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Discussions

Interactive comment on "Automated time-height-resolved airmass source attribution for profiling remote sensing applications" *by* Martin Radenz et al.

Anonymous Referee #1

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The paper by Radenz et al. introduces an effective and user-oriented way to present height-resolved transport modelling simulations associated with aerosol sources. Moreover, the methodology can be applied independently of observations and can be tuned to accommodate unusual aerosol emissions such as volcanic eruptions or intensive biomass burning episodes. The results highlight the robustness and useful- ness of the technique when compared against advanced lidar data. Nevertheless, the presentation of the methodology and results should be improved to help the reader understand the ramifications of the study. Moreover, the precision of the language could be improved. There are several issues and technical comments that can improve it. The paper can be published in ACP although it does not fit yet the scope of the

Special Issue (EARLINET aerosol profiling: contributions to atmospheric and climate research). The authors should consider to acknowledge EARLINET if they want to keep the link with this Special Issue given that Polly instruments also participate in the network.

In the following, comments are given for consideration in Specific Comments. The last section lists the Technical Comments.

Specific Comments

Ln2 & Ln51: I understand that the distinction "backward trajectories or particle positions" refer to Hysplit and Flexpart respectively. However, in line 51 you refer to "backward trajectories" for the two models. Therefore, I ask you to clarify throughout the text and keep homogeneous wording to avoid confusion.

Ln8 & Ln59: Is it 7- or 8-week campaigns? Please correct.

§1: In the introduction, you describe that trajectory models simulate air parcels while particle dispersion models simulate particles. In my understanding, the terms "airmass" and "air" include the terms above. It would be nice to clarify this in the text.

Ln20–21: Please give the abbreviations and anywhere else.

§2: A summary table with the versions of the models, the meteorological data, the pros and cons, etc. will enhance the clarity of this section.

Figure 1: A similar Figure for Flexpart is needed.

Ln70: What is a "wind trajectory"? I am confused. Hysplit and Flexpart rely on meteorological data to drive the simulations.

Ln83: What does it mean "purpose-serving"? Could you expand on this?

Figure 2 & Figure 3: Both Figures are not introduced and explained in the manuscript!

Figure 3: Figures 3a, 3b, and 3c refer to Limassol, Punta Arenas, and the shipborne observations, respectively. What are the figures for Krauthausen and Finokalia of Section 5? Why the geographical areas are not uniformly defined? Why the Oceans are not included in this selection? What is the reason behind this decision?

Ln94–97: The residence times for Flexpart and Hysplit are not comparable. Could they be normalized?

Pg6Ln106–107: Although Baars et al. (2017) provide the information, a brief description for retrieving the high resolution products should be introduced with the aim to make the manuscript self-contained.

§4.1: It would be nice to see the values of the intensive parameters that characterize the aerosol layers similar to §4.2.

Ln146–149: Could it be that the airmass, although originated from N. America, is aerosol-free over the measuring site? Is it safe to make this assumption? Polly is

a high-performance lidar and it should be used to demonstrate the validity of the methodology. I consider that increasing the averaging either temporally or vertically or both will demonstrate if something resides in higher altitudes.

Figure 4 & Figure 6 & Figure 10: For the sake of completeness, you could report the particle backscatter coefficient for the "orange" sectors? Also, Baars et al. (2017) produce target classification maps that I consider valuable for the assessment of the overall performance of the methodology.

Ln143–144 & Figure 5: What could be the reason that the last 0.5-1 km of the aerosol layer remain undetected? The same is visible for Figure 9.

Ln163–166: What is the origin of this layers? The signature of this layer is somewhat different from a dust layer.

Ln169–170: Is it a mixed dust layer? Is Middle East dust mixed with anthropogenic particles? Can you clarify?

Figure 10: What are the dense backscattering features (e.g., around 4-5 km at 12 utc)? Is it because of the color scale or are they clouds? If they are clouds, shouldn't they be removed?

Figure 12 (a & b): It seems that the profiles indicate "Water" from the ground up to 10 km. This finding is in disagreement with the lidar data. How should we treat this?

Figure 13: Similarly, the simulations indicate significant aerosol transport over 6 km,

whereas the lidar suggests otherwise.

Technical Comments

The use of definite and indefinite articles should improved.
Ln2: Add "of" before "how".
Ln6: Remove "exemplary".
Ln12: Replace "trough" with "through". Remove "and entangled".
Ln13: Replace "require" with "are required".
Ln18: Move "either" before "forward".
Ln19: Remove "either" and add "and" in place of "or".
Ln20: Remove "process". Correct to "parameterized".
Ln35: Replace "is" with "are", "done" with "used", and "Most available approaches" with "The majority".
Ln41: Replace "attributed by" with "assigned".
Ln45: Replace "becomes" with "become".
Ln49: Replace "Though" with "Although".
Ln51: Replace "In here" with "Herein".
Ln54: Replace "An" with "A".
Ln58: Remove "application".
Ln59: Remove "out" and "dataset".
Ln63: Replace "past" with "travelled path".
Ln68: Replace "acquires" with "will acquire". Change "spend" with "spent".
Ln69: Add "and" after "surface".
Figure 1: Add "of" after "Example". Rearrange "(a)" and "(b)".
Table 1: Add "of" after "Overview".
Ln77: Add "most" before "recent".
Ln82: Replace "to" to "into".

Ln98: Replace "each other" with "another".
Ln100–101: Please rephrase.
Ln125: Replace "quasi backscatter coefficient" with "quasi particle backscatter coefficient" and everywhere else in the document.
Ln126: Remove "time and height" and "of the observation".
Ln140: Replace "discuss" with "discussed".
Ln145: Remove "only".
Ln151: Remove the first "the".
Ln155: Remove the open parenthesis.
Ln159: Remove "for one period" and "one".
Ln162: Remove the first "of".
Ln167: Remove "height".
Ln168: Remove "it's depth".
Ln169: Replace "middle east" with "Middle East".
Ln180: Remove "also".
Ln182: Remove "at this site".
Ln183: Remove "one".
Ln192: Replace "soruce" with "source".
Ln208: Remove the second "are".
Ln215: Remove "Exemplary, the".
Ln223: Remove "over".
Ln248: Replace "constrains" with "constraints".
Ln251: Remove "for example" and "for a first estimate".
Ln261: Replace "fully-fledged" with "full-fledged".
Ln270: Remove "proved".
Ln274: Replace "approached" with "approach".