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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "The regime of desert dust episodes in the Mediterranean based on contemporary satellite observations and ground measurements" *by* A. Gkikas et al.

**Anonymous Referee #2**

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In this study the desert dust regime is analyzed based of ground truth data and remote sensing tools for seven consecutive years. The study is good giving some new results on both the spatial and temporal variability of strong and extreme dust events. However, the manuscript is too long with 1-2 sections that are strongly suggested to be omitted, the one dealing with the trend on intensities and frequencies of DDs and the second dealing with back-trajectories to try and explain the origins of the hot spot of the extreme events. Consequently, I consider this paper as deserving its publication in ACP but only after taking into consideration the following comments:

1)Line 97:Tropical Atlantic Ocean is by far more affected by Saharan dust (see paper



JGR of Moulin, 1998) 2)Line 183: The daily temporal resolution is fine for a climatological based study but might be too coarse for case study analyses of DDs - pls comment on this issue. 3)Line 187:Retrieval of AOD over arid regions is by using the deep Blue MODIS, however, it could not be used here.How this drawback is compensated? 4)Line 226:Is the fact that the mean annual cycles of AI products derived from Earth Probe and OMI enough to legitimate using them as a consistent and homogeneous data base? 5)Line 232:The author should give an argument for the adjustment made on AI values of OMI-Aura. 6)Line 235:How the 21 surface PM sites were defined as background sites? 7)Line 237:Surface PM data measurements are missing over the most dust polluted regions, i.e., the North African Coast and the Middle-East. This is especially important for extreme DD episodes as shown in Fig.5(ii) Please comment. 8)Line 243:Is precision and accuracy of real-time instruments consistent with the gravimetric measurements? 9) Line 371:The distribution of the surface stations are biased with a denser coverage over the western basin. Please comment how this might affect the results. 10)Line 413: The poor correlation obtained for the summer should be expressed as a hypothesis. 11) Line 479: Could the authors argue please on this increasing south-to-north gradient of DD episodes frequency? 12) Line 566: This result showing a maximum frequency in strong DD episodes in the spring is not fully consistent with Dayan et al. (2008) who classiïňĄed the synoptic systems dominating the EM region in observed dust-days for 37 years. They found that $\sim$ 60% of the dust yield was observed in Feb-Mar., generated by Cyprus Lows. - Please discuss the possible reasons for this discrepency.

Ref: Dayan U, Ziv B, Shoob T, Enzel Y (2008) Suspended dust over Southeastern Mediterranean and its relation to atmospheric circulations. Int J Climatology, 28, 915-924. 13)Line 648:As regarded to the trend in DDs frequency:Due to the large interannual variability and the rather short record, it is suggested to express this trendline with reservations, if at all. 14) Line 665-698:The relationship between the NAO and DD episodes should be checked for each sub-basin separably for the following reasons: Moulin et al. (1997) found that the interannual variations in dust transport

over the Western Mediterranean is well correlated (R = 0.66,p = 0.027) with the NAO index during summertime. They explained this positive correlation by the frequent passage of cyclones sweeping the western basin during positive phases of the NAO and mobilizing dust from North Africa. Contrary to this finding over the western basin, Dayan et al. (2008) presented evidence on the role of the negative phase of the NAO in controlling dust transport during winter to the Eastern Mediterranean. Moreover, in another study, Avila and Roda (2002) could not ïňĄnd any correlation between the NAO and wet deposition of African dust over a rural western Mediterranean site in north-east Spain. They suggested that contrary to the Eastern Mediterranean, the two variables controlling wet deposition over the Western Mediterranean vary in an opposite direction with respect to the NAO, i.e., precipitation inversely and dust updraft directly, therefore, cancelling each other effects.

Ref: Avila A, Roda F (2002) Assessing decadal changes in rainwater alkalinity at a rural Mediterranean site in the Montseny Mountains (NE Spain). Atmos Environ 36:2881–2890. 15) Line 700-717:It is suggested to omit this section due non-significant trend and the short record of data. 16) Line 718-768: As regarded to the author's attempt to trace the origins of the DDs: As the authors stated DD events extend to wide areas. Since the HYSPLIT Model is very sensitive to the location of the receptor, it is not surprising that the superposed trajectories figure is complicated and not very representative. The authors should consider omitting this whole chapter.

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