

## ***Interactive comment on “Evaluation of the Aqua MODIS Collection 6.1 multilayer cloud detection algorithm through comparisons with CloudSat CPR and CALIPSO CALIOP products” by Benjamin Marchant et al.***

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Anonymous Referee 2:

General Comments:

Thanks a lot for your comments and suggestions. Regarding the fraction of clouds where MODIS found multilayer clouds while active sensors not, I totally agreed with you that it depends on how multilayer clouds are defined and there could be some underlying sensitivity to the multilayer tests to cloud vertical structure within single con-

C1

tiguous layers. This analysis is limited however to the definition of multilayer clouds used in MYD06 products (which assumes two separate cloud layers). But I agree that it could be very interesting to extend this analysis (in a future work since it is going to require a lot of data processing first) using 2B-CWC-RO and 2B-CWV-RVOD and a broader definition of multilayer clouds.

Note: To make this research reproducible, a Jupyter (python 3) Notebook has been created allowing to re-create all the figures of the paper and to download the data used: [https://www.science-emergence.com/Jupyter/MODIS\\_myd06\\_collection\\_6\\_multilayer\\_clouds\\_analysis/View/](https://www.science-emergence.com/Jupyter/MODIS_myd06_collection_6_multilayer_clouds_analysis/View/)

Answers:

â€” The ‘intent’ of the algorithm is touched on at line 59 and lines 97-99. The latter occurrence seems out of place and would fit better near line 59. In fact, the ‘intent’ should be articulated for other multilayer algorithms besides MODIS.

Content has been updated accordingly.

â€” Lines 77 and 79, references should have years added:

Years have been added.

â€” Line 95, section should be two, not three

Section number have been updated

â€” The discussion of figure 1 starting at line 138 is a little bit disjointed. I wasn’t sure if panel (b) should be the sum of panels (e) to (h), or whether multiple positive tests can occur in a single pixel. I’m pretty sure it’s the latter but it needs to be laid out clearer than is.

Yes, panel (b) is a combination of panels (e) to (h) (and each test does not have the same weight). So multiple positive tests can occur in a single pixel. Figure caption has been updated.

C2

â€” To be clear, the Pavolonis and Heidinger algorithm is available within the L2 products but not in the L3 products? If that is correct, why is that the case?

Yes, it is correct the Pavolonis and Heidinger multilayer cloud detection algorithm output is available in L2 (through the MYD06 multilayer cloud QA) but it is not used for aggregating the MYD06 cloud products available in L3, since preliminary analysis during MYD06 Collection 6 development have shown that this algorithm was flagging too much cloudy pixels as multilayer clouds (this issue has been addressed in the MYD06 Collection 6 User guide).

â€” line 212, (a) and (b) should appear before including and excluding, respectively

Done

â€” line 252, answer about

Done

â€” figures 4 and 7 appear to have problematic axes. The number spacing in both axes is not uniform. Perhaps there is a rounding issue at play or the axes need to have additional bins or tick marks.

Thanks for noticing that, the issue comes from the grid which was 9 by 9, instead of 10 by 10.

â€” Figures 8 to 11, would be helpful to make clearer in each column at the top that this is “liquid” and “ice”, or perhaps “liquid 2.1  $\mu\text{m}$ ”, “liquid 1.6  $\mu\text{m}$ ”, etc. The subpanel titles are pretty useless and could be included in the figure caption.

The subpanel titles have been removed and x-axis labels have been replaced by “liquid 2.1  $\mu\text{m}$ ”, “liquid 1.6  $\mu\text{m}$ ”, to make CER histograms easier to read.

â€” Furthermore, it would be easier to read the paper if cloud optical thickness reduced to the tau symbol or COT, and likewise with cloud effective radius could be  $r_e$  or CER

C3

Cloud effective radius and cloud optical thickness have been replaced by CER and COT respectively in the paper main content.

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C4