

Comments on the “Radiative cooling and atmospheric perturbation effects of dust aerosol from the Aralkum Desert in Central Asia” by J. R. Banks et al.

With the help of COSMO-MUSCAT model and a series of sensitivity experiments, the authors investigated the DREs and atmospheric perturbations of dust aerosols from the Aralkum Desert. The topic is relevant, the methodology is well established, and the datasets are frequently used in other studies. However, due to the issues listed below, I recommend a major revision before the manuscript is acceptable for publication.

Major issues:

1. The authors found that, on the yearly timescale, the net surface DRE is $-1.34 \pm 6.19 \text{ W m}^{-2}$, of which $-0.15 \pm 1.19 \text{ W m}^{-2}$ is from the Aralkum dust. Moreover, in the atmosphere, the yearly DRE is $-0.62 \pm 2.91 \text{ W m}^{-2}$ and $-0.05 \pm 0.51 \text{ W m}^{-2}$ comes from the Aralkum dust. As you can see, the uncertainties (the authors did not introduce what are the meaning of uncertainties either) are generally larger than the average state by one order of magnitude, making it difficult to determine whether the dust is cooling or warming the land surface/atmosphere.
2. The general finding from this study is that the Aralkum dust is cooling both the land surface and the atmosphere on the yearly timescale. Many previous studies argued that dust aerosols heat the atmosphere, at least in the aerosol layer. The findings in this study are new, however, the authors did not provide a clear explanation for their novelty.
3. The English in the manuscript needs significant improvement. There are many instances of English misuse, particularly with numerous long sentences and dependent clauses, making comprehension very difficult.

Minor points:

1. L66: The section title is too long, think about shortening it.
2. L74: Could you show DUBLT domain also in Figure 1, as it was mentioned multiple time in the manuscript and is supposed to be important to understand the results.
3. L172: In Figure 3a, the author are comparing simulated DODs to MODIS AODs, which are two different variables.
4. Figure 3: What are the black and green points in Figure 3 a, c, e, and g? The black points in Figure 3a should not be CERES. What is the RMSD? The Bias and RMSD should have a unit.
5. L181: “7.51 and 5.22 Tg”, from which plot those two values are obtained.
6. Figure 4: You need to indicate the black and cray points as a legend in the plots so that audience can clearly notice the differences.

7. L213: What is “SKT”?
8. L226: panel (i) -> Figure 6i
9. L227: panel (j) -> Figure 6j
10. Figure 6: Suggest removing the black grid lines or using a light color, which obscure the shading plots. Also for Figure 7 and Figure 10.
11. Figure 7: I am completely confused by this plot. For example, what are panels a to c, and what are panels d to f. Is the colorbar "present DOD at 550 nm" for (a) to (l), while colorbar "present-past DOD difference" is for (m) to (x)?
12. L268: “0.25-0.32 ($10^{-0.6}$ - $10^{-0.5}$)”, which is not understandable.
13. L403: “as much as -0.72%”, is this significant?