Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2017-182-RC4, 2017

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 #4

Received and published: 7 September 2017

This work deals with the use of different lidar techniques and configurations for studying radiative forcing of aerosol and clouds. In particular, authors analyze the use of backscatter and Raman lidar signals. Backscattering lidar needs the assumption of a constant extinction-to-backscatter lidar ratio for the entire profile while combination of backscattering and Raman signals allow indpendent retrievals of aerosol and clouds extinction and backscattering profiles. Authors show that different lidar techniques and different data processing produce different resuts, and in this research advance

Printer-friendly version

Discussion paper

in showing quantitatively how much are those discrepancies. The novelty of this work is then in quantifying the impact of each technique on radiative forcing calculations at TOA and SFC. Due to the large number of backscattering lidar, e.g. MPLNET network uses such systems and very few EARLINET instruments do have Raman lidar during daytime, the results of this analysis are of great interest for the scientific community and valuable for its publication in Atmospheric Measurement Techniques. Neverthleless, I agree with other reviewers that major revisions are needed as the publication suffers from hasty writing and more cases should be considered. Other concerns should be addressed before publication:

MAJOR REVISIONS

1.- I think that a single case thin cirrus cloud is not exhaustive for the analysis. I would rather extend the research at least for three cases: thin cirrus clouds (as already studied) with COD<0.03, Opaque cirrus clouds,with a COD in between 0.03 and 0.3 and thick cirrus cloud case, with a COD>0.3

2.- It comes from the analyis that there is a different behaviour between cirrus cloud and aerosols (cf. fig. 3 and fig. 4) It could be very intresting to add in the analysis cases where there is a simultaneous presence of a cirrus cloud on top of an aerosol layer, like dust or biomass-burning. In those cases it would be interesting to verify if technique or data processing are critical

MINOR REVISIONS

3.- The description of lidar signals and the different ways of resolving the equations should be in a methodology section.

4.- Page 2, line 22: Traditional lidar Raman are expensive but the development of the rotational Raman techniques make it cheaper and improve signal-to-noise. Please include it in your discussion.

5.- Page 2, line 23: The High Spectral Resolution Lidar and Dial techniques should be

commented and cited.

6.- The NASA Aerosol-Clouds-Ecosystems mission does plan to implement a multiwavelength HSRL system in the space allowing retrievals of aerosol microphysical parameters. Please include it in your discussion.

7.- Radiative transfer codes do assume certain aerosol properties for each species. The Fu-Liou-Gu model assumes OPAC aerosol module, which may differ from real measurements. Retrievals of aerosol microphysical properties can improve retrievals of radiative forcing if aerosol effective radius and single scattering albedo are introduced. Please discuss the use of an aerosol model

8.- I agree with the previous referees that the current title does not macth approately with the goal of the manuscript. Please consider to change it.

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

Printer-friendly version

Discussion paper