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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Fast cloud parameter retrievals of MIPAS/Envisat" *by* R. Spang et al.

Anonymous Referee #1

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This paper is a potentially important contribution, although I wonder by how much it differs from previous work, especially that by Hurley et al. (2011). The most important new contribution is probably the introduction of the area density path (ADP, the equivalent of optical thickness for nadir-viewing instruments in the horizontal dimension). I also think that, given the content and scope of the paper, it would have been more appropriate for submission to AMT, since it is mainly focused on the new algorithm and comparison with other instruments (i.e., validation of the algorithm). In general, the manuscript is not very well written and organized. In addition to quite a few Grammar/English issues, it is sometimes unclear what this paper is really about. I give a few examples:

After reading the abstract and introduction, it appears that MIPclouds will add cloud-retrieval capabilities to the MIPAS mission which so far has not provided cloud and aerosol information in their level 2 products. This would be a very important contribu-

tion, but later we learn that Hurley et al. (2011), and earlier work by the first author of this paper have already published about this.

The introduction also promises the introduction of a robust cloud detection threshold. If I understood correctly, this is one of the utilities of the newly introduced ADP. The detection threshold is introduced in terms of ADP. However, while I suspect that this is more or less the reasoning of the authors, I don't see this clearly stated anywhere. The ADP may also be used in cross-platform sensitivity comparisons, although the "translation" to nadir-viewing sensitivities is not well (or not at all) described.

While I indicated "minor revisions" above, I think that quite a bit of work (between "minor" and "major") will be necessary to make the manuscript flow better. When revising the manuscript, I would also strongly revise to shorten it, i.e., removing unnecessary sections that don't contribute to the main core of the paper, while extending/adding sections that do help the core statements.

Major comments: * The 3D aspect, stressed various times in this paper, should be more clearly demonstrated by showing some of the 3D/2D cloud fields that were used as input in, e.g., the blind tests. Were the input fields as shown in Figure 7 used by SHDOM which calculated the radiance spectra, which then formed the basis for the blind test?

* Describe the outcome of the blind test in terms of 3D variability. In the abstract and introduction, the promise is given that ADP will address these problems, and that is good, but has to be shown with examples (see comment above).

* Figure 2: I think this Figure shows a very interesting result that should be further discussed. While the bi-modality of thick/thin clouds is mentioned, the implications are not. To my knowledge, this bi-modality has never been discovered in climatologies based on nadir-viewing instruments. Discussing this in more detail could be one added science aspect of this paper. In the caption, "number density" should be renamed to "probability density", the same on page 33022,l18.

* Figure 4: The meaning of the confidence classes "disputable", "likely" is not defined. Explain. Also, add "The" before "Bottom figure" in the caption.

* Figure 9, and discussion around it. Explain better what was actually done here. Were ECMWF fields used as input to radiative transfer calculations in the context of a blind comparison? Is there a "true" ADP that the reader can compare to? Otherwise, I see no point in figures 9 or 10.

* The same is true for Figure 8; while the "truth" (i.e., IWC) is given in Figure 7, the outcome in terms of ADP cannot be compared to any truth unless ADP is directly derived from the input fields, circumventing the algorithm, and *then* retrieved by the algorithm, unless I am missing something here.

* In the interest of making the manuscript easier to digest, I recommend removing Figure 20 and 21, and

* What is a "naive" Bayes scheme? (p33030,l10)

* p33038,l5-7: Unclear

* p33038,l21, and following lines. Use more accurate language than saying "FOV case". What is meant is that unlike in the other calculation, the FOV is taken into account in these blind test. Unclear what the next lines convey.

* The discussion of the threshold on p33039,l12 is only qualitative and should be made quantitative.

* p33039,l23 and following. Explain what the percentages refer to: Likelihood, fraction of retrieved spectra?

* Structural comment: For example, at the end of section 5.1.1 one would expect the presentation of data and plots, the same is true after 5.1.2 and 5.1.3. Instead, this is delayed until later when a confusing amount of plots is presented. This could be restructured by showing the data earlier, here in these sections where they belong.

* p33046,l6-8: Why can subvisible and opaque clouds not be separated by MIPAS? After all, they should be at opposite ends of the ADP range!

* Table 4 - These results are discussed as "good" agreement. I think table 4 needs to be better explained in general. To the untrained eye, it appears that not only the table reveals substantial differences between the MIPAS techniques, but also substantial differences when applying the technique to different data (sets). This is an important table that needs to be interpreted much better.

* Summary: Quantify "excellent" correspondence with other instruments. Table 4 makes the reader think otherwise.

Minor comments/technical corrections:

p33022,l26: "pure trace gas variability" –> "trace gas variability only" p33024,l20: "cloud is present" –> "a cloud is present" p33029,l25: remove "fully" p33030,l10: "the naive Bayes..." –>"a naive Bayes..."? p33032,l10: Insert "for" after "example" p33043,l3: "is" –> "are" p33043,l3-12: The entire section about GLAS needs to be in past tense. p33046,ll9: "kind of summary" is slang / colloquial and should be avoided p33048,l6: "shows up a cloud and the other does not" – revise English p33048,l11: "MIPAS detects cloud in 39% of the evens a cloud" – unclear what that means - revise. p33049,l26: Add "the" before "macro"

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 33013, 2011.