

Review report egosphere 2023-1749

The current study examines the meteorological drivers favored the occurrence of dust outbreaks in the western Mediterranean during winter periods over recent years (2020-2022). In winter, the occurrence of dust episodes is more common in the central/eastern Mediterranean in contrast to the western sector. The authors analyze/present a variety of reanalysis and observational datasets (observational, reanalysis) towards reaching to their goal. I have some concerns about the datasets which are utilized. Despite this, I believe that it is very interesting and constructive study, and it can be accepted for publication after revising the manuscript based on the following comments/suggestions:

1. **Page 6 – Line 12:** Why are you using the MODIS Collection 6 data and not those of 6.1?
2. **Page 6 (Line 24) – Page 7 (Line 5):** It would be useful here to elaborate how much your results are affected by “mixing” two different CALIPSO versions. I would remove Level 2.5km from the text because it is confusing (Level 2 – 5 km resolution along the satellite track).
3. **Section 2.2:** Can you explain why you are not using a more updated reanalysis dataset providing numerical products at finer spatial resolution (e.g., ERA5, GDAS)? I think that this is a very important issue since atmospheric patterns (not evident in the coarse NCEP/NCAR reanalysis dataset) can be revealed.
4. **Page 7 – Lines 18-19:** Can you rephrase this sentence? It is not so clear.
5. **Page 8 – Lines 11-12:** Do you mean the low-level jet or there is mistake in the pressure levels?
6. **Page 12 – Lines 1-16:** The authors state that they are processing the MODIS L3 AOD data. Which data are used exactly (daily or monthly)? Can you comment (show) how cloud contamination can “impact” your results considering that the analysis is representative for winter months? Have you checked the temporal availability of the MODIS data? I assume that due to extended cloud coverage there will be gaps throughout the study period. If so, this might have impact on the calculation of the mean and standard deviation values.
7. **Page 13 – Lines 4-17:** It would be useful to discuss further the maximum occurrences recorded in February 2016 and 2017. How much different was the atmospheric circulation in the aforementioned months? Are there other factors which can explain these maximum frequencies?
8. **Page 16 – Lines 13-14:** How much different are the atmospheric patterns presented here with those discussed in previous relevant studies?
9. **Page 16 – Lines 14-17:** I would propose to rephrase these sentences to be consistent with the relevant figures. What do you mean four concatenated cut-off lows? How are you excluding the possibility of a persistent low-pressure system? I would suggest discussing more the position and the strength of the anticyclones as well as the convergence zones.
10. **Page 17 – Lines 4-5:** Can you please rephrase this sentence?
11. **Figure 4:** It seems that between the clusters 1 and 2 many similarities in spatial terms exist and there are deviations on the relative frequencies. Nevertheless, this is not the case for the clusters 3 and 4, as already stated in the manuscript. Can you please interpret the observed inconsistencies?
12. **Figure 5 and the relevant discussion:** The authors state that “...that some WRs do not have a direct apparent correspondence with the clusters of Figure 4 (e.g., GL, ZO)”. I am confused with this part of the study. How much can affect this inconsistency the connection between the patterns that you have obtained from the cluster analysis and the weather regimes of Grams et al. (2017)? If I am not missing something, in the latter study it is not considered the dust transport from N. Africa towards the region of interest.
13. **Page 20 – Lines 1-4:** It would be easy to reproduce the maps with winds at 10 meters in order to check in which regions the wind speeds exceed the thresholds.
14. **Page 20 – Lines 6-7:** I would remove or rephrase the ‘...before being absorbed by the general circulation.’
15. **Section 4:** Please consider splitting this section in “Discussion” and “Conclusions”. Also, I believe that the part of the text after the bullets can be reduced by summarizing the main findings and outcomes.