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Atmospheric Measurement Techniques Discussions

Interactive comment on "Use of rotational Raman measurements in multiwavelength aerosol lidar for evaluation of particle backscattering and extinction" *by* I. Veselovskii et al.

Anonymous Referee #1

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General comments:

The paper studies the benefits of using pure-rotational (PR) Raman detection channels instead of the standard vibrational-rotational (VR) Raman detection channels in multi-wavelength aerosol lidars. First, model studies are presented that illustrate the errors associated with the necessary assumption of an Aangstroem coefficient in VR Raman signal-based measurements of aerosol extinction and backscatter coefficients. It is concluded that the alternative use of PR Raman signals would better the measurement results, and an interference filter-based PR Raman receiver is proposed. A discussion of the temperature dependence of the PR Raman signals ensues, and opti-

mal values of interference filter bandwidth and center wavelength are determined for a lidar wavelength of 532 nm. Then the implementation of a PR Raman detection channel in an existing multi-wavelength aerosol lidar is described briefly and measurement examples are shown.

The subject material falls within the scope of Atmos. Meas. Tech., and is of interest to the aerosol lidar and modeling communities. Qualitatively, the presented results are hardly surprising, but the authors provide quantitative estimates of the Aangstroem coefficient-related errors in VR Raman signal-based measurements and derive optimal experimental parameters for PR Raman signal detection at a common lidar wavelength, which are significant contributions.

In summary, the manuscript is suited for publication in Atmos. Meas. Tech., minor revisions should be considered.

Specific comments:

1. Expand optical scheme of Fig. 7 to include the two PR Raman interference filters, because that is the most relevant part of the modified receiver.

2. Discuss the experimental set-up in more detail. E.g., are the PR Raman filter tilted? What was the backscatter ratio of the clouds you report complete blocking of elastic light for? Demonstration of receiver performance in the presence of clouds is recommended. Please, name manufacturers of all optics shown in Fig. 7.

3. Discuss measurement of Figs. 8 and 9 in more detail. With a lidar ratio of about 60 sr this is clearly an (elevated) aerosol layer and not a cloud. Was A=1 chosen so that the extinction profiles match? Why the profile truncation at 1000 m (beta) and 1200 m (alpha), overlap issue? Use the same vertical range for both figures.

Technical corrections:

1. Throughout text: Indices must not be italic, differentials likewise.

2. Throughout text: Use the same style '... Fig. x' for figure references.

3. P. 9: Write 'Fig. 3 shows the RR spectra of ...'

4. P. 12: Start new paragraph before 'Fig. 8 shows backscattering ...', otherwise misleading.

5. P. 13: Write 'As in the case of HSRL, ...'

6. Caption Fig. 4: Write 'The reference...'

7. Caption Fig. 8: Write 'Dash-dot line...'

8. Caption Fig. 8: Write '... radiosonde.'

9. Caption Fig. 10: Write '... 1 July ...'

10. Fig. 10: Use different line styles for the extinction profiles.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 6759, 2015.