Atmospheric
Measurement
Techniques

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Discussions

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comment

# *Interactive comment on* "Aerosol monitoring in Siberia using an 808 nm automatic compact lidar" *by* Gerard Ancellet et al.

**Anonymous Referee #1**

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The submitted manuscript shows the results of a lidar measurement campaign that took place in Siberia, near the city of Tomsk, from April 2015 to September 2016. Despite the measurements of the vertical profile of the aerosol geometrical, optical and microphysical properties are extremely precious in this wild and remote region of the world, the manuscript is still not ready for publication, suffering probably from hasty writing, as some sentences are approximate (see next sections). However, I am sure that the authors have will brilliantly address the issues raised below.

Major Issues:

The described measurement technique is not introducing any innovative aspect. Since Klett (1981) and Fernald (1984) papers, tens of research articles were published about elastic lidar signal inversion, together with their pros and cons. For example, the tech-

nique described in Section 2 is operational (with some minor differences) since 1999 in the NASA MPLNET lidar network. However, all those different inversion methods using either the retrieved sunphotometer AOD to constrain LR or taking it directly from a model as FLEXPART (or a combination of both), still assume that the LR is constant over the atmospheric column. This might introduce large bias and uncertainties, especially when co-exist different aerosol layers at different altitudes. For those reasons, the manuscript is unbalanced as a large part of it is dedicated to describe the retrieval technique (including Appendix A and B)

The instrument wavelength (808nm) might be more appropriate to study clouds than aerosols. The molecular signal at this wavelength is about 5 times less than at 532 nm and about 26 times less than 355nm making calibration very difficult (impossible during daytime as showed in Fig. 1). Moreover, the backscattering from the sub-micron part of the aerosol spectrum is almost negligible.

FLEXPART model is used to speciate the aerosol layers and quantitatively assess the columnar LR to be used in the inversion. However, many parameters are assumed without giving convincing explanations., i. e. A and B. How the results change if, for example, the number of released particles changes and also the altitude?

I suggest to put more emphasis on characterizing the source origins, transport processes, and vertical distributions of the aerosol layers on the region, possibly integrating the lidar observation with in-situ measurements, if available.

Specific Comments:

Line 1, Abstract: The word climatology is not appropriate considering the total number of measurement.

Line 8-9, Abstract: "it was complemented..." please rephrase as it is not clear. Do the authors mean ancillary ?

Line 9-10, Abstract, The sentence is unclear. What exactly is compared? attenuated

backscattering with CALIPSO? or What? and what is it compared with MODIS and IASI data?

Line 10, Pag. 2 the term "Radiative Forcing" is misused. I would change it into "Radiative Effects"

Line 13, Pag. 3 "continuous measurements of clouds and aerosols" again, this sentence lacks of precision. Please specify what it is measured.

Line 6, Pag.4 "counts/s"

Line 16 pag 4. How much is it the lidar blind region ? (overlap 0%).

Line 31 pag 4 supposing clear air at 2-4 km altitude is very risky

Figure 1 upper plot labels are very small and can't be read

Pag. 5 bottom: fire is not a good choice, I would say biomass burning

Line 8, Pag. 6 why 35%? any reference?

Line 1 Pag. 7 how much is the lidar sensible to the thermal stability?

Line 30 Pag. 9. How is retrieved the AOD at 808nm from 870nm?

Line 1 pag 10. how much is it the integration time to get a good molecular signal ? 30 mins are enough?

Figure 8. is 3.3 and 16.1 the time? it is pretty uncommon way...and the caption should be more detailed

Figure 9,10. same as Fig. 8

Line 11 Pag. 19. The link is broken

It is missing a discussion why the selected cases are representative of the region

Line 13 Pag,. 22 Micropulse lidar in Sicard et al., 2016 is more suitable to study aerosol

variability being at 532nm