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Interactive Comment

Interactive comment on "Scanning rotational Raman lidar at 355 nm for the measurement of tropospheric temperature fields" *by* M. Radlach et al.

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The paper of **M. Radlach, A. Behrendt, and V. Wulfmeyer** "Scanning rotational Raman lidar at 355nm for the measurement of tropospheric temperature fields" is concerned with an urgent topic of the remote control of atmospheric parameters (temperature measurements). Atmospheric temperature is one of the most important thermodynamic parameters of the atmosphere determining the majority of the processes of atmospheric physics and optics of aerosols. Especially actual and useful is obtaining the information about the temperature distribution in time and space with high temporal and spatial resolution.

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This paper is a new step in the lidar application of the well-known pure rotational Raman technique of the atmospheric temperature measurements. A new kind of the lidar facility – the scanning rotational Raman lidar is described. The size of the steering mirror system is impressive. The system should have high quality flat mirrors to prevent spoiling the image quality of the receiving telescope and destroying the aliment of optical axes. Temperature measurements, presented in the paper show, that this problem was successfully solved by the authors.

The main problem of the pure rotational Raman technique is to isolate the selected portions of pure rotational Raman spectra of atmospheric nitrogen and oxygen. The problem is that it is necessary to suppress a powerful line of the unshifted scattering at a very short spectral distance. And the suppression level should be at least 8 orders of magnitude. That is why the key part of the rotational Raman lidar facility is the spectral device providing the solution to this problem.

There are two approaches to the spectral isolation of the portions of pure rotational Raman spectra in the temperature measurements. One of them proposes development of double grating monochromator technology, another one – the use of a cascade of special designed multi cavity interference filters. A filter approach allows one to obtain more efficiency due to the relatively high transmission of the interference filters as compared to the diffraction grating monochromator. However, the double grating monochromator has higher level of suppression of the unshifted scattering line. Both of these approaches have been developed independently and have own advantages and disadvantages. However, finally both allow reaching the final goal – lidar temperature measurements.

The authors have intensively and successfully developed a "filter" approach during about last 10 years. With this publication, we can see the next step in this direction.

In the paper, we find an optimization technique of spectral positions of filter transmission functions depending on the temperature measurement range. It is obvious, that the authors are familiar with peculiarities of the rotational lidar technique, and can optimize the lidar facility for the atmospheric measurement task.

In spite of the fact that the suppression of the unshifted line for the filter monochromator has a sufficient level not for all atmospheric situations (for instance, the fog and clouds), the presented temperature profiles are in good agreement with the balloon data. The lidar facility appears to be rather stable, precisely calibrated, and finally can be used for remote temperature measurements. Some exercises of the temperature field's measurements using a scanning mode of the facility demonstrate promising capabilities of the system for studying the atmosphere.

It is very acceptably, that the authors adequately assess the shortcomings of the system and have clear understanding how to improve it.

The paper produces as a whole good impression and can be interesting for experts in lidar technique, atmospheric physics and for everybody who is interesting in new optical technologies.

I would like to recommend this article for publication in the Atmospheric Chemistry and Physics (ACP).

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