

Interactive comment on “Analysis of Global Three-Dimensional Aerosol Structure with Spectral Radiance Matching” by Dong Liu et al.

Anonymous Referee #1

Received and published: 26 September 2019

The authors present a method that expands the aerosol vertical profiles retrieved with nadir-pointing lidars to locations away from the lidar's nadir track that is based on matching radiances with a colocated imaging multispectral radiometer. The method, which includes a self contained ability to test the reliability of the profiles constructed off the track, is tested using CALIPSO and MODIS data. Finally, a case study is performed, that presents scientific results.

Overall, I believe the manuscript is generally well written and contributes a useful and potentially important scientific tool although there are several minor, mostly grammatical errors, that I have listed. I therefore, recommend that it be considered for publication after minor revisions.

C1

Issues throughout the paper:

- In some cases there is a space between a value and the unit km and in some cases there is no space. Using a space is preferred but in any case it should be consistent.
- Use of LaTeX ‘-’ vs ‘-’ (two minus signs) is not used properly in some places.
- Equations before ‘where’ should have commas after them.
- There are cases of Table.X and Figure.X which obviously should not have a period. There are also cases of Fig.X and Tab.X that don't have a space after the period which they should have.
- In table captions the period is missing after the table number.
- Maybe use ‘lon’ instead of ‘long’ to be consistent with the 3 letter use of ‘lat’.
- In almost all cases of parenthetical cites with more than one cite there is no space after the semicolon. There should be.
- In the table titles, except for the ‘Table X.’ the rest of the caption should not be bold.
- Please indicate the processing versions of the CALIPSO and MODIS products.

Comments with a particular location:

- **Page 1, Line 28:** The cite uses [] when it should use ().
- **Page 2, Line 5:** The reference used here is rather old and is cloud specific. What about Levy et al. (2013).

C2

- **Page 4, Line 5:** The MODIS radiances are also provided at 250 m (bands 1–2) and 500 m bands (1–7) and I am pretty sure these are used for the official aerosol product.
- **Page 4, Line 6:** Again the the references here could be better and more up-to-date. Consider using Levy et al. (2013) and Platnick et al. (2017).
- **Page 4, Line 26:** The operators and brackets should not be italicised.
- **Page 4, Eq 1:** Use italics (math mode) for variables $F(i,j;m) \rightarrow F(i, j; m)$.
- **Page 4, Eq 1:** In the summation notation the lower variable is an index. The upper variable should be the upper value of the index. In this case both are the same variable.
- **Page 4, Line 30:** $K = 4$? Related to previous comment.
- **Page 4, Line 31:** I think I understand why these bands are chosen but maybe have a bit of explanation.
- **Page 5, Eq 2:** Use italics (math mode) for variables $D(i,j;m) \rightarrow D(i, j; m)$.
- **Page 5, Line 9:** The asterisk in $(m^*, 0)$ is weird.
- **Page 5, Line 12:** ‘of construction’ \rightarrow ‘of the construction’.
- **Page 6, Eq 5:** Inconsistent use of italics. MR should not be italicized (use MR) and N should be italicized. Note other usages of MR below.
- **Page 6, Line 30:** ‘km AGL’ \rightarrow ‘km above AGL’.
- **Page 7, Line 15:** ‘donors meets’ \rightarrow ‘donors that meet’.
- **Page 7, Line 18:** ‘air column’ \rightarrow ‘air columns’.

C3

- **Page 7, Line 19:** ‘air column’ \rightarrow ‘air columns’.
- **Page 7, Line 29:** ‘This is resulted’ \rightarrow ‘This results’.
- **Page 7, Line 29:** ‘of TBM’ \rightarrow ‘of the TBM’.
- **Page 7, Line 32:** ‘by total’ \rightarrow ‘by the total’.
- **Page 7, Line 33:** ‘in reconstructed’ \rightarrow ‘in the reconstructed’.
- **Page 8, Line 1:** ‘in reconstructed’ \rightarrow ‘in the reconstructed’.
- **Page 8, Line 11:** Use LaTeX \times instead of ‘x’.
- **Page 8, Line 16:** ‘In reality, this’ \rightarrow ‘This’.
- **Page 8, Line 29:** Use LaTeX \times instead of ‘x’.
- **Page 8, Line 30:** ‘surrounding Bohai’ \rightarrow ‘surrounding the Bohai’.
- **Page 9, Line 13:** ‘heating. Average’ \rightarrow ‘heating. The average’.
- **Page 9, Line 16:** ‘C, average’ \rightarrow ‘C, the average’.
- **Page 9, Line 20:** ‘AOD, especially’ \rightarrow ‘AOD, with especially’.
- **Page 9, Line 26:** ‘with CALIPSO’ \rightarrow ‘with the CALIPSO’.
- **Page 9, Line 27:** ‘hour of’ \rightarrow ‘hours of’.
- **Page 9, Line 27:** ‘using 10’ \rightarrow ‘using the 10’.
- **Page 9, Line 31:** ‘have larger’ \rightarrow ‘have a larger’.
- **Page 10, Line 9:** ‘to alter our’ \rightarrow ‘to improve our’.

C4

- **Page 10, Line 10:** 'for study' → 'for the study'.
- **Page 10, Line 12:** 'using SRM' → 'using the SRM'.
- **Page 10, Line 16:** '6.%' → '6%'.
- **Page 10, Line 18:** 'with sufficient' → 'with a sufficient'.
- **Page 10, Line 25:** 'on SRM' → 'on the SRM'.
- **Page 10, Line 25:** 'a power' → 'an important'.
- **Page 10, Line 26:** 'well off' → 'not'.
- **Page 16, Table 3:** Identify the abbreviations in the headers.
- **Page 20, Figure 3:** 'with 30km' → 'with a 30km'.
- **Page 20, Figure 3:** \sigma should be in italicized.

References

- R. C. Levy, Matteo, L. A. Munchak, L. A. Remer, A. M. Sayer, and N. C. Hsu. The collection 6 modis aerosol products over land and ocean. *Atmospheric Measurement Techniques*, 6: 159–259, 2013. doi: 10.5194/amt-6-159-2013.
- Steven Platnick, Kerry G. Meyer, Michael D. King, Galina Wind, Nandana Amarasinghe, Benjamin Marchant, G. Thomas Arnold, Zhibo Zhang, Paul A. Hubanks, Robert E. Holz, Ping Yang, William L. Ridgway, and Jérôme Riedi. The MODIS cloud optical and microphysical products: Collection 6 updates and examples from Terra and Aqua. *IEEE Transactions on Geoscience and Remote Sensing*, 55(1):502–525, January 2017. doi: 10.1109/TGRS.2016.2610522.