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Atmospheric Measurement Techniques Discussions

Interactive comment on "APOLLO_NG – a probabilistic interpretation of the APOLLO legacy for AVHRR heritage channels" *by* L. Klüser et al.

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We thank the reviewer for his/her detailed reasoning of why he/she does not recommend publication in the current form. Additionally motivated from the comments of the anonymous Referee #3 - which in parts aim in the same direction as those one presented by Referee #1 - we nevertheless would ask the referee for his/her approval to guide us through a review process with this manuscript.

We acknowledge that the manuscript requires language work in many places. When we are given the possibility of submitting a revised manuscript we will carefully consider

the language issues brought up by the referee.

In a revised manuscript we will also more clearly elaborate the close relation to the traditional APOLLO method and add more detailed descriptions for readers not familiar with the previous APOLLO papers. This detailed description of the traditional APOLLO approach and the applications of APOLLO for several purposes such as aerosol remote sensing and solar energy mapping will also highlight the justification of the algorithmic changes. We hope that by the examples from use cases of the traditional scheme together with theoretical justification of the newly introduced methods the intention of the changes will become clear. Moreover we think that these examples together with examples of how the new scheme really works (for example figures of the probabilities of the different tests and how they feed into the overall cloud probability) will increase the reader's understanding of the capabilities of the improved APOLLO_NG and will be convincing that these new capabilities represent real improvements. We will present requirements from state-of-the-art applications that more flexibility in cloud detection would be a benefit compared to static schemes such as the traditional APOLLO. These applications include aerosol remote sensing and solar energy mapping.

Below we would take the opportunity to also reply to the more specific comments of Referee #1 as well:

4415, L15: We thank the referee for detecting our reference to the wrong Holzer-Popp et al. paper. The one which should be referenced here should be Holzer-Popp et al. (2008) in ACP.

4415, L18: We will widely enhance the reference to the use of APOLLO and APOLLO_NG in the field of solar energy applications and will also come up with a couple of additional references for that.

4416, L5: The referee is correct in his/her understanding that we focus on the AVHRR heritage channels for being able to use a consistent method for a wide range of sensors. We fully acknowledge that the results nevertheless will not be consistent, for

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example due to differing channels or channel widths. Strictly speaking this is also true for within the AVHRR family, as the channels also varied for AVHRR/1, AVHRR/2 and AVHRR/3. We will address this issue and will explain our intention to use the same algorithm design consistently for a couple of sensors..

4417, L15-27: 1. We thank the referee for the examples of using distance as probability estimate. 2. We agree with the referee that a threshold alone is not a probability and that it can be interpreted as consistence confidence. We will describe in more detail the interpretation of the traditional thresholds in our approach in the revised manuscript. 3. We thank the referee for this clarification. Fig. 2: We see the point of the referee. We also understand (and acknowledge) that the five tests require some representation in the figure aside from the general algorithmic flow. We will rework Fig. 2 for the revision of the manuscript.

4421, L18: 1. We agree with the referee and will change the term accordingly throughout the manuscript. 2. We will follow the suggestion of the referee. 3. We agree that there is low physical meaning behind the information content. It is just a mathematical way to describe how much the different cloud tests agree or not. As we update our cloud probability after each test, we cannot just add the probabilities of the different tests to see the agreement. That is one clear difference to the traditional APOLLO scheme. We could also change the name of variable H_inf in order to make this clearer. We will give a more comprehensive explanation of what H_inf means in the revised manuscript.

Sec. 2.2: We thank the reviewer for his/her detailed expression of concern and will include a passage that we mainly use this approach because it is straightforward and easy to implement, but that there are limits in accuracy of cloud representation.

Sec. 2.2: We see the referee's point that the five tests do not refer to the same features of a cloud (or in the referee's words, the same types of clouds). Consequently we can understand the argument that the Bayesian processing seems inappropriate at first

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sight. But on the other hand our (newly to be introduced) examples of applications in remote sensing show that some current applications require more flexibility that saying "a pixel is a cloud" or not. And here the Bayesian processing comes into play, when we interpret x in a slightly different way, such as "the pixel shows definitely a cloud exhibiting all features tested by the scheme". That would be a bright cold cloud with low coherence and having a cirrus top (also broadly speaking). Of course we fully acknowledge that most clouds to be observed do not exhibit all these properties. That is also the reason, why in the end a pixel is not flagged cloudy at anything >50% but already with probabilities as low as 25%. Such approach provides the flexibility required by the applications we will introduce as mentioned above. We will significantly expand the explanation of this view of cloud probability in this section. Eq. (6): We understand the referee's confusion and will add the required explanation.

Sec. 2.3: We agree with the referee and will reproduce the respective tables in the revised manuscript. We hope that then also eq. (6) will become more comprehensible.

4423, L19: The choice is a bit arbitrary. We will add an explanation in the revised manuscript.

4424, L16: We thank the referee for this suggestion which we will follow.

Sec. 2.3.5: Indeed the T45 technique is kept unaltered from Kriebel et al. (2003), which we will make clear in the revised manuscript.

4427, L9: We thank the referee for detecting the missing v.

4430, L4: The referee is absolutely correct; we will refer to "large errors" here.

4432, L15: We will follow the suggestion of the reviewer.

4433, L13-14: We will correct this mistake in the revised manuscript.

4436, L1: Together with the above referred examples from applications we will show a different version of Fig. 1 in the revised manuscript. This will indicate the flexibility of

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the APOLO_NG scheme based on the user's needs and requirements.

4436, L22-24: As above, we agree and will change the word.

4436, L28: We agree with the referee and will rephrase the full paragraph, also accounting for concerns mentioned above and by other referees. We thank the referee for his/her comments with respect to the grammar and will work on the manuscript language as already announced above.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 4413, 2015.