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Interactive comment on "A 10-year climatology of globally distributed ice cloud properties inferred from the CALIPSO observations" *by* Honglin Pan et al.

Anonymous Referee #3

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Review of the Paper "A 10–year climatology of globally distributed ice cloud properties inferred from the CALIPSO observations" by H. Pan et al.

General comments This paper analyzes a 10 year climatology of the spatial and temporal distributions of ice cloud fraction, ice water content, and ice cloud optical depth for sub-visual, thin, and opaque clouds, based upon the newly released CALIPSO level 3 data files. Due to the concerns expressed in the Specific comments section of this review, the paper falls in the "Good" category. Revision is necessary prior to publication. Specific comments Though the calculations are useful, I do not know a) How the calculations compare to previous published calculations, and b) What is "new and innovative"

in the results presented in the paper. For these two reasons, the paper is problematic. The authors need to address these issues prior to acceptance of the paper. In the Introduction (line 92, page 4) the authors state that previous studies (6 studies, see lines 89-90) "are not sufficient". Why are those papers "not sufficient"? What does the current paper achieve that was not achieved by previous papers? Please answer these questions without stating an unsubstantiated negative value judgement. In the Summary and Conclusions section, there are no references to the previous literature. What are the commonalities (and differences) between the current calculations and the previous literature? Add a paragraph or two, with references, to address this concern in the Summary and Conclusions section. Technical comments Abstract, line 42: Change to "The latitude-and-altitude mean distributions of ICF and IWC were found to be unimodal in all seasons". I am not sure what unimodal refers to, either on line 42 or later in the text at lines 206 and 242. Please clarify. See comments below on lines 206-209. The use of the phrase "On the other hand" is confusing, since it is commonly used to make a contrast, and the sentence if it is used in (line 42) does not make a contrast to the previous sentence. Though the English in the text is generally good, there are several lines in the text which should be revised: Line 47, page 2: change "strong convective activities" to "strong convective activity" This comment also applies to lines 192 and 213. Line 111, page 5: change to the "A-train" constellation of satellites Line 131-136, page 6: change to The Level 1 CALIOP data file contains 532 nm parallel-polarized and 532 nm perpendicular-polarized attenuated backscatter coefficients. The attenuated backscatter coefficient at 1064 nm is also used to produce the level 2 data file products, given the CALIOP measurements and several algorithms.

In equation 2, line 165, on page 8: Why is the summation from 43 to 19 (with 43 below the $\sum$ symbol, instead of 19 to 43 with the 19 under the $\sum$ symbol?) Line 167, page 8 : What are the numerical ranges of $IWCB$ and $IWCH$? Line 189, page 9 : change to storm activity Lines 206 − 209, page 10 : change to coverage of ICF generally exhibited a vertical profile with a single peak independent tropical tropopause altitude, followed by a peak decreasing in altitude steadily towards both the SH and NH polar reg "Why are the nighttime ICF larger than the daytime values?" Though there is discussion later in the text (lines 248 and 373), it wou

change to asymmetrical distributions. For Figure 1, page 31, the color scale goes up to 0.5, while the data is mainly from 0 to 0.3. The
Use the same g/m3 units in the text as in Figure 5. Line 235, page 11 :
I did not understand what the "spike−shaped structure" refers to. From previous CALIPSO papers, this structure is likely iden
band lidar backscatter feature, or something else?) Line 238 − 240, page 11 :
The sentence is not clear. Please revise. The term "we excluded the maximum" is not clear. Line 328, page 15 :
change to during night compared to day. In Figure 8 (page 37), it may be better to graph 100 (#nightobservations
−#dayobservations)/#nightobservations instead of #nightobservations −
#dayobservations. Line 387, page 18 : The phrase "the values of these parameters were obtained from the CALIPSO platform"
389, page 18 : change to Fig. 9 shows the 10−year global contour density plots of nighttime and daytime IWC, RH, and TE. Line 44
446, page 20 : Rephrase. See comment on lines 206−209. Table 3. The numbers are too small. Expand the table into two parts to incr

1. Does the paper address relevant scientific questions within the scope of ACP? yes
2. Does the paper present novel concepts, ideas, tools, or data? No (the calculations
are similar to those in many previous studies) 3. Are substantial conclusions reached?
No 4. Are the scientific methods and assumptions valid and clearly outlined? Yes 5.
Are the results sufficient to support the interpretations and conclusions? There are few
interpretations and few conclusions that are new. 6. Is the description of experiments
and calculations sufficiently complete and precise to allow their reproduction by
fellow scientists (traceability of results)? Yes 7. Do the authors give proper credit
to related work and clearly indicate their own new/original contribution? No (this is
a major concern) 8. Does the title clearly reflect the contents of the paper? Yes 9.
Does the abstract provide a concise and complete summary? Yes 10. Is the overall
presentation well structured and clear? Yes 11. Is the language fluent and precise?
There are several places in the text where the English could be improved. 12. Are
mathematical formulae, symbols, abbreviations, and units correctly defined and used?
Mostly yes (the bounds of the sigma summation are odd) 13. Should any parts of the
paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated?
There are several places where clarifications are needed, and the fonts of Table 3
are too small. 14. Are the number and quality of references appropriate? Suggested
additional paragraphs will introduce more references. Is the amount and quality of

supplementary material appropriate? Not relevant here.

Please also note the supplement to this comment:
https://www.atmos-chem-phys-discuss.net/acp-2019-1116/acp-2019-1116-RC2-supplement.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-1116, 2020.