

Interactive comment on “One year of Raman lidar observations of free tropospheric aerosol layers over South Africa” by E. Giannakaki et al.

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Page 1347, line 24: The word volume has been deleted. We derive the extinction coefficient and not the volume extinction coefficient

Page 1348, line 13: the sentence has been changed as proposed by the reviewer: ‘The lidar measurement site at South Africa was located on a hill top at Elandsfontein (26o15’S, 29o26’ E, 1745 m a.s.l.) in the Highveld region.’

Page 1350, line 18: The word ‘campaigns’ has been replaced by the word ‘campaign’

Page 1351, line 2: The phrase ‘are derived’ has been replaced by the phrase ‘is derived’

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Page 1352, line 27: The percentage is relative to the number of possible measurement. The sentence has been changed accordingly: ‘In Figure 1(b) we present the percentage of the measurements in which at least one free-tropospheric aerosol layer was observed (green bars) relative to the hourly averaged (every three hours) lidar measurements.’

Figure 2: The height of the PBL top was continuously measured by PollyXT lidar. The results were presented by Korhonen et al., 2014. The lower geometrical bottom of the aerosol layers presented in this study (Figure 3) is around 500 m. In order to clarify that the PBL height is lower than the bottom of the layers we present the hourly PBL height as well as the difference between the bottom of the first free tropospheric layer observed and the PBL. The variability of PBL is shortly discussed in the new manuscript. ‘South Africa is a region of high atmospheric variability on both short-scale (days to weeks) and seasonal time spans. This atmospheric variability together with a large surface temperature range and significant seasonal changes in precipitation has an impact on the vertical mixing of particulate matter, and hence, on the PBL evolution’ A reference is also given for more details. The diurnal cycle of PBL observed in Elandsfontein during 2010 was discussed in detail and presented by Korhonen et al., 2014.

Page 1354, line 15 : In this study we first derived the layer properties of the individual 1-hour profiles and then average on monthly basis. The sentence has been changed accordingly: ‘The analyzed hourly center height, geometrical depth and AOD at 355 and 532 nm are monthly averaged and presented in Figure 4 (a), (b) and (c) respectively.’

Figure 6: Caption on Figure 6 has changed as proposed by the reviewer: ‘Variation of AOD at 355 nm (a) of the boundary layer (blue squares) and the free troposphere (orange circles) and (b) the monthly free tropospheric contribution to total AOD at 355 nm. In (b) the squares represent the mean value, the horizontal line the median, the boxes the 25 and 75 % percentiles, the whiskers the standard deviation and the stars

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the maximum and minimum values during the respective month.'

Answer on the general comment on sections 3.1 and 3.2: In this paper we present the statistics on the seasonal behavior of free tropospheric aerosol layers above South Africa. Our initial aim was to attribute each aerosol layer to a certain aerosol type, since different source regions emit different kinds of aerosol. However, this was not possible because the aerosol layers were often observed in a mixing state rather than as one single pure aerosol type. In this study we present the statistics on the seasonal behavior of free tropospheric aerosol layers above South Africa. Detailed analysis with respect to optical and microphysical aerosol properties for selected aerosol layers that have been assigned to specific aerosol types will be followed up in a subsequent article.

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