

***Interactive comment on* “Detecting cloud contamination in passive microwave satellite measurements over land” by Samuel Favrichon et al.**

Anonymous Referee #2

Received and published: 4 December 2018

This manuscript describes a Neural Network(NN)-based method of detecting clouds from passive microwave observations. The NN is trained using co-located SEVERI cloud classifications and GMI observations. This method has several properties that make it useful for a variety of applications: the NN performs well over land, where physical methods of detecting clouds are more difficult than over water due to the more variable and heterogeneous surface, and the NN outputs a cloud probability metric that can be thresholded to screen more clouds (at the expense of increasing false detections) depending on the application.

I have a few minor comments that pertain to describing the method and its skill in more

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detail. There are also some recommended technical corrections but none of these issues are major and the manuscript should be acceptable for publication after these revisions.

Minor Comments: 1. On page 3, there are some additional microwave imaging radiometers that could be included in your list. WindSat would fall into the group with channels < 40 GHz, and TMI could be listed under those with channels < 90 GHz.

2. Section 2.3 - I'm interested in the detail of how SEVIRI was mapped to GMI. Was the 36 GHz footprint of GMI used, or some other channel? The higher frequency (smaller) footprints might result in more homogeneous scenes for training but could also misrepresent the cloud type in the larger footprints.

3. Is there a reason that most of class 7-10 clouds are classified as class 8 by the NN? It seems as though these can't be distinguished from each other by the MW but are still being detected - you could group these classes together and training and confusion matrix would be more diagonal. I see these are excluded from the training altogether later, which is also logical since these optically thin ice clouds shouldn't have much impact on microwave brightness temperatures, and in fact any detection may be via correlation to upper level humidity inferred from the Tbs near 190 GHz.

4. Table 4: I think a measure of skill that evaluates the NN detection to random chance, such as the Heidke Skill Score, would be helpful here. For example, it is stated on Page 11 that the detection of classes 7-8-11 is similar to a random assignment, so there is no skill, while presumably, the detection of opaque clouds has higher skill. It would be helpful to see this for all classes to evaluate the relative detection capability.

Technical Corrections and Typographical Errors:

Page 2, Line 2: "spatial resolution" is erroneously repeated

Page 2, Line 8: "frequencies" should be "frequency"

Page 2, Line 23: "miss-interpreted" should be misinterpreted

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Page 3, Line 2: "80's" should be "1980s"

Table 1: The 36 GHz channel on GMI is centered at 36.64 GHz (to avoid conflict with the Ka band radar)

Page 3, Line 16: "similar" should be "constant" in this context, I think

Page 4, Line 10: "emissivities" should be "emissivity"

Page 6, Line 4: for GMI, the level 1C product is internally calibrated (other sensors are intercalibrated to it), so I don't think "corrected" is needed here

Page 8, Line 5: "situation" should be "situations"

Page 14, Line 12: "miss classified" should be "misclassified"

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