' with the caveat that SYNOP isn't perfect made within the text. 12. Figures with RGB: Are these actual RGB's or false colour images? This should be made clear and the channels used described in the figure captions. 13. Figure 16: Light blue error bars are difficult to see. Could you change the colour? 14. There is some existing literature about cloud detection and surface classification over Polar Regions from within the SST CCI project: o Bulgin, C. E., Eastwood, S., Embury, O., Merchant, C. J. and Donlon, C. (2015) Sea surface temperature climate change initiative: alternative image classification algorithms for sea-ice affected oceans. Remote Sensing of Environment, 162. pp. 396-407. ISSN 0034-4257 doi: https://doi.org/10.1016/j.rse.2013.11.022 How does your algorithm compare to a Bayesian approach? This paper also shows the limitations of the SADIST mask that you mention in your paper. 15. Have you given any consideration to classification at nighttime? I realise that in the context of aerosol retrievals this isn't relevant, but it is for other applications so would be good to include a sentence on this.

Technical comments: 1. Line 32: Comma after 'though' doesn't make sense. 2. Line 36: Comma after 'since' doesn't make sense. Please check throughout, as there are not many instances in English where it is appropriate to use a comma after the first word in a sentence, except with 'however' on occasion. 3. Line 39: Snow/ice are also cold – this is the limiting factor in the thermal infrared. 4. Line 47: 'as' thin cloud? 5. Line 151/152: The revisit times stated here are not consistent with those given in the introduction (0.9 days). 6. Line 277: Only in Polar Regions – deserts for example can be bright. Sunglint over water is also bright. 7. Line 650: Should be 'lower'.