Atmos. Meas. Tech. Discuss., 5, C3046–C3048, 2012
www.atmos-meas-tech-discuss.net/5/C3046/2012/

Atmospheric Measurement Techniques Discussions

Interactive comment on "Esrange lidar's new pure rotational-Raman channel for measurement of temperature and aerosol extinction in the troposphere and lower stratosphere" *by* P. Achtert et al.

P. Achtert et al.

peggy@misu.su.se

Received and published: 27 November 2012

We thank referee 2 for the review. Below we respond to the questions/comments raised by the referee #2:

Referee: This manuscript presents interesting new capabilities to derive temperature with lidar including the lower stratosphere with the rotational Raman technique simultaneously with PSC detection. While this technique is not new, such systems in the Arctic

region are not numerous and will be a great tool to study the ice cloud formations. The temperature is a crucial parameter and so the development of such instrumental tool is important for the physics of the PSC. The manuscript describes clearly the new instrument as well as the scientific issues, that are topics well adapted for the AMT journal and should be published. The manuscript correctly describes the both critical issues of elastic signal rejection and calibration. However, I recommend to add a specific discussion on radiosonde uncertainties while it is crucial for PSC investigations, it is important to cover this issue. For the calibration issue, while the method is convincing, authors should give some references and highlight the fact that radiosondes have their own uncertainties that are not always negligible (instrumental and spatio-temporal origins) mainly in polar region. Also radiosonde types are useful information that can be added. This is a critical issues while the next step will be to derive correlations between temperature and PSC occurrence as stated in the conclusion. In the conclusion, author should discuss how they will handled the potential temperature uncertainty linked to the calibration and uncertainty of radiosonde measurements.

Response: Thank you for your comment. We launched radiosondes of the type VAISALA RS92-SGP. We added that information as well as the information on uncertainties of the used radiosonde type to the manuscript.

We added the following statements at page 6463 line 10: "During a measurement campaign in January/February 2011 eight radiosondes (VAISALA RS92-SGP) for the comparison were launched from Esrange and reached altitudes between 15 and 30 km. According to the data sheet the total uncertainty is 0.5 K for a measurement range from +60°C to −90°C (VAISALA, 2012). However, the 2010 WMO intercomparison of different radiosonde systems reported a total uncertainty of only 0.2 K for the VAISALA RS92 radiosonde (WMO, 2010)."

And at page 6464 line 5: "The calibration can only be performed when the radiosonde and the lidar measurements are close in space and time. In the case presented here the reference data for the calibration were taken below an altitude of 15 km to ensure

a negligible influence of radiosonde drift-off. The horizontal distance of the radiosonde to the launch site at Esrange was 38.5 km at an altitude of 15 km. Note that the total uncertainty of the radiosonde temperature data below that altitude lie between 0.2 K and 0.3 K for the height range 1080 to 100 hPa and 100 to 20 hPa, respectively (VAISALA, 2012)."

And at page 6466 line 23: "Regular calibration with radiosondes will become part of the measurement routine to ensure a high quality of temperature profiling with the Esrange lidar."

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 6455, 2012.