Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2018-357-RC1, 2018

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Extreme levels of Canadian wildfire smoke in the stratosphere over central Europe – Part 1: AERONET, MODIS and lidar observations" *by* Albert Ansmann et al.

Anonymous Referee #1

Received and published: 4 May 2018

General comments:

This article is an introductory paper (part 1) dealing with the analysis of an extreme event of smoke particles advected from Canada to Central Europe. The work presented here is valuable, especially because high quality and trustworthy climate modeling is only possible in close connection with observations as the ones presented here. In general, the article is writing but my main concern is the reason why this work has been split in two different papers. I recommend merging them into one more robust and complete paper.

Specific comments:

The first part of section "Introduction" seems more like results and you should move to the section "Observations". Because this study is part of the EARLINET network, it would be nice to include a paragraph summarizing the EARLINET findings on this type of particle layers, especially coming from Canada. As suggestion, some these papers are listed below:

Lucja Janicka, Iwona S. Stachlewska, IgorVeselovskii, Holger Baars, Temporal variations in optical and microphysical properties of mineral dust and biomass burning aerosol derived from daytime Raman lidar observations over Warsaw, Poland, Atmospheric Environment, 169, 162-174, 2017.

Ortiz-Amezcua, P., Guerrero-Rascado, J. L., Granados-Muñoz, M. J., Benavent-Oltra, J. A., Böckmann, C., Samaras, S., Stachlewska, I. S., Janicka, Ł., Baars, H., Bohlmann, S., and Alados-Arboledas, L.: Microphysical characterization of long-range transported biomass burning particles from North America at three EARLINET stations, Atmos. Chem. Phys., 17, 5931-5946, https://doi.org/10.5194/acp-17-5931-2017, 2017.

Page 2, line 28. AOT is a quantify depending on the wavelength. It is necessary to specify the wavelength referred to.

Section "Instrumentation" contains more than solely instrumental information. In contrast, methodology details are given here. Please, consider rename this section.

Instrument section should reorganized due to in this paper (part 1) detailed lidar analysis is not the focus. Thus, I recommend to present first Sun-photometer, then MODIS and finally lidar system.

Page 4, lines 21-24. Temperature and pressure profiles needed for the Fernald method were obtained from GDAS. Is there any radiosounding station nearby? Can you quantify the uncertainty introduced by GDAS profiles instead of using actual radiosoundings?

Page 4, lines 26-31. Volume linear depolarization ratio is defined here and used in this

paper. I am wondering why this quantity, which simultaneously provides information of particles and molecules, is preferred instead the particle linear depolarization ratio, which provided information on particles solely.

Page 6, line 15. Here it is stated that the stratospheric smoke particles detected were irregularly shaped. Is it possible to identify the process/processes leading to this kind of shapes using solely your lidar information? Authors refer to the work Haaring et al. (2018). However it would be nice to include some information here.

Figure 7. Which are the error bars associated to these profiles?

Page 8, line 25: Here you present results on particle linear depolarization ratio. However, this quantity has not been defined previously.

Technical corrections:

Page 4, line20: replace “was highest” by “was the highest.” Review the entire profile to correct for this typo.

Page 4, line 26: replace “volume depolarization ratio” by “linear volume depolarization ratio”. Check the entire body text for replacement.

Page 6, line 25: replace “Figures” by “Figure”

Page 8, line 20: replace “Amercian” by “American”

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