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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Detection of dust aerosol by combining CALIPSO active lidar and passive IIR measurements" *by* B. Chen et al.

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We are very appreciative of the reviewer's thorough review of the paper and recommend to "accepting". Our point-by-point responses to the comments (italics) made by the reviewers are as following.

-It is a good idea to combine CALIOP and IIR and the A-train satellites to identify the dense dust aerosol since it has a significant different IR properties comparing with clouds. The detail method and the algorithm with error analysis are presented. This new method can improve the classification made only by the CALIOP CAD method especially over the dust source region. This manuscript is well constructed and the equations are well stated. I recommend the acceptance of this manuscript after the revision is made.

Specific comments:

- Page 3427 line 16 : "...launched early in 2006..." Actually CALIPSO and CloudSat was launched by the same vehicle.

The sentence "...launched early in 2006..." has been replaced by "...launched on April 28, 2006..." in this revision.

-Page 3428 line 12 : "...for one CALIOP pulse are below 0.6 km" I prefer "profile" instead of "pulse".

The "pulse" has been corrected by "profile" in the revision by following reviewer's suggestion.

- Page 3429 line 2 : "Such wind speeds are sufficient to produce and support dust storms." Could you please give a reference here?

On the basis of field observation at Taklamakan, Chen et al. (1995) (Chen W.,et al.: The threshold wind velocity in the Taklimakan Desert, Acta Geographica Sinica, 7, 361 -367, 1995. (in chinese)) concluded that at the height 2m above ground surface, the instant fluid and impact threshold velocities are 6.0 and 5.0 m/s, respectively, while at the height of anemometer tower (11.4m above ground surface) is 7.8 and 6.63 m/s, respectively. So as our paper denoted that such wind speeds are sufficient to produce and support dust storms. The reference paper has been added in revision.

-Page 3429 line 8 "...feature mask (FMK) derived ..." In the figure 2c, in the plot you use "VMF". The caption you use "VFM". Do these three have the same meaning?

They are all the same meaning. "VMF" have been removed in whole paper, and "FMK" has been used in whole paper, including: text, figure and figure caption.

-Page 3431 line 19 : "... is the layer-integrated 1064 to 532-nm volume color ratio" Is this a "layer mean attenuated color ratio"?

Yes, it's mean "layer mean attenuated color ratio".

-Page 3431 line 22 : "...the layer-integrated perpendicular-to-parallel 532-nm attenuated backscatter at depolarization ratio." What does this mean?

his means "the depolarization ration (layer-integrated perpendicular-to-parallel 532-nm attenuated backscatter)". We have corrected it in revision.

-Page 3432 line 9 : "Figure 5 shows a flowchart of the CLIM method " Is this only for "single-layer"? if so, please make it clear and also in the fig.5.

The Fig. 5 is a flowchart that detect dust aerosol in a segment by using CLIM method. As the flowchart showed, we first identify and test whether all feature mask in a segment are single layer feature or not? IF so, the CLIM method will be used.

-Page 3435 line 11 : "The highest dust aerosol altitude was 6 and 8 km for the V2-CAD and CLIM method, respectively. The CLIM method, however, showed more dust and greater backscatter between altitudes of 1.8 to 6 km." I see the high occurrence in (a) and (b) is from 2 km to 4 km. it doesn't show any information about backscatter coefficient of dust aerosol. In this fig, you have selected the profile which elevation is below 3km. will this bias your statistics? Same criteria also used in fig 10 and fig 11.

"The highest dust aerosol altitude ..." means the highest altitude where dust aerosol can extend and doesn't mean the altitude where the highest occurrence frequency of dust aerosol exists. The highest occurrence frequency of dust aerosol in (a) and (b) is from 2 km to 4 km as reviewer mentioned. The coefficients of the CLIM method are only used in the Taklamakan where the elevation is mainly below 3 km. There are a little of differences from comparison the statistics results of spring 2007 and 2008, so it doesn't bias the statistics.

-In fig 9 (b), what happened that there are very high occurrence from 3 to 6 km (the values are almost 1, red color)?

There is one of heavy dust occurrence regions where the V2-CAD method considers the feature layers as cloud and the CLIM method has corrected. So the dust occurrence

obtained from CLIM method is higher than V2-CAD method.

-Page 3436 line 9 : typo "1064/532-μm". It should be nanometer. Please find others.

This is true and we have corrected in the revision.

-Page 3435 line 25 : "Figure 11 presents the vertical profiles of regionally averaged dust lidar parameters..." How many profiles are used for averaging? Since the attenuation in each height for different profile is different, is this meaningful to average attenuated backscatter profile? I prefer average the extinction profiles.

There are 3914 segments (about 3914*3 lidar profiles) for V2-CAD method and 6811 segments (about 6811*3 lidar profiles) for CLIM method averaging. For comparison the relative difference of results obtained by the V2-CAD with CLIM method, we just average attenuated backscatter profiles in each height and the mean attenuated backscatter profiles difference can correspond with the extinction profiles difference.

- In fig 11b, Is this depolarization ratio the "volume" or "particle"? Please make it clear.

The depolarization ratio is particulate and has been denoted in the final manuscript.

-Since you use the daytime CALIOP data, is the signal-to-noise ratio sufficient for your data analysis?

The signal-to-noise ratio should be sufficient for our data analysis. The aim for our paper is to develop a new method that detect dust aerosol by using the processed data and feature mask data by CALIPSO process team, and compare the relatively statistical result by the CLIM and the V2-CAD method. We think that signal-to-noise ratio is sufficient for our data analysis.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 3423, 2010.