

## ***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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Thanks a lot for your comments. We updated the figures following your suggestions and hope it looks better now.

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/)

C1

- section III: It's not clear to me if there are some changes in the MODIS ML algorithm between C6 and C6.1 although it might be worth to explain somewhere briefly the differences between the 2 collections

MODIS MYD06 multilayer clouds algorithm is the same between C6 and C6.1. So C6.1 has been replaced by C6 only (since the conclusions of the paper should be valid for C6 and C6.1 as well).

- I240: About the ML clouds ice/ice identified as liquid by MODIS, do you have an idea why?

We believed that it might be due to the ice cloud effective radius tests (used in the MODIS MYD06 C6 cloud thermodynamic phase algorithm) which have been trained using monolayer clouds only according to CALIOP 01 and 05 cloud layer products.

- I322: In the end, would you recommend to keep this PH04 test for the MODIS ML algorithm?

Yes, since the PH04 test contains useful information that can still be used for instance to filter MODIS MYD06 cloud effective radius (which is the primary goal of the MODIS MYD06 ML algorithm: to detect ML that can impact the cloud optical retrievals).

- Description of Fig2: is the product shown on Fig2b an official product? You do not mention or describe it in the paper. Is the 3km distance a common threshold to identify different layers?

Figure 2b does not show an official product, it is quick visualization that has been created to illustrate the impact of choosing an separation distance threshold to define multilayer clouds.

- I37: ...layers may strongly... replace by can, we are sure the presence of ML clouds can impact the retrievals

Done

C2

- I49: I think the POLDER ML detection technique uses polarized reflectances but is not based on them.

Content has been updated

- I84-85: the sentence is not nice.

Content has been updated

- I107: and in the C6/C6.1

Done

- Globally: when you write  $0.94 \mu\text{m}$ , like I20, there should be a space between the number and the unit, in Latex there is something similar to half a space ( $\,$ , for me)

Done

- I123 to 125: not clear, do you mean : reflectances at  $0.65 \mu\text{m}$ ,  $1.6 \mu\text{m}$ ,  $1.38 \mu\text{m}$  as well as brightness temperatures at  $11 \mu\text{m}$  and  $12 \mu\text{m}$  and their differences?

Yes, content has been updated

- I128: ...)- $2.1 \mu\text{m}$ ... : not clear

Sentence has been changed

- I133-135: it seems a bit redundant with I104-105. I134: ...was intended... is it still a confidence level? maybe add a reference for this SDS

Done

- I160: ...to that applied... replace by ...to the one applied... ...rather than considering....

Done

- I180: ...we use a naive definition of multilayer clouds here... maybe say that, in a first step , we use a naive... Otherwise I find it confusing as you previously underlined the

C3

importance of this definition (I72-73)

Done

- I285: when you describe Fig8, say something about the liquid case.

Done

- I291: at effective radius around

Done

- I307: the sentence is not clear.

Sentence has been replaced

- I315-316: the sentence should be rewritten

Done

- I354: if replace by it

Done

- Figures General comments on the figures: please put the (a), (b)... labels out of the plots and check the subtitles. Very often you repeat several times something that could be put in the caption, and try to put explicit subtitles.

Done

- Also for the contingency tables, it would be useful to say somewhere that the numbers are percentages of a population.

Done, percentage % symbol has been added to each contingency table

- On several figures the labels for the x-axis are vertical, which is not convenient for the reader, could you try to put them horizontally?

The x-axis labels have been put horizontally now for figure 5 and 6.

C4

- Fig1: MODIS MYDO6 C6.1 2008 : no need to write this 8 times add some spaces between the plots, put bigger (a), (b)...

Done

- Fig2: caption: (b) the numbers ... found replace by identified ...of less than

Done

- Fig3: caption ...with (a) and without (b) the Pavolonis...

Done

- Fig4: P(MODIS...) is useless MODIS COT >0.4 can be put in the caption. caption : with (a) and without (b)

Done

- Fig8-9-10: I would do subplots: (a) MODIS C6 liquid, (b) MODIS C6 ice.

Subplot titles have been removed and x-labels simplified to make the figure easier to read.

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