Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2017-182-RC1, 2017
© Author(s) 2017. This work is distributed under
the Creative Commons Attribution 4.0 License.

Atmospheric Measurement Techniques Discussions

Interactive comment on "Fu-Liou Gu radiative transfer model used as proxy to evaluate the impact of data processing and different lidar measurement techniques in view of next and current lidar space missions" *by* Simone Lolli et al.

Anonymous Referee #1

Received and published: 5 July 2017

General

The paper deals with radiative transfer estimations based on lidar profile observations of dust and cirrus. The goal is to show the impact of the lidar retrieval method.

I have a problem with the methodology (see details).

Major revisions are needed.

Details

Although the paper deals with lidar observations of cirrus extinction profiles, there is no information on the laser beam pointing (zenith or off zenith to avoid specular reflection) and no information about the receiver field of view which has an impact on the multiple scattering contribution. On the other side, the depolarization technique is explained (even the 45 deg calibration) although not used.

Please re-write this section, update the instrument part to meet the requirements for this paper.

Now, I come to my most important point:

The authors use both, the Raman lidar method and the Klett retrieval to determine particle extinction profiles. And EARLINET members (experts in the field of Raman lidars) probably know that the optimum Klett solutions of the backscatter and the extinction profiles are obtained with the 'actual' lidar ratio (profile) from the Raman lidar observations. Ideally, Klett and Raman backscatter and extinction profiles coincide, ... but usually the available Klett codes cannot handle lidar ratio profiles.

However, if you apply the method to such a rather rather thin cirrus as done in this paper, then we may have a problem. I would recommend to use a visible, very well developed cirrus cloud deck (not this subvisible cirrus with an optical depth 0f about 0.02). Is there a reason why this quite unusual cirrus is taken, and not a very normal one?

Nevertheless, by just taking a climatological value for the dust lidar ratio of 45 sr and for the cirrus of 25 sr in the Klett retrievals, and in this way by completely ignoring the reality, i.e., the 'actual' Raman lidar observations of the lidar ratio . . .. it is not surprizing that you obtain different Klett and Raman extinction profiles. The true ones are, by the way, the Raman solutions. The Klett solutions are wrong.

If your Klett code cannot handle lidar ratio profiles (from the Raman lidar observations),

then you should at least take the dust layer optical depth from the Raman lidar observations to constrain the Klett solution. The Klett column backscatter times the used input lidar ratio must match the Raman solution for the dust optical depth. By playing around with the Klett solutions to find the best lidar ratio, you finally end up with the most appropriate column dust layer lidar ratio.

After optimizing the Klett/Raman solution set you may continue with radiation calculations and show remaining differences in terms of TOA and SFC forcings. I am sure they are small.

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-182, 2017.