Response to Short Comments by W. Guo

General Comments

This paper utilized the multi-year ERA-Interim reanalysis data to examine and characterize the NLLJs over the Taklimakan Desert. Convective boundary layer (CBL) height and the magnitude of the momentum were investigated that allowed the authors to study the possible effect of NLLJ on dust emission. The relationship between satellite-derived AOD and low-level wind speed was further analyzed in order to demonstrate the importance of NLLJ on dust emission over the TD region. This is an interesting study. The manuscript is well written, logically structured and fits within the scope of ACP. I recommend it for publication after the following comments are well addressed.

Response: We thank W. Guo for his constructive comments on this manuscript, which are very helpful for us to improve our paper. Our responses to the specific comments are presented below.

Specific Comments

The authors shown a roughly positive correlation between wind speed and AOD over the TD region in figure 2 and later stated that an enhancement of wind in lower atmosphere will be associated with an increase of AOD (L. 367-368). This is reasonable for the dust source regions, while it also means any mechanism (e.g. cold front in spring) that can cause a strong surface wind could obscure the direct link between AOD and NLLJs. The author claim that this risk is avoided (L. 370), could you show some evidence?

Response: Thanks for this comment. It is true that large surface winds, which may be caused by different mechanisms, can always induce an increase of AODs. We did a composite analysis with all time-matched AOD and wind profile data. As shown in the following figure, significant enhancements of wind speeds in the lower atmosphere are obvious in all seasons. After selecting the data with the appearance of NLLJ, high dust loading dose not significantly correlate with an increase of wind in Spring and Winter shown in the Figure 10 in the manuscript. We expect that the risk may be significantly reduced.

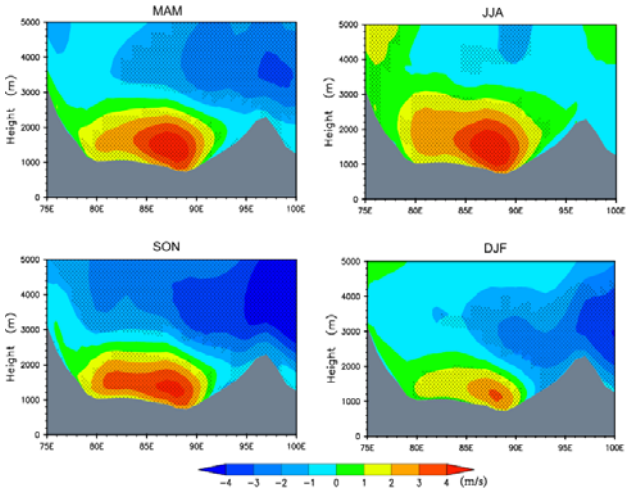

Figure 1. Same as Fig. 10 in the manuscript, but all time-matched AOD and wind profile data are used.

The authors indicated that NLLJ may play an important role in the both dust emission and transport (L. 105-106). However, the Taklimakan Desert is surrounded by high mountains and only opens on eastern side (L. 55-57), and the wind direction of NLLJs is mainly easterly (L. 261-262). Will the NLLJs be important for dust transport over this region?

Response: Dust in the lower atmosphere may not easily escape from the basin, however our former study (Ge et al., 2014 JGR) indicates that dust can be lifted up to heights of about 10 km in summer as shown in Figure 2. These dust can be further transported to far downwind regions. We also did a numerical simulation of dust lifting for a case in July, 2012 in Figure3. We can see that there is a meridional circulation which lead to a southward transport of dust. NLLJ may couple to this meridional wind circulation and loft dust to high altitudes above the mountain ranges.

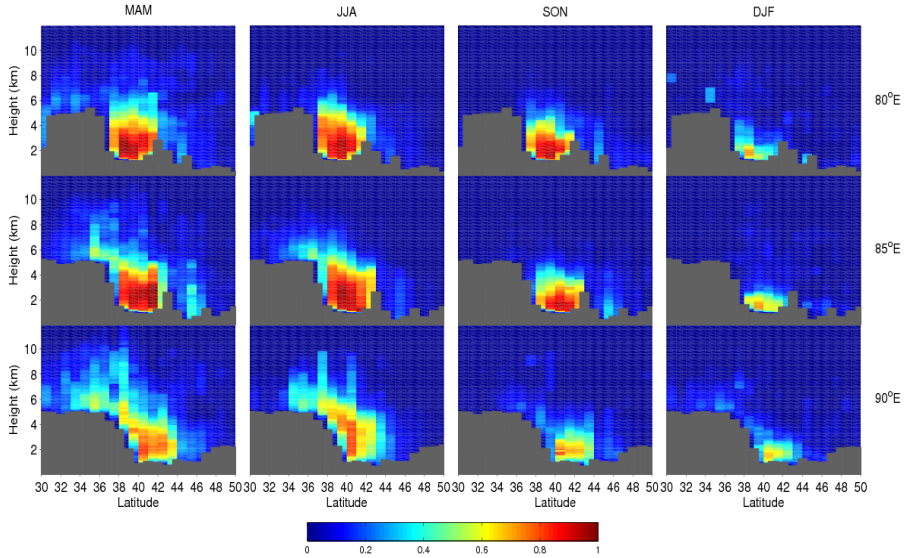

Figure 2. Seasonal frequency occurrence distribution of dust over Taklimakan desert and surrounding areas for three longitudinal transects. Gray areas represent mountain profiles along the transects.

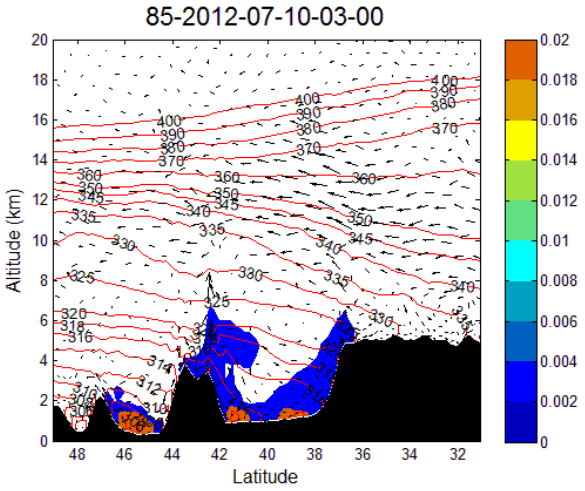

Figure 3. Simulated dust extinction profiles, meridional wind circulation and potential temperature along 85^0E longitudinal transect.

L. 307: Add references for Richardson.
Response: A references is added

L. 326: Are you sure there is no any of clouds on NLLJ nights?
Response: “Cloudless” is not an accurate word. We examined both the occurrences of clouds and total cloud covers (TCC) over the TD at 00 and 06 UTC for January and July from 2000 through 2013. Our results shown that both the occurrence of clouds and TCC on NLLJ days are much smaller than no-jet days, especially in July. Please also see my reply to reviewer #1.