**Atmospheric
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Interactive
Comment

Interactive comment on "On retrieval of lidar extinction profiles using Two-Stream and Raman techniques" *by* I. S. Stachlewska and C. Ritter

Anonymous Referee #1

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General comments:

Two stream method proposed in this manuscript is very interesting and useful technique which can be applied to airborne or satellite together with ground base measurements. It allowed find large variability of the lidar ratio with altitude during 15 and 19 of May 2004. During this days the two stream and the Raman methods show reasonable agreement however unexpected behavior. The extinction and backscatter coefficients are independent which can be only explain by a large variability of aerosol size and chemical composition with altitude.

Page 20237, line 7: What value of aerosol Angstrom exponent was assumed in the Raman retrievals to related the extinction coefficient at 532 and 607 nm? How this assumption is influence the strong altitude variability of the lidar ratio (Fig. 1, 2)? The

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large variability of the lidar ratio is caused by the variation of single scattering albedo or (and) backscatter phase function. However, the single scattering albedo is usually varied in smaller range (typically 0.9-1.0) in compare to scattering phase function. Therefore the last quantity is probably responsible for large lidar ratio variation with altitude. The scattering phase function is a function of aerosol size distribution and refractive index. Therefore variation of the lidar ratio corresponds to aerosol size variation with altitude. Assuming the constant Angstrom exponent in the Raman retrieval can significant influence these results.

Page 20235 , Eq .5 Could you comment why you used correlation coefficient in this form instead of correlation coefficient based on the extinction coefficient.

Page 20241 first paragraph. Authors has been written that the accuracy of retrieval the backscatter coefficient is below 2x10-7 1/m/sr. In opinion this small value is unrealistic which shows Fig.1 The extinction coefficient from two stream method is close to zero around at 1550 m while the backscatter non zero (close to molecular value 1x10-6 1/m/sr). This discrepancy shows that backscatter coefficient should be significant smaller because non zero backscatter coefficient lead to non zero extinction coefficient. Therefore uncertainties of backscatter coefficient should be 2-3 times larger.

Page 20249 third sentence: Could you update Ansmann et al 1992 study of Cirrus lidar ratio.

Page 20243, line 25: "The enhanced extinction, together with the high lidar ratios, the high relative humidity and the low volume depolarization . . . . suggest that theses layers were composed of a very small spherical supercooled water droplets" Very small droplets have small lidar ratio due to larger backscatter coefficient in compare to larger droplets.

Specific comments:

Eq.5: The limits of integration is missing the same as the symbol "dh" in the first and

un the second integral.

Page 20249 third sentence: the unit "sr" should be added to lidar ratio Bci. . .

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 20229, 2009.

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