

## ***Interactive comment on “Lidar profiling of aerosol optical properties from Paris to Lake Baikal (Siberia)” by E. Dieudonné et al.***

### **Anonymous Referee #2**

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#### General

This paper describe a unique mobile lidar observation in Eurasian continent. However, as the anonymous referee #1 stated extensive and carefully, substantial revision is necessary prior to be published. I almost agree with the comments of the referee #1. Beside the observation results and the discussions, I have a strong doubt in this mini Raman/polarization lidar instrumentation at 355 nm, because they use only the analog detection (Royer et al, 2011) though that a large dynamic range is more necessary in UV-lidar signals. Simultaneous photon counting is indispensable for retrieval of the lidar ratio (LR) and the particle depolarization ratio (PDR) possible at nighttime and may the results can be extent to the daytime data. This fact deteriorate to convince the observed important optical parameters, LR, PDR of aerosols for public. And the

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numbers and errors seem odd sometimes as mentioned by the referee #1. This paper tends to belong to qualitative than quantitative snapshot lidar observations. Certainly shorten and high lighten the paper for ACPD readers.

Specific comments following my impressive points

I also recommend to use the extinction-to-backscatter ratio (LR) than BER, because it is more standard. If you feel to need to use the BER in radiation discussions elsewhere, then you can inverse it. For example Page 27913, lines 18, the LR indicated always in the parenthesis after the BER, but two inverse processes give a different number of the LR from the original paper: 50+-11 sr not 48.6+-8.5 sr (Murayama et al., 2004).

The LR values indicated here are rather higher than the literature even dust and smoke.

Page 27914, Since the specific observation results the dusty-mix case is not shown at all (only the values Table 1), the dusty-mix case study can be omitted. ACP readers expect clear evidences in this vast area not explored by the ground-based lidar frequently and typical aerosol events.

The error of the PDR is large when the aerosol loading is small. And as pointed out by the referee #1, the error is strongly depend on the matching (boundary) condition at Rayleigh scattering dominant high altitudes and the gain ratio. The value close to 1% seems meaningless and embedded in the errors.

Backscattering coefficient or scattering ratio than extinction coefficient and recommended in Figures 11 and 15 because the extinction coefficient is rather sensitive to the LR in the Klett inversion. Raman constraint partial AOT is useful to determine the average LR in the remarkable aerosol layers than show the LR profiles.

Figures 1, 4, I also want to see the geographical view the Europe and Russia. I have to often look into my map book to check the levels and desert area and so no. Why the route is almost along with 55 degree north in latitude? Convenience or scientific interest?

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Figures 11, 12, Though I recommend to show the backscatter coefficients than the extinction coefficients in Figure 11, the scale is enough in linear? The vertical ranges in the two is not same better to be same. The width of ticks in vertical axis of Figure 12 seems not a good number. The ticks is missing in the vertical axis of Figure 11.

Figures 15, 16, The same for Figure 11, 12.

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Interactive comment on Atmos. Chem. Phys. Discuss., 14, 27881, 2014.

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