

Interactive comment on “Enhancement of aerosols in UTLS over the Tibetan Plateau induced by deep convection during the Asian summer monsoon” by Q. S. He et al.

Q. S. He et al.

ccli@pku.edu.cn

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Dear Referee,

Our manuscript acp-2013-860 entitled " Enhancement of aerosols in UTLS over the Tibetan Plateau induced by deep convection during the Asian summer monsoon" has been revised according to your comments. We appreciated your suggestions and endeavor. Two new figures and more statements about the comparison of MPL with CALIOP and the reason of the continuous lidar observation split into two stages were added to the manuscript to support the conclusion. In particularly, the aerosols in UTLS

C2297

influenced by Nabro volcano eruption were considered in this study and therefore the title of the manuscript is also changed to "Lidar-observed enhancement of aerosols in UTLS over the Tibetan Plateau during the Asian summer monsoon". Almost all your suggestions have been incorporated into the revised paper with the major revises highlighted. In the following, we will give an item by item response to your comments.

Best wishes. Qianshan He

Referee report This paper presents some continuous lidar measurements of aerosol profiles at a meteorological station over the Tibetan Plateau during August 2011. It is found that a maximum aerosol layer persistent above the tropopause and is anti-correlated with the tropopause temperature and satellite-derived OLR values. By this, the authors concluded that the aerosol layer is resulted from deep convection over the Tibetan Plateau during the Asian summer monsoon. This is a very interesting work and should be publishable in ACP if the following issues are addressed in the revised version.

1. The paper (Figure 2) shows that the day-to-day variations of the maximum aerosol extinction coefficient in 12 days are anti-correlated with the tropopause temperature, how are about the data between 12 Aug. and 22 Aug.? R: We appreciated the reviewer's suggestions and endeavor. More explains are added in the 3rd paragraph of Section 3, as follow, Between the two stages, the existence of low clouds decayed the lidar signal to the extent that no available aerosol layer observed in UTLS. Additionally, some cases with cirrus in upper troposphere might increase the retrieval error of extinction coefficient of above aerosol layer, which are also removed from the dataset.

2. The authors indicate that OLR values less than 200 Wm^{-2} are indicative of deep convection, but only OLR values larger than 200 Wm^{-2} are shown in Figure 4. How can we know that deep convection actually occurred in those days? Please also provide more evidence to show such an aerosol layer is absent if no deep convection occurred. R: In fact, the aerosol layer was always maintained in UTLS throughout the

C2298

whole August due to the Nabro stratovolcano erupted on 13 June 2011, which injected plenty of SO₂ to the upper troposphere, resulting in a large aerosol enhancement in the stratosphere as pointed out in the newly manuscript. OLR value, as an indicator of the organized deep convective activity in the troposphere, can also characterize the intensity of convective activity. Here we want to indicate that the increasing convective activity lift air of source regions to enhance aerosol layer in UTLS.

3. The aerosol data are obtained in cloud-free days, but OLR data reflect cloud top heights, how these two datasets are correlated? R:As pointed out in Section 2.3, the horizontal resolution of OLR is 2.5° by 2.5°, while the lidar is located on single point. The clouds in this rectangle region of 2.5° by 2.5° might provide available OLR data, which can be used to stand for convective activity near the lidar site.

4. The manuscript is generally well rewritten, but there are many wording or typo errors. The authors should check the whole text carefully. R: We appreciated the reviewer's suggestions and endeavor. We have improved the presentation through the manuscript.

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/14/C2297/2014/acpd-14-C2297-2014-supplement.pdf>

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 3169, 2014.