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Interactive comment on "Mediterranean desert dust outbreaks and their vertical structure based on remote sensing data" *by* A. Gkikas et al.

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General comments

This paper aims to provide a description of the vertical structure of the intense Mediterranean dust outbreaks. It is clearly written, the overall presentation is well structured and clear, and the paper addresses scientific questions fully within the scope of ACP/AMT special issue on ChArMEx. Generally the analysis is interesting but it appears that the use of CALIOP-CALIPSO data set to describe the vertical distribution of dust events, with an extended spatial coverage over the Mediterranean area, is the main new contribution of the paper.

As extensive research has been carried out on Mediterranean dust outbreaks, based on ground-based (AERONET) and satellite observations, the paper should be more focused on what is really new in the data set and associated analysis. For example

the analysis presented in Section 4.1. (2-D geographical distributions of desert dust episodes frequency and intensity) is not fully novel as nearly all the conclusions have been already reached in Gkikas et al. (2013). Even if the period of study is extended and the identification of desert dust method slightly improved (use of both MODIS-terra and Aqua, QA-weighted level-3 data, threshold on cloud fraction), the modifications are relatively minor. The main novel aspect of the paper is the analysis of vertical structure of the intense desert dust episodes with CALIOP, so I suggest to emphasize this part of the paper. In the present paper only two figures are related to this aspect.

It is surprising that section 4.2, which is centered on the evaluation of the satellite algorithm (combining MODIS and TOMS/OMI) against AERONET and PM10 measurements represents the longest part of the paper. The analysis and results are interesting but they seem quite disconnected to the main topic and objective of the paper, i.e. vertical structure of intense dust outbreaks, as stated in the abstract. In other words, a lot of effort (and figures) is put in certifying the ability of the satellite algorithm to identify desert dust episodes although it is not clearly announced as a main objective of the paper.

In order to clearly reflect the contents of the paper, the title should indicate that analysis focus on intense desert dust outbreaks. I suggest: "Mediterranean intense desert dust outbreaks and their vertical structure based on remote sensing data".

My recommendation is to publish this paper after some appropriate changes: (i) taking into account the fact that too much conclusions are identical to Gkikas et al. ACP 2013 in sections 4.1 and 4.2 (despite the slight modifications regarding methods, time period, and sensors) and (ii) reinforcing analysis on its main objective and scientific interest, i.e. analysis of CALIOP vertical distributions of intense desert dust events in section 4.3.

Specific comments 1. P 27682, lines 21-22: "The main target of the present study is to describe the Mediterranean desert dust outbreaks' vertical structure over the period

from March 2000 to February 2013." This sentence should be reformulated since the analysis of CALIOP retrievals presented in section 4.3. cover the period 2006-2013. 2. In section 2.1.2 EP/TOMS and OMI-AURA, the period considered for each satellite data as well as their respective spatial resolution should be provided. 3. Figure 1 of the paper has already been published in Gkikas et al., ACP 2013 (figure 2). 4. Figure 7: it is not necessary to provide results for both MODIS-Terra and Aqua, as they are very similar. 5. Results presented in Table 2 and page 27701 lines 20-24 are not clearly described.

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