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Discussions

Interactive comment on "Detailed characterisation of AVHRR global cloud detection performance of the CM SAF CLARA-A2 climate data record based on CALIPSO-CALIOP cloud information" *by* Karl-Göran Karlsson and Nina Håkansson

Anonymous Referee #2

Received and published: 14 November 2017

General comments

The paper presents an unprecedented evaluation of satellite-based cloud climatology (CMSAF's CLARA-A2) against CALIPSO/CALIOP performed at the global scale. Despite some limitations of CALIOP dataset discussed in the paper, it is the only currently considerable reference for cloud retrievals covering oceans, polar regions and other areas of very sparse cloud observations and measurements. Such evaluation has become possible with the sufficiently long CALIOP dataset. The authors also present an analysis of the CLARA-A2 cloud detection sensitivity, i.e. the threshold in the cloud

optical thickness (COT) above which the cloud detection algorithm detects more than 50% of clouds. Screening the CALIOP data with COT below the globally-averaged detection sensitivity allows for "more realistic" evaluation, i.e. taking into account the difference between the sensitivity of CALIOP (active sensor) and AVHRR (passive sensor). Therefore, the paper will be an important first step towards proposing described validation methodology for the list of standard validation activities performed before releases of new cloud climate data records.

While the content of the paper is novel, valuable and appropriate for the publication in AMT, the paper structure should be significantly improved. Finally, the paper has some grammar and language issues, which should be addressed. They are mostly related to the syntax, i.e. sentence length and inappropriate word order. Some examples are indicated in the following, but the whole manuscript should be revised.

Specific comments

(1) The title of the paper is a bit misleading. "Detailed characterization" suggests that the evaluation of the CDR is more detailed than the standard one, e.g. provided in CLARA-A2 validation report. However, the collocations of AVHRR and CALIOP are limited to NOAA-18 and NOAA -19, afternoon orbits and 10-year period only (from 30y+ of the CDR). Taking into account that one of the challenges in deriving CDR is stable performance in time, the evaluation presented in the manuscript cannot serve as an evaluation of CLARA-A2 CDR.

(2) Objectives of the study should be described better in the Introduction. In relation to (1), it should be clear if the aim is to present new methodology using a subset of CLARA-A2 as a a example or to evaluate CLARA-A2.

(3) The current discussion section is a mix of discussion remarks and conclusions. I recommend to separate the two. In the results' section, there are also interpretations, which are hypothetical (they often start with "we believe", "we claim") and should be moved to the discussion. Otherwise it is often difficult to judge which statements are

really supported by the results achieved in this study.

(4) The analysis of detection sensitivity reveals some interesting non-expected results. One is that CLARA performance is not better at dark and warm ocean surfaces (L374-375). The hypothesis this is due to sampling and geometry of AVHRR and CALIOP FOVs needs more explanation. The problem was detected here, because it leads to unexpected results. However, how to measure a possible effect of this issue on results in other situations, regions, etc.? I would consider a separate section (or paragraph) in the discussion.

(5) Is the cloud detection sensitivity a measure of CDR performance itself? There is no discussion if 0.225 signifies good or bad CLARA performance. One can imagine the same analysis (i.e. evaluation against screened CALIOP data), but with the estimated cloud detection sensitivity of, say, 0.5. Please elaborate on that. In addition, since the authors recommend the methodology to be widely used (e.g. in CFMIP), more detailed guidelines would be appreciated. For instance, when applied to different passive-sensor-based CDRs, should the cloud detection sensitivity be always recalculated?

L50, "be very accurate to be able.." - please be more specific, e.g. referring to GCOS recommendations

L82, "FOV resolution" - field of view does not have a resolution, I would keep FOV and remove 'resolution' (or 'size' in other places in the manuscript)

L92, 'various parameters retrieval' - be more precise

L117-119, "Thus CALIOP products..." - please provide a reference for this statement

L126-127, "...claiming that useful...seems to be available" - based on which results?

L140-L145, If these improvements are relevant for the study, please explain them better

L150, "..how thin or thick..." - do you mean optically, in height?

C3

L151, "The second aspect..." - something is wrong with the syntax, please rephrase

L192, The investigation if the method used by Karlsson and Johansson (2013) is still applicable to the new CLAY version should be listed as one of the paper objectives (i.e. already in the introduction). The results (L206-223) should be moved from this paragraph to the Section 4.

L249, why 'CLARA-A2 cloud masks', i.e. in plural?

L250, "This approximation is acceptable.." - provide a reference

L288, Why 50% is an appropriate threshold for the cloud detection probability?

L326, "..but we still believe..." - what if the authors are wrong?

L328 and L349, Please consider giving different section names. These two are not very informative.

L369, "This contributes..." - it's not clear what is meant. Please rephrase.

L361-404 – It would be easier to follow the text divided in paragraphs

L381, "We first conclude..." - is it based on actual results or it is a hypothesis?

L406-407, Wrong syntax, please rephrase

L407, "...is undoubtedly a clear improvement", please explain why?

L436-438, Please explain better, preferably in a separate paragraph in the Discussion

Figure 11, it would be useful to have a different color scale (e.g. as in previous figures), with a shift between colours at 0.225. Otherwise it is difficult to see the 'edge' at 0.225

Figure 12, it would be useful to add FAR or KSS here. POD alone does not reveal the true performance of the cloud detection, as it gives no information about false alarms.

Technical corrections

many times in the manuscript, use a lower case after using a colon in the sentence

L11, should be "sensitivity of the detection"

L14, results of? Please rephrase.

L16, "portions" looks weird in this context

L23, use elevation or altitude instead of "highest"

L66, remove "

L132, 70 N/S

L200, remove second "be"

L230, should be 'where' not 'were'

L237, give colon after 'namely'

L317, "...a minimum of the number or matchups" should be "a minimum number of matchups"

L371, should be "Kuipers score"

L570, incorrect order of references

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-307, 2017.