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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A Global Analysis of Dust Diurnal Variability Using CATS Observations" *by* Yan Yu et al.

Anonymous Referee #2

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This paper deals with the diurnal variations of dust using measurements from the CATS lidar that operated on International Space Station between 2015 and 2017. The manuscript is a revised version of an earlier submission to ACPD. The primary problem with that submission was that the authors did not address the substantial difference in the CATS lidar calibration from daytime to nighttime that is known to exist. In the current version the authors have attempted to address this issue by analyzing the daytime and nighttime variations in local time separately. This is not quite a satisfactory way of dealing with the problem. Thus no attempt has been made to disentangle the daytime variations from the large uncertainties (∼21%) in total attenuated backscatter coming from the large daytime calibration uncertainties. This may complicate interpretations of the variability with low dust loadings, for instance over North America as well as in

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the southern hemisphere. Also they continue to use the quality unassured and sparse AERONET nighttime data to assess CATS day/night data quality. In any case the current version has improved particularly in terms of including data from CALIOP as well as providing vertical and seasonal information of the variations and including wind data to interpret the dust loading. They have also revised the manuscript in the light of other comments from the referees on the previous version. The paper is within the scope of Atmospheric Chemistry and Physics and should be useful to the community interested in dust variability using satellite measurements. I have a few minor comments on the current version.

1. There are some significant differences between the CATS plots of seasonal DAOD in Figure 2 and supplemental Figure 3. For example, note the high DAOD values of ∼0.2 over the biomass burning areas in southern Africa in JJA in the supplemental Figure 3, which are not there in the corresponding plots in Figure 2. If this is due to the standardization applied to Figure 2 then it should be made clear in the text in section 3.2. I do not see particularly high values of DAOD in the corresponding CALIOP 532 nm plots either for 2015-2017 or 2006-2017. The authors have used dust as well as mixture of dust with smoke or marine aerosols, i.e polluted dust and dusty marine in CALIOP terminology. On the other hand they have used only “dust” from CALIOP dataâĂŤcould this be making any difference in these plots?

2. Does Figure 2 include data from both day and night?

3. Lines 119-120: this sentence needs to be rephrased, may be replacing “According to . . .modelling results” by “For example,..” and giving the link to the browse image rather than just giving the NASA center name : https://cats.gsfc.nasa.gov/data/segment_detail/330280/

4. There are some inconsistencies between the text (lines 321-323) and the plot numbers referred to.

5. Line 297 and supplemental Figure 5: please specify the CALIOP wavelength used

in this Figure —is it still 532 nm?

6. In Figures 10-13, the number of CATs overpasses within each time window is shown at the bottom of the bars but is barely visible. Please increase the font size or use bold.

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