

Review of the paper: Evaluation of the Aqua MODIS Collection 6.1 multilayer cloud detection algorithm through comparisons with CloudSat CPR and CALIOP products

1. General comments

This article evaluates the MODIS Collection C6.1 multilayer cloud detection algorithm through comparisons with CPR and CALIOP products.

This study is very interesting as it presents a thorough study of the MODIS ML algorithm performances. Indeed, it describes in details the importance of the cloud optical thickness, the vertical separation distance of the layers and the cloud thermodynamic phase for the identification of ML clouds as well as the consequences of those clouds on the MODIS retrievals.

Overall, I only have minor suggestions for the revision process.

2. Specific comments

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

l240: About the ML clouds ice/ice identified as liquid by MODIS, do you have an idea why?

l322: In the end, would you recommend to keep this PH04 test for the MODIS ML algorithm?

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?

3. Technical corrections

l37: ...layers **may** strongly... replace by can, we are sure the presence of ML clouds can impact the retrievals

l49: I think the POLDER ML detection technique uses polarized reflectances but is not based on them.

l84-85: the sentence is not nice.

l107: and **in** the C6/C6.1

Globally: when you write 0.94 μm , like l20, there should be a space between the number and the unit, in Latex there is something similar to half a space (μ , for me)

l123 to 125: not clear, do you mean : reflectances at 0.65 μm , 1.6 μm , 1.38 μm as well as brightness temperatures at 11 μm and 12 μm and their differences?

1128: ...)-2.1 μm ... : not clear

1133-135: it seems a bit redundant with 1104-105.

1134: ...was intended... is it still a confidence level?
maybe add a reference for this SDS

1160: ...to that applied... replace by ...to the one applied...
...rather than considering....

1180: ...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 importance of this definition (172-73)

1285: when you describe Fig8, say something about the liquid case.

1291: ~~at effective radius~~ around

1307: the sentence is not clear.

1315-316: the sentence should be rewritten

1354: if replace by it

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.

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

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?

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

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

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

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

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