

## ***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 #1**

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Review for manuscript Comparative assessment of GRASP algorithm for a dust event over Granada (Spain) during ChArMEx-ADRIMED 2013 campaign. Authors provide comparison of inversions of lidar and sun photometers observations using three different algorithms: LIRIC, GARLIC, AERONET operational algorithm, and demonstrate that results are similar. Such comparison is useful, showing that approaches are consistent. On another hand, similarity in results is hardly surprising, because all three algorithms are based on the same principles. Possibility to use two sun photometers at different heights is interesting, because it helps to analyze possible biases due to geometrical overlap effects. I think manuscript can be published after some revision.

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Discussion paper



General comments The main question is what we can conclude from this comparison? Authors write: “Results obtained here show that the combination of lidar and sun photometer data can provide improved and more complete column-integrated data compared to AERONET retrieval.” I think this statement is unsupported. The difference between methods is inside the inversion uncertainty. This is just comparison and can not be considered as validation. In conclusion they write: “As a future outlook, it will be of great interest to expand the present analysis covering different scenarios including a major variety of aerosol types and loads during campaigns with airborne measurements in order to validate the new improvements”. Yes, it is always useful to consider more situations; still it is not validation. Expected advantage of combining lidar with sun photometers is ability to profile intensive particle properties, such as effective radius, refractive index, Angstrom exponent. Authors provide profiles of volume and backscattering, so it is difficult to conclude if they observe height dependence of intensive parameters. Authors write “For 17th June, vertical profiles of SSA are sensitive to the different aerosol layers with different aerosol types illustrating the capabilities of GRASP for detecting different aerosol layers with different composition.” But from fig.7, 8 I can conclude in the height range  $\sim 1.8 - 2.7$  km backscattering is very low, so variation of SSA in this range is probably just artifact. The same is true for fig.9, variations of AE in this range are probably not real. Do authors have depolarization measurements? Height variation of particle depolarization ratio could provide some information. Specific comments 1. Fig.3. In Granada imaginary part has spectral dependence typical for dust, while In Cerro Poyos no. Why? PSD look similar. Is it possible to provide vertical profile of imaginary part? 2. Information about airplane measurements would be useful. Did it ascend by spiral? How much time did it take for one vertical profile? 3. Fig.6, 17 June, Granada, 355 nm. Why Klett is not given for  $\sim 1.8 - 2.5$  km? If it is 0, it still should be shown. Why Klett at 355 is not shown below 1.6 km while Grasp retrievals are given? The same questions are for Cerro Poyos. 4. References take about 50% of the text volume. Probably too much.

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