Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2017-200-RC2, 2017

Atmospheric Measurement Techniques Discussions

Interactive comment on "Comparative assessment of GRASP algorithm for a dust event over Granada (Spain) during ChArMEx-ADRIMED 2013 campaign" *by* Jose Antonio Benavent-Oltra et al.

Anonymous Referee #2

Received and published: 14 August 2017

General comments: This paper presents the comparative assessment of the GRASP (Generalized Retrieval of Atmosphere and Surface Properties) algorithm aerosol optical properties using combined sunphotometer and lidar measurements with other ground-based lidar products and airborne-based in-situ measurement during ChArMEx-ADRIMED 2013 campaign. The second section of the paper is the explanation of Granada site and instrumentation of ground-based remote sensing (sunphotometer and lidar) and airborne in-situ measurements during the campaign. The list of equipment, retrieved/measured optical properties with algorithm characteristics, and its uncertainties are presented with references. The third section is the explanation of GRASP and LIRIC inversion algorithms. Although both algorithms use the information

Printer-friendly version

Discussion paper

of combined lidar and sun-sky photometer measurements, the detailed processes are different and described in this section. The main advantage of GRASP is the simultaneous inversion using 180° backscattering information of lidar and direct-sun and almucantar measurement of sky radiance by sun-sky radiometer. The fourth section contains the comparison results of GRASP and other measurements according to different optical properties: column-integrated properties such as size distribution, effective radii of course and fine modes, volume concentration, refractive indices, and single scattering albedo, and vertically-resolved properties such as volume concentration, extinction and backscatter coefficient profiles, single scattering albedo, and scattering Ångström Exponent. Most aerosol optical properties of GRASP show similar results with other measurements, but also provide different information such as coarse mode shift to higher radii compared to AERONET-only or more information such as profiles of SSA and scattering Ångström Exponent compared to LIRIC.

The paper presents an abundant comparison results of GRASP with other measurement during the campaign, and the results are clear. The scope is well-addressed also, thus I recommend it for publication after the responses for some points listed hereafter.

Specific comments/questions:

1) In section 2.1, the distribution of observation sites or geological map could help to understand geographical conditions although the located information is described in manuscript because the authors explain apparent errors as the different location of measurement sites at some compared aerosol optical properties.

2) In section 2.2 (page 4 line 16), recent AERONET data version is changed from 2 to 3. Although the version of inversion data is still version 2, please notate the data version (i.e. version 2).

3) In section 3, please describe the input and output information of lidar and sunphotometer for LIRIC and GRASP specifically (i.e. which wavelength of sky-radiance of sunphotometer, lidar measurement as input, and which column-integrated/vertical

aerosol optical properties as output).

4) In section 3 (page 5 line 31), Which information of the photometer is provided for lidar retrievals? Please describe “otherwise” (the assumption in lidar measurements) more specifically.

5) In section 4 (figure 1), what is the definition of the lidar range corrected signal? Is it calculated as P*r2, where P is the lidar data (received power) and r is the range?

6) In section 4.1 (page 7 line 11 and 27): the authors mentioned that the wavelength of RRI and IRI from airborne measurement is 500 nm. However, it is not on the 500 nm in the Figure 3. Please clarify it.

7) In section 4.1, which height is represented from the airborne measurement? Would it be possible reason of difference because lidar profile shows different concentration in 17 June?

8) In section 4.1 (page 7 line 32) which wavelength for SSA of “0.80-0.90”?

9) In section 4.2 (page 8 line 30), please briefly describe difference in the method of “Klett” and “GRASP” in terms of lidar ratio (LR).

10) In section 4.2, (page 8 line 39), could you explain why the discrepancies b/w two B-coeffi products are getting larger in longer wavelength although the error range of GRASP B-coeffi profile is smaller in longer wavelength in Granada on 16th June and Cerro Poyos on 17th June?

11) In section 4.3 (page 9 line 12), could you show the error range of SSA profiles from GRASP? It could be useful information to understand this SSA profiles because the AODs of all cases are less than 0.3 and SSA error could be large.

12) In section 5 (page 10 line 20), I agree for the combination of lidar and sunphotometer data in GRASP algorithm can provide improved and more complete data compared to AERONET retrieval. The refractive indices of GRASP show better agreement

with in-situ measurement compared to those of AERONET. However, the column-integrated size distribution and SSA doesn't show any in-situ measurement results together. Could you quantify the improvement in GRASP compared to AERONET measurement?

13) In Section 5 (page 10 line 29-30), please explain which the improvements of GRASP are new and the method of a second sun-sky photometer in your plan. Is the three instruments combination as one lidar and two sun-photometers in GRASP?

Technical correction:

Please check whether the typos I found are correct.

1) In section 2.1 (page 3 line 31) it local sources → its local sources

2) In section 2.2 (page 4 line 20), removing ")".

3) In section 3 (page 5 line 29): lidar "an" sun-sky photometer measurements → lidar "and" sun-sky ..

4) In section 3 (page 5 line 35), please write full name of "CRI" (is it "components of refractive indices"?)

5) In section 5 (page 10 line 29), vaity → variety

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2017-200, 2017.

Printer-friendly version

Discussion paper