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

Anonymous Referee #1

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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.
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 \textit{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).
• 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 6, Eq 5: Inconsistent use of italics. MR should not be italicized (use \textit{mathrm}) and $N$ should be italicized. Note other usages of MR below.

• Page 6, Line 30: ‘km AGL’ → ‘km above AGL’.

• Page 7, Line 15: ‘donors meets’ → ‘donors that meet’.

• Page 7, Line 18: ‘air column’ → ‘air columns’.
• Page 7, Line 19: ‘air column’ → ‘air columns’.
• Page 7, Line 29: ‘This is resulted’ → ‘This results’.
• Page 7, Line 32: ‘by total’ → ‘by the total’.
• Page 7, Line 33: ‘in reconstructed’ → ‘in the reconstructed’.
• Page 8, Line 1: ‘in reconstructed’ → ‘in the reconstructed’.
• Page 8, Line 11: Use LaTeX \times instead of ‘x’.
• Page 8, Line 16: ‘In reality, this’ → ‘This’.
• Page 8, Line 29: Use LaTeX \times instead of ‘x’.
• Page 8, Line 30: ‘surrounding Bohai’ → ‘surrounding the Bohai’.
• Page 9, Line 16: ‘C, average’ → ‘C, the average’.
• Page 9, Line 20: ‘AOD, especially’ → ‘AOD, with especially’.
• Page 9, Line 26: ‘with CALIPSO’ → ‘with the CALIPSO’.
• Page 9, Line 27: ‘hour of’ → ‘hours of’.
• Page 9, Line 27: ‘using 10’ → ‘using the 10’.
• Page 9, Line 31: ‘have larger’ → ‘have a larger’.
• Page 10, Line 9: ‘to alter our’ → ‘to improve our’.

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• 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
