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Atmospheric Measurement Techniques Discussions

Interactive comment on "A Raman lidar at La Reunion (20.8deg; S, 55.5deg; E) for monitoring water vapor and cirrus distributions in the subtropical upper troposphere: preliminary analyses and description of a future system" *by* C. Hoareau et al.

Anonymous Referee #2

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Review of "A Raman Lidar at La Reunion (20.8°S, 55.5°E) for monitoring Water Vapor and Cirrus Distributions in the Subtropical Upper Troposphere: Preliminary Analyses and Description of a Future System" , C. Hoareauet al.

The article describes an improvement of a Rayleigh - Mie lidar operating at La Reunion Island for the measurement of the water vapor (WV) vertical profiles with the Raman

technique. By analyzing the measurements taken along the period 2002 -2005, results on seasonal and diurnal cycles of WV and on cirrus clouds classification are reported. Finally, a new, very powerful, system in implementation phase in the Island is described.

The topics discussed in the paper are of primary scientific interest, both because it deal with the theme of the measurement of the WV, on which the entire lidar community is debating, in the frame of the international Network for the Detection of Atmospheric Composition Changes (NDACC), both because it describes WV lidar activities in the tropical region, and, furthermore, in the austral hemisphere, were these kind of techniques and measurements are really infrequent.

The most of the following remarks tent to clarify parts of the paper to improve the significance of the paper and its helpfulness for the entire WV Raman lidar community.

I recommend the publication after some improvements of the discussion and of the text, according with the following observations.

GENERAL

a. Some part of the article, mainly in the results of the data analysis (seasonal and diurnal cycles, cirrus classification. . .) would be more clear with a more extended discussion (see the following specific comments).

b. Often, symbols utilized in the equations are not defined.

c. In some cases the figures quotation appears postponed. Would be helpful for the reader if they were at the beginning of the respective discussion and not at the end.

d. Some figure appears lacking of labels and/or comments.

SPECIFIC COMMENTS

P. 6454 Please explain why the Raman technique to retrieve the extinction cannot be utilized in the case of the present lidar (for the new lidar, direct retrieving of the extinc-

tion is foreseen, see P.6464.).

P. 6455. I am not familiar with the expressions “alfa – epsilon”, “alfa – omega” please clarify.

ii. It is evident that optical fibers are utilized, but there is no mention in the text: please add this detail to make more rapidly understandable the whole set up of the system.

P. 6456. The text reports the dark count rate with no comparison with the background. Please add some element on the background intensity in that specific lidar location.

P.6457. About the temperature independence at 660 nm, with 1 nm of bandwidth, did you take into account the central wavelength of the BPIF utilized, according with Whiteman, Appl. Opt. 15, 2571-2592, 2003 (see P.2577, Figure 4)? Please, possibly, quote the article.

P.6458. Examining Figure 3, the interval of comparison ECMWF – lidar profiles for calibration seems to be from $\sim$17 km up to $\sim$25 km. Is this deduction correct? Please specify which the adopted criterion to choose the calibration interval is.

P. 6459. Considering that the lidar operates in the austral hemisphere, I do not understand how the nighttime can be longer in February-March and October-November.

P.6460-6461. The discussion about the WV profiles evolution during the night and the link with the peculiar atmospheric circulation over the Island is very interesting; thus I suggest extending suitably such a discussion.

P.6463. Please, report, at least approximately, some statistics linking the observed cirrus classes with the three different meteorological situations observed by the Meteosat 5 images.

P.6465., line 5. The sentence “. . .this protocol permits to obtain constant illumination condition at the optical fiber output and that even telescope alignment changes” is not very clear. Does it means that using optical fibers, the geometrical factor should be

identical for the two wavelengths, independently on the optical alignment, (provided having a complete mixing of the signals in enough long fibers)?

P.6466, line 13. Please specify which kind of tests on the photomultiplier you refer to, or put a reference.

P.6466. Equation 3. A square root seems to be missed in the numerator.

P. 6467, line 7. Signals extending from ground to stratosphere should present a so wide dynamics variation to be hardly detectable by a single photocounting channel (in Figure 17, the foreseen signal intensities below 9 km does not appear); in fact you are going to use gating of the photomultiplier. Do you consider utilizing a different, attenuated channel for the lower altitude, down to the ground?

Line 11. The distance of 20 km between lidar and radiosonde sites could be not very effective for what concerns the calibration. Please refer to the paper of Dionisi et al. (J. Atmos. Oceanic Tech, 27, 108-121, 2010) for a methodology to calibrate through noncollocated radiosoundings (with a similar range of noncollocation). Furthermore, lidar and radiosoundings can be never considered exactly collocated, owing to the horizontal transport of the sonde, during its ascent. In the specific case, the statistics of the local meteorological circulation should be also considered.

P. 6468. In Equations 5 and 6 many symbols are not defined. Furthermore, to shorter the formulas and for an easier understanding, I suggest to directly define a single symbol for the product fâĂć∆tâĂć2âĂć∆R/ c, representing the total integration time.

P. 6469, lines 20-23. The discussion is not very clear as the mentioned “ratio” is not defined (it refers to pure signals or to signals with noise?); on the other hand, the altitude of 3 km, reported in the text, do not appears in Figure 17.

Figure 13. Please identify each cirrus class on the respective plot.

Figure 14. The Figure is not well understandable, please consider add labels on the single parts and/or more information in the captions.

MINOR REMARKS

P. 6452 line 15 “Cooney et al.”: please control “et al.”

P. 6453, Eq. 1. Not all symbols are defined. Please add the missed definitions.

P. 6462. Please define the shortened form SVC (sub visible cirrus) as it is its first appearance.

Figure 8. The “pink dotted line” becomes visible only with some magnification of the figure on the monitor; please consider increasing in some way its appearance.

Figure 9. Please report explicitly that the time on the figure is expressed in UTC.

In the text, Figure 16 precedes figure15.

Please also note the supplement to this comment:
http://www.atmos-meas-tech-discuss.net/4/C2406/2011/amtd-4-C2406-2011-supplement.pdf

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6449, 2011.