We would like to thank the Reviewer for his/her comments (in italics) to which responses are provided below.

The main concern of the Reviewer is the absence of clear evidences for the diversification of the present paper and algorithm by those of Gkikas et al. (2009, 2013). Therefore, an effort was made: (i) first to further diversify the existing paper from the previous ones and (ii) to make clearer in the manuscript and to the reader the already existing differences in the original manuscript.

"*The paper is clearly written and previous works on the paper's subject have been accounted for. However, I believe that main paper results have already been reported in Gkikas et al., 2013, as one can observe by comparing the summary of the submitted manuscript with the one of Gkikas et al., 2013. Therefore the paper is not suitable for publication in ACP. Indeed, an updated version of the algorithm introduced in Gkikas et al. (2009, 2013) for the identification of strong and extreme desert dust episodes, over the period March 2000–February 2013, was applied in the submitted manuscript.*"

We acknowledge that there some similarities between the present geographical distributions of desert dust (DD) episodes' frequency and intensity, in sub-section 4.1, and the corresponding ones in the work by Gkikas et al. (2013). However, it should be noted that despite the apparent similarity, there are differences, and more specifically:

(i) In the present study, the satellite-based algorithm is applied over a more extended time period (almost double). We believe that this is important because it confirms the dust episodes regime across the entire Mediterranean basin. Even if this may seem trivial, it is not so, since the work by Gkikas et al. (2013) has been the first, yet the single one to date, which appropriately described this regime, at a complete spatial coverage. Therefore, basically it was not guaranteed that the regime could not change over the time, which is proven by the obtained results in the present paper.

(ii) In the present revised manuscript, apart from the methodology presented by Gkikas et al. (2013), we have also applied another one. This methodology, referring to the identification of dust outbreaks, has been proposed by the Reviewer 4, and the obtained results with the two methodologies are compared to each other. This intercomparison is presented in the revised manuscript and constitutes another novelty.

(iii) In addition, a few other points make the difference between this and our previous works. Thus:

  (a) the evaluation of the satellite-based algorithm is largely improved in terms of robustness by: (1) considering much more, actually all the currently existing AERONET stations within the study region, and (2) using more aerosol optical properties.

  (b) issues related to the MODIS Level 3 AOD sub-grid spatial representativeness and homogeneity, affecting the agreement between MODIS-AERONET AODs, are accounted for and addressed in the present study (Figure 5).

  (c) the comparison of the satellite algorithm's outputs against ground PM_{10} data is more detailed here (e.g. success scores, dust contribution, mean and median levels are reported) than in Gkikas et al. (2013).

  We would like to clarify that the main objective in the work by Gkikas et al. (2013) was the description of the intense Mediterranean desert dust episodes' regime. More specifically, their main characteristics, namely their frequency of occurrence, intensity and duration, were presented therein at different temporal and spatial scales. On the contrary, the main

objective here is the description of the dust outbreaks' vertical structure. This is achieved through the implementation of the CALIOP-CALIPSO lidar profiles.

For all these reasons, we believe that the present revised paper is a significant improvement and extension of that by Gkikas et al. (2013).

"*Moreover, for the identified DD episodes, collocated CALIOP-CALIPSO vertical feature mask and total backscatter coefficient retrievals have also been considered in the submitted manuscript, to describe the annual and seasonal variability of dust outbreaks' vertical extension over the Mediterranean. However, CALIOP-CALIPSO data have not been well exploited. Consequently, the results reported in the manuscript have not added any new scientific result with respect to the ones reported in the many references cited in the manuscript. To my opinion, CALIOP-CALIPSO data could have been used, for example, to understand the weak correlation AOD-PM. Note that quite often dust particles remain confined above the PBL and consequently do not affect the PM at the ground level.*"

Please, note that in the revised version of the manuscript we have added a new section (Section 4.4 and Figures 11, 12, 13) in which the issue raised by the Reviewer is addressed. In this new section, we identified specific desert dust outbreaks of various geometrical characteristics for which our algorithm's outputs, ground PM_{10} concentrations and CALIOP-CALIPSO lidar profiles are all together available concurrently. The objective of this new analysis is to investigate how the dust outbreaks' vertical distribution, i.e. their height and vertical extension, can affect the level of agreement between columnar AOD retrievals (MODIS) and ground PM_{10} concentrations (this was actually suggested by the reviewer, in last paragraph of page C9471 of his Review). There are four such studied dust outbreaks that took place in Censt (southern Sardinia, 26th May 2008), Els Torms (NE Spain, 16th July 2008), San Pablo (central Spain, 12th September 2007) and Agia Marina (Cyprus, 25th February 2007). We believe that describing such dust outbreaks' vertical structure, through the simultaneous implementation of both active and passive satellite retrievals, as done in our analysis, provides essential information, similar to that acquired by ground lidar stations. Nevertheless, the satellite-based approach adopted in our study has the great advantage of extended spatial coverage in contrast to the local-scale ground-based lidar profiles. Even so, such ground-based lidar aerosol profiles are not common, and in the Mediterranean basin come from the EARLINET network which encompasses only a few stations, all of them north of 40^{o} N. Therefore, there is an entire information gap for the southern parts of the Mediterranean basin, i.e. near to the major dust sources, of course not to mention the similar gap in northern areas as well. This gap can only be fulfilled by reliable satellite observations, in the way done in the present analysis (Figures 9 and 10 of the revised manuscript).