

Interactive comment on “Interaction of Dust Aerosols with Land/Sea Breezes over the Eastern Coast of the Red Sea from LIDAR Data and High-resolution WRF-Chem Simulations” by Sagar P. Parajuli et al.

Sagar P. Parajuli et al.

psagar@utexas.edu

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We are very much grateful to the reviewer for providing expert insights on our paper. We welcome all the comments and will incorporate them into our revised manuscript. A summary of our response is presented below.

We thank the reviewer for providing us examples of previous studies on vertical aerosol profiles using LIDAR data. We have compiled an extensive review of studies using LIDAR from satellites, field experiments, and networks, as suggested, which will be

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included in the revisions. We are far not the first who employ lidar observations for dust profile analysis. However, we would like to highlight that there are no other such studies in the Red Sea coast region. Our research is essential because the presence of breezes over the Red Sea coast affects aerosols' vertical distribution.

We agree that the paper needs better organization, especially the section on conclusion/discussion, which was also pointed by reviewer #1. We also agree that a separate model validation section is preferable. We also recognize that it is more appropriate to use the term 'annual study' than climatology since we only use 2-year data. Regarding cloud contamination in the MPL retrievals, especially at 6-7 km height, it is an essential point because thin clouds can undoubtedly affect the retrievals, and clouds can be confused with aerosols. Even with superior cloud-filtering techniques, we cannot get rid of this problem entirely because, in many cases, clouds and aerosols tend to occur 'together,' especially during large-scale dust events (e.g., during haboobs). Therefore, we agree that some cloud contamination is possible, but we believe that it would not be too much to misidentify a whole aerosol layer. The model does show aerosol layers at that height during the large-scale dust storm (case study). We will be happy to double-check the performance of the GRASP algorithm on cloud screening to ascertain this.

Regarding the PBL height comparison between MPL and model, we have presented the actual model-simulated PBL heights in the supplementary information. In the observations, the PBL height can be taken as the top of the aerosol layers, consistent in MPL and model aerosol profiles (Figure 8).

We will incorporate all other suggestions provided by the reviewer in our revisions. We thank the reviewer again for giving constructive and thoughtful comments.

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