Atmos. Chem. Phys. Discuss., 8, S9565–S9567, 2008
www.atmos-chem-phys-discuss.net/8/S9565/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Optical characteristics of biomass burning aerosols over Southeastern Europe determined from UV-Raman lidar measurements" *by* V. Amiridis et al.

Anonymous Referee #2

Received and published: 1 December 2008

The paper is very interesting and has possible high impact on the lidar community for reducing uncertainty in the aerosol backscatter coefficient determination starting from a simply elastic backscatter lidar as the first satellite-borne lidar actually operational (CALIPSO). However, this point should be addressed in a more convenient way.

The authors present their data focusing mainly of backscatter-related Angstrom exponent values, but these are determined starting from a backscatter profile at 355 nm, retrieved without critical assumptions, and from the backscatter profile at 532 nm, retrieved making assumption about the lidar ratio value at the same wavelength. How do you choose lidar ratio values at 532 nm? How critical is this assumption? Please

quantify the uncertainty on backscatter at 532 nm and on backscatter-related Angstrom exponent related to the choice on lidar ratio.

Even if affected by a large uncertainty due to lidar ratio assumption, backscatter-related Angstrom exponent can still provide indication about the size of the particles, but probably it should be stated more clearly in the paper that here retrieved values for backscatter-related Angstrom exponent are estimations and not properly measurements. I imagine that the uncertainty on the backscatter-related Angstrom exponent is too large to provided a relationship between it and the age of the particles in a quantitative way.

However, authors present great results also in terms of measured lidar ratio values. In this case, the error is only statistical and probably much lower than the total error affecting the backscatter-related Angstrom exponent values. Therefore I strongly suggest to focus their results mainly on these measurements instead that on the backscatter-related Angstrom exponent estimations. Comparing Fig 6 and 7, it seems to me that it should be a correlation between lidar ratio values and the age of the particles too (larger values for aged particles). This result should be more quantitative and it could be also more useful for multi-wavelength elastic backscatter lidars retrieval: the authors suggest that “for smoke particles and in the case of multi-wavelength elastic-backscatter lidars, one measures the backscatter-related Angstrom exponent and assumes a specific value for the lidar ratio” because of the backscatter-related Angstrom exponent – lidar ratio relationship shown in Fig 7. But this is not possible, because with a multi-wavelength elastic backscatter lidar, you need to obtain the backscatter profiles (assuming a lidar ratio), first, and then the backscatter-related Angstrom exponent is obtained. Instead, the great result that I see in this work is that since there is also a relationship between lidar ratio and age of the particles, a better assumption on lidar ratio values can be obtained starting from information about the age of the particles.

Finally, it is clear from comparisons with literature values, that the retrieved relationship

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is probably not valid for all fires and on the whole globe, also because it is based only on 10 cases. This could be clearly stated in the paper.

Besides this principal point, there are some clarifications that should be added in the text and some suggested changes:

Page 5 , line 6: “The EARLINET…” remove The

Page 6, toward the end: it is not clear if the error estimation reported are referred only to Thessaloniki algorithm or not. Please check reported numbers, because, looking for example at extinction, I found in Pappalardo et al., 2004, that the error in the 2000-4000m is larger than 10% stated by the authors. I suggest also to distinguish the estimated error not on the base of the altitude but on the aerosol content: PBL, lofted layer and low (negligible) aerosol content.

Page 8, the number of the formula should be right aligned Page 9, Section 3, line 10: “Fig.1 shows an aggregate plot of all (A) ATSR…” what is (A)?

Page 11, line 3: add a reference about the assumption of 600 ha/hotspot for the fraction of consumed biomass.

Page 13-end : see main comment

Page 15, line 7: please add that the lidar ratio can be calculated also with HSRL.

Table 1: why do you not observe fires during 2003 and 2004?

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 18267, 2008.