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Atmospheric Chemistry and Physics Discussions

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.

Anonymous Referee #2

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This paper examines lidar measurements at a meteorological station over the Tibetan Plateau during August 2011. A distinct aerosol layer in the UTLS above the tropopause is observed. The temporal variations of the aerosol layers are found to be correlated with the changes of deep convection strength. The authors conclude that deep convective transport is the primary mechanism for the enhancement of aerosols in the UTLS over the Tibetan Plateau.

While the suggested mechanism is very plausible, the supporting evidence based on very limited measurements does not substantiate the conclusion. I suggest the authors address my major concerns listed below before a publication can be considered.

1. Quality of the aerosol measurements by the Micro Pulse Lidar: A comparison of the surface lidar measuremnts with NASA CALIPSO measurements will help to validate your observations.

2. The correlation with convective indices: the authors used Tropopause temperature and OLR as two indices for deep convection strength. However, the samples are so limited ($\sim$12) that the correlations do not appear robust. For example, Figure 4 breaks up the 12 samples into two groups. The two separate correlations are high but the overall correlation for all 12 cases is very low. The authors explained the separation as two convective events although no evidence is provided how these two events are different. I suggest additional analysis of surface emission and low and mid-tropospheric cloud and aerosol conditions for the two events should be conducted.

3. The hourly variations of nigh-time aerosols: the authors showed that the night-time aerosols peak around mid-night and claimed this is a further proof of convective influence on the UTLS aerosols. I found this quite speculative. The paper by Nesbitt and Ziper (2003) discussed the development of MCS through the night over ocean. Over land, rainfall cycle shows a maximum in the afternoon and a slowly decreasing trend through midnight. I suggest the authors look for further evidence of convective intensity change at night time. A possible source is the 3-hourly brightness temperature data from ISCCP, which will provide a diurnal variation of convective strength. TRMM precipitation may be useful, too, but I am afraid some deep convection systems do not produce rainfall over the Tibet.

4. To discount the other mechanism regarding the enlargement of pre-existing aqueous solution droplets, the authors imply there is a threshold value of water vapor for such aerosol growth. What is the threshold value of water vapor? The Vasisala radiosondes have a known low bias of water vapor mixing ratio in the UT. They don't provide a rigorous test of the "growth" theory.

The paper is generally well written, but there are a number of grammar errors, which

I will defer to the second review if a revised manuscript is submitted and all the major concerns are addressed adequately.

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