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Comment

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

### **Anonymous Referee #2**

Received and published: 20 February 2015

The paper “One year of Raman lidar observations of free tropospheric aerosol layers over South Africa” is an interesting paper providing information about aerosol layers in a region typically not monitored in terms of vertical profiles.

The authors provide a good insight about monthly occurrence of layers in the free troposphere and geometrical properties of them. Then optical depth and intensive properties are studied. This is very important for radiative effect but also for the aerosol typing. In the complex, the paper is clear and well written, addressing all relevant aspects one would expect.

There are however some points that should be improved in a new version. Here I summarized the most relevant ones. Detailed comments and some text suggestions

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are reported as comments in the attached pdf. Authors in some points affirm that extinction profiles are too few for studying lidar ratio at this wavelength, but then they used these measurements for the Angstrom exponent calculation. If the measurements of extinction at 532nm are limited in some cases for detector problems, these could strongly affect the derived Angstrom exponent (logarithm of the ratio of the 2 extinction). On the other hand AOD at 352nm is very low (this is the reason why probably the extinction at 532nm is so hard to be retrieved). All the consideration reported in the paper using the very few measurements of extinction at 532 nm could be misleading. Because of these reasons, I suggest to investigate into details the backscatter related Angstrom exponent at 532/355 instead of the extinction one. Also the integrated backscatter instead of the AOD could be analysed. The section related to discussion of lidar ratio and Angstrom values respect to literature is not so clear. It needs a revision of the text.

More specific comments:

Abstract: something about the considerations on more relevant aerosol types throughout the year based on measured lidar ratio and angstrom considerations should be added  
Section 3.3: authors should explain why they do not use the depolarization measurements here and should mention something about errors on the measured properties. For example: which is the error on lidar ratio and Angstrom? I suppose values of fig 9 and 10 are, for each case, mean value within the layer and then all this case-by-case values are averaged together. Are mean weighted?

Page 10, end of Section3: no needs to explain which was the first idea of the paper respect to what reported in the current version.

Section 4.2: discussing layers extensive and intensive properties authors should consider that in some months the number of cases is very low

Figures 7-9-10: frequency sum is not 100%

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Please also note the supplement to this comment:  
<http://www.atmos-chem-phys-discuss.net/15/C333/2015/acpd-15-C333-2015-supplement.pdf>

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 1343, 2015.

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