Atmos. Chem. Phys. Discuss., 9, S2043–S2046, 2009
www.atmos-chem-phys-discuss.net/9/S2043/2009/


Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Cloud-type dependencies of MODIS and AMSR-E liquid water path differences" *by* M. de la Torre Juárez et al.

**M. de la Torre Juárez et al.**

Received and published: 8 May 2009

Response to reviewer # 3

Thanks for the promptness and for taking the time to go through our manuscript. We hope to address with the revisions and this response the major concerns expressed by the reviewer. Our responses refer to changes made in the revised manuscript by giving page_nr:lines..

## *Interactive comment on* "Cloud-type dependencies of MODIS and AMSR-E liquid water path differences" by M. de la Torre

# Juárez et al.

**Anonymous Referee #3**

**Received and published: 18 February 2009**

**This paper seeks to expand on previously-noted discrepancies in retrievals of cloud liquid water path by satellite vis-nir and microwave techniques. The problem is an interesting one, as by now several authors have noticed differences even for cloud types best fitting retrieval assumptions, but no convincing explanation has yet been provided. Thus, this manuscript fulfills a useful function in maintaining attention on this issue. I was disappointed by the manuscript, however. Although the manuscript expands upon the cloud types and cloud conditions examined, it does not provide further light on the causes of afore-noted differences.**

The authors have collectively intercompared a variety of geophysical parameters from approximately ten satellite and in situ observing systems, leading to about thirty peer-reviewed papers. In our experience, even retrieval experts have limited understanding of the strengths and weakness of the data sets they are making publicly available. This experience inspired us to write proposals to do the kind of work described in this study; the success of those proposals in turn led to this manuscript. As in earlier studies, we asked some basic questions. Where do the two data sets agree? How correctly do quality flags reflect that agreement? Are there other internal measures of retrieval effectiveness? What geophysical conditions lead to poorer agreement? In an optimally constructed retrieval algorithm, the data set would self-consistently indicate the shortcomings of the methodology listed by the reviewer. Thus, our fundamental goal was to gain insight into the physical representativeness of the reported data. So, while we have access to the analytical tools needed to assess the retrieval algorithm, we deliberately chose to answer the questions just posed.



**ACPD**

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Interactive Comment



Underpinning all these other questions was the most fundamental one: could we create a global climatology using these publicly available data sets? Note that the current literature hardly addresses this last question. Almost all the studies cited have examined one cloud regime: warm, low clouds mostly west of the subtropical continents. There was a clear need to assess other geophysical regimes and other areas. For example, we examined ice flags because of the high scientific importance of mixed-phase clouds, and because of the prevalence of cirrus ice over shallow cumulus. Similar issues motivated the entire study.

That said, it is entirely our responsibility to make clear our viewpoint. The reviewer remark shows that we failed to do so in the submitted version of the manuscript. To address that shortcoming we made the following changes:

- Added the previous statement at the introduction in p3:76–80.
- Added one sentence in lines 3–4 of the abstract: "The study addresses the differences in LWP climatologies emerging from the datasets that have been made publicly available."
- Added one sentence in lines 329–333 of the Summary and Conclusions: "The objective is to asses a wide range of geophysical regimes and areas. Specific retrieval approaches to reduce the differences are outside the scope of this work, causes for the differences are diverse and require testing of the retrieval algorithms at levels within the competence of the retrieval teams. The classification of the differences by cloud type provide hints on what cloud scenes are more appropriate to study different cloud processes with each instrument."

**Indeed, it may further confuse the search for the underlying cause by including ice clouds, to which microwave radiation mostly transparent or scattered, while visible-nir radiation is notably influenced by the presence of ice.**

Ice clouds are used only in the first column of table 3 and one histogram in figure 1a. Otherwise, only cloud scenes with over 90% liquid clouds are used. This is explained in p5:119–120. The insensitivity of AMSR-E retrievals to ice pointed out by the reviewer



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is mentioned also in that page as the justification for our requirement of >90% liquid clouds.

**I urge the authors to refine their focus, and search for the reason for why MODIS LWPs>microwave LWPs for thin, warm, overcast clouds.**

We found that focusing on such clouds would hardly add to the careful works of Bennartz, Hovarth, Greenwald and others. We tried thus to address a wider range of situations. As a consequence, these sets of clouds are a subset of our study. Their comparisons are shown in the red line of the histogram in fig. 2a, and are captured in a subregion of the clouds discussed in figures 9.

**My initial evaluation of this manuscript is to recommend rejection, reasoning that the manuscript does not provide additional insight to the studies of Horvath and co-authors, and Bennartz and co-authors. My hope is that the manuscript authors, through the more interactive mechanism of this forum, can instead revise the manuscript substantially. If not achievable by the end of the discussion period, I will recommend rejection.**

We agree that the paper does not provide additional insights into the details of the retrievals algorithms but it instead provides greater insight into the available data themselves, over a broader range of conditions than what has been addressed in earlier studies. We ask the reviewer to reconsider this recommendation.

Our study is made to understand the differences that a climatology of LWP would have when using one satellite versus the other. The RSS and MODIS teams are in best position to identify retrieval improvements based on the symptoms identified in this work, but we also noticed that there are teams working on climatologies from MODIS and AMSR-E data who benefit from understanding the possible sources of differences.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 3367, 2009.