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Atmospheric Chemistry and Physics Discussions

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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Comment on aerosol optical depth at 532 and Ångström related to backscatter (355 – 532 nm)

We retrieve the aerosol optical depth at 532 on 163 cases, which is more than the half of the measurement cases comparing with the aerosol optical depth at 355 nm. The seasonal behaviour of aerosol optical depth, as shown in Figure 4, is the same for both wavelengths. Also, in Figure 5 the aerosol optical depth at 532 is very well compared to sunphotometer values, taking into account that Raman lidar measurements are performed only night time while sunphotometer data are referring to daytime measurements along with the fact that our site face strong diurnal variation regarding the

aerosol load.In addition, the seasonal behaviour of Ångström exponent (both related to extinction and backscatter) are given to Figure 9, along with the number of layers averaged for each of the months. Also, the Ångström related to backscatter values between 355 and 532 (as well as the Ångström related to backscatter values between 532 and 1064 nm) are already given to the Table 3 for each of the seasons as well as for the dry, wet and biomass burning period.

Comment on aerosol typing

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.

Comment on depolarization

The particle depolarization ratio at 355 nm has not been retrieved for the aerosol optical profiles that has been analyzed in this paper. As mentioned previously a second paper will follow, discussing the optical (also depolarization) and microphysical aerosol properties on selected case studies. The analysis on the selected cases has shown that depolarization is less than 5 % on the majority of the cases, while some biomass burning aerosol layers appears with depolarization ratios as much as 10%. There is no indication of desert dust aerosol layers in the selected cases analyzed.

Comment about errors in the retrieval of optical properties

A paragraph concerning the error in the optical properties has been added in Section

2.1 ‘The relative errors in the nighttime aerosol products are mainly determined by signal noise. Systematic uncertainties introduced by the correction of Rayleigh scattering, air density, and overlap effects are of the order of 5%-10% for heights above 500 m. The overall relative errors of the lidar-derived aerosol properties are in the range of 5%-15% for backscatter coefficients, 10%-30% for extinction coefficients, 15%-40% for lidar ratios and about 5%-10% for AODs (Ansmann et al., 1992; Hänel et al., 2012). ‘

Page 10, end of Section 3

In the end of section 3 there is no discussion relatively to the first idea.

Section 4.2

The number of the layers averaged is given in the Tables 1,2 and 3. The number of layers is more than 40 except for the retrieval of extinction at 532 during summer which is 18 layers (this mean 28% of the layers observed during summer).

Comment regarding Figure 7-9-10

Figure 7 presents the monthly variation of wind speed and the number of hotspots. The frequency sum of all parameters given in Figures 8,9 and 10 is 100%. The number given in each column is the number of atmospheric layers found in each bin group (and not the % percententage). The percentages are given in Y-axis. This is now clarified in the figure captions.

Figure 3

The vertical scale in Fig 3(c) has been changed

Figure 4

The Y-axis is now named ‘columnar AOD’

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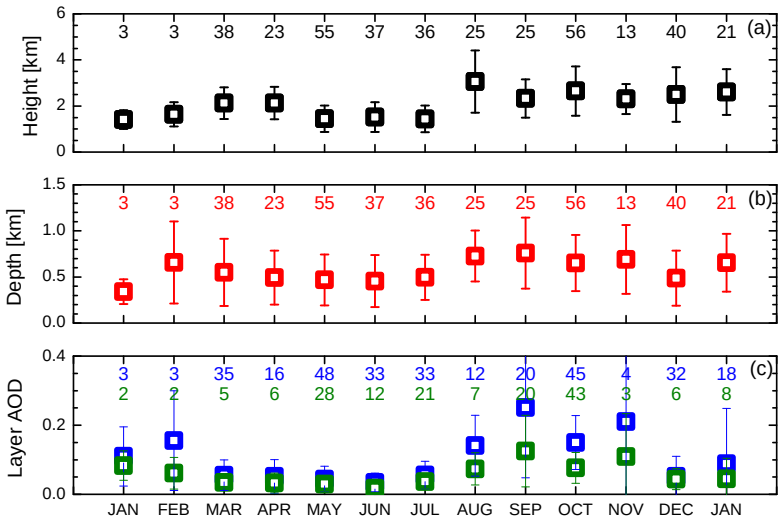

Fig. 1.

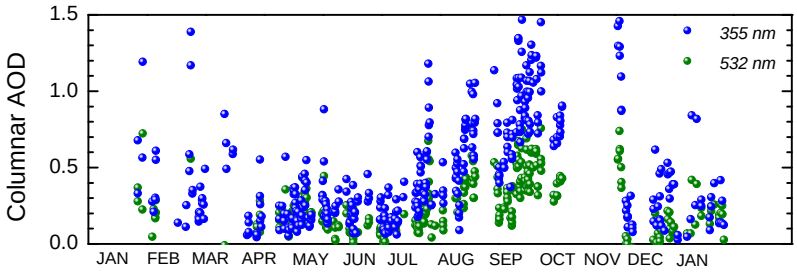
Columnar AOD
1.5
1.0
0.5
0.0
355 nm
532 nm
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
JAN

Fig. 2.