Review of "Differences in cloud microphysical properties between MODIS Collections 5.1 and 6" by John Rausch et al.

The manuscript presents a needed comparison of the impact of algorithm updates for a widely used cloud remote sensing data set. It definitely deserves publication. In my opinion, a few important points can be improved nonetheless.

General comments:

I see three major points, I would like to see improved before publication.

1) The title raises expectations that differences in all cloud microphysical properties of the standard MODIS products would be discussed. However, the paper focuses on the CDNC/ cloud number droplet concentration which is not a part of the MODIS standard product itself. Optical thickness, water path ... and ice microphysical parameters are not mentioned at all. Please either extend the discussion/comparison towards a more general comparison (preferred) or choose a more specific title.

2) Throughout large parts of the manuscript, the explanation of presented details and reasons for the seen differences is too short to be understood without extensive reading of further literature. This should be extended wherever needed (see specific comments).

3) Language is sometimes sloppy. Sentences are sometimes contructed in a complicated way. Technical slang is used. Should be improved.

Specific comments:

Page 1, lines 16+17: sloppy unprecise language in several places, technical slang: "Channel pairs" cannot be "retrieved" and are hardly "successful". Should be a "retrieval based on channel pairs" and a "retrieval which is successful". Other places P5, l14: "retrievals exist for all three effective radii retrievals" or P5, l15: "primary advantage of this ... is a comparison"

P1, l19: Maybe mention other MYD06 differences before talking about derived quantities? What about COT? LWP? Cloud mask?

P1, l25: I'm missing a short outline of reasons for the differences in the abstract.

P2, l19: What means "nearly identical"? Can you say that in a few words, that readers don't have to look into the literature mentioned.

P3, l 20: Menzel and Baum papers certainly do not contain C6 change description. The sentence sounds like they would. Pleaser reword.

P4, l1: Is this chapter completely taken from literature? Please make that clear and tell the reader whether this is a standard MODIS cloud product from the official data sets or a matter of post-processing.

P5, l14: Sentence is hardly readable as it is split by the >"independent of vertical stratification" ... By the way, did you talk about this stratification before? Otherwise it only confuses the reader. If it's important here, you have to spend another sentence on it.

P5, L19: That means, you only compare all pixels for which retrieval exist in both collections for the same phase and for all three combinations. The way you say it is slightly confusing. Please say this in a simpler way.

P5, l20 Tell us the specific difference you show: C6-C5.1 or C5.1-C6? You could insert "for the common pixels" after "droplet effective radius".

P6, l10: Tell the reader why re3.7 is considered the most appropriate retrieval?

P6, l25: What is "tau"? Did you introduce the symbol before?

P7: Please clarify the whole first paragraph. It is not clear where changes and numbers for them should come from in several places:

1. P7, l1: It is not clear why reff is lowered? Does the surface get darker on average? Then the lookup table would get darker. Bright measurements would be related to more reflective smaller particles. The sun glint, on the other hand, would cause a brighter surface and reverse effect. Am I wrong? Where does the value "1 mu" come from? Literature? Tests? Guessing? Please clarify.

2. P7, l4: Does the re-registration cause any systematic effects? How? Please clarify.

3. P7, l6: Of what nature where the updates to the CTP algorithm? A 100 hPa change for stratocumulus decks would mean more than 1000 m change in height. Are you sure? Is this for the same pixel population? That must strongly affect the CDNC values towards smaller values, but this emphasis on stratocumulus regions is not striking. Please explain in more detail.

4. I guess a lower cloud means more absorption. That means cloud of otherwise unchanged properties will appear darker in NIR in the LUT. Looking up a measurement of given reflectivity in such a table would indeed lead to lower Reff, but for other reasons as you formulated.

P7, l17: Why don't you show such a case study? A small 4 panel display of effects of CTP change, F0 change, emission and total result could illustrate everything. This way the explanation is once more a bit too short and the reader has to accept your explanation without any supporting data.

P7, l20: The way you aggregate the individual data points I cannot see any additional source of difference. Please explain.

P8, l10: "However, in the subtropical subsidence regions, the decrease is near 4%." Why do you use "however"? I do not see a contradiction here? Please clarify.

P9, l7: Why is it better to exclude the more problematic or different cases, if 1.6 or 2.1 fails and 3.7 worked than the other way round? Please explain.

P9, l18: "Biomass season". Do you mean the "biomass burning season"?

P10, l14: There are no statements about optical thickness differences in this manuscript? I'm missing something about it. And about ice properties.

P10, l22: Sentence "N3.7 differences … uniform." Two points: 1) Can you say in which N3.7 differences are more subtle in simple words? 2) The sentence does not seem to be a sentence. Please check.

P11, l3 and last paragraph: You have to draw some conclusions for yourself? It could be something like: further analysis is needed. Please tell the reader. The last sentences are very vague. Can you be a little more specific about new dangers and new posibillities?

Figure 1: Total of what? Is this for liquid phase clouds only? Is this valid Re3.7? Is this valid CTP retrievals? Pleases tell us.

Figure 2: Does that means that the vertical Reff profile as probed by the three retrievals steepened by 5 mu? Can you comment in the text?

Figure 4: What happens in regions with increasing CTP and decreasing CTT? How can that happen at the same time. Please comment in the main text.

Figure 5: You could maybe skip this figure and discussion in the text. It does not contribute any additional understanding as the independent comparison is, as you correctly state, highly depending on the selected population of pixels. In addition these are mostly problematic pixels, as you also mention, because retrievals failed for one or more channel combinations.

Technical corrections:

P.2, l. 3: Typo "though" -->through

P2, l23: The sentence starting "As there is a considerable …" does not make sense. Please correct.

P5, l14: "radii retrievals" --> "radius retrievals"

Figure 2 caption: Technical slang … Please replace "products for a) 1.6 mu" by "products using a) 1.6 mu".

Figure 2-5: Plot titles should be integrated in the caption text and removed.