Atmos. Chem. Phys. Discuss., 15, C6898–C6906, 2015
www.atmos-chem-phys-discuss.net/15/C6898/2015/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling study on the transport of summer dust and anthropogenic aerosols over the Tibetan Plateau" *by* Y. Liu et al.

Y. Liu et al.

jiar13@lzu.edu.cn

Received and published: 16 September 2015

Response to Referee #1

We are very appreciative for the referee's careful review and constructive suggestions with regard to our manuscript. His/her suggestions and comments are helpful in improving the paper. We hope that the revised version of the paper has addressed much of the referee's concerns and is now acceptable for publication. The following are our point-by-point responses to the referee's comments:

General comments: This study describes the transport processes of dust and anthropogenic aerosols over the Tibetan Plateau by the simulation using an aerosol transport model coupled with a non-hydrostatic regional model. It is worthwhile to clarify the

transport processes because the aerosols over the Tibetan Plateau arrive at the high altitude and spread in the wide range. However, there are ambiguous descriptions in the paper. It is better to indicate the locations of the northern and southern slopes, and the east area of the Tibetan Plateau in the figures. I recommend publication after the revisions.

Specific comments: 1. 15013, L4-5: Two locations of Taklimakan desert are written,"Northeast of TP, Taklimakan desert" and "West of TP, the Taklimakan Desert". Response: We are very sorry for our ambiguous descriptions. In fact, we wanted to express that the Taklimakan desert is the important dust source not only for west of TP but also for northwest of TP. However, the correct meaning was not descripted in this manuscript. To express more accurately, we change 'Northeast of the TP' to 'For the northeast of TP' and change 'West of the TP' to 'For the west of TP' (15013, L4-6).

2. 15015, L16: Where is the area of "the decreasing SSA and AE over the northern slope of the TP" in Figure 4? The solid box? The SSA decreases but the AE increase in the solid box. Furthermore, the AOD (Figure 3b) and the mass column loading of dust (Figure 9) are small in the solid box. What is the aerosol in the solid box? Response: The area of 'the decreasing SSA and increasing AE' is the solid box in Fig. 4 and so we delete 'over the northern slope of the TP' (15015, L16-17). In order to show the transport of dust visually, we use the uniform color bar for the three days. However, the uniform color bar may cover up some details of some relative smaller values. To present more clearly, here, we show the simulated AOD and mass column loading of dust in different color bar for three days. As shown in Figures B1-B2, the dust aerosols and carbon suggest eastward-moving trend in the solid box, which may be the reason of the changes of SSA and AE in solid box. Furthermore, for accurately, orbit-altitude cross section of feature classifications from CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation) Level 2 Aerosol Layer and Vertical Feature Mask (VFM) products is given in Figure B3. As shown in Figure B3, the main component of aerosols in the solid box is polluted dust. It could be concluded that

ACPD
15, C6898–C6906, 2015

there are large numbers of dust aerosols and some of these dust particles have been polluted by carbon.

3. 15015, L21-23: The SSA of the dust regions shown in Figures 3 and 9 is high in Figure 4a. The high SSA regions spreads eastward in Figure 4a. Response: 'The simulation suggests that the eastward and southward migration of dust aerosols induced the declining SSA over the northern slope and east of the TP' is changed to 'The simulation suggests that the eastward and southward migration of dust aerosols induced the increasing SSA over the northern slope and east of the TP, respectively (15015, L21-23).

4. Figure 5: The topography of the southern slope of the TP is very different between Figures 5a and b. Is this due to the model resolution? Response: Yes, the limitation of model resolution induces the obvious differences of the topography between Figures 5a and b. Considering the computation pressure of SPRINTARS added to NHM and the minor difference of aerosol properties in different model resolution, we set the model resolution shown in manuscript and the simulated result does descript the horizontal and vertical distributions of aerosol.

5. 15017, L27-28: What is "whereas another current curves northeast"? Response: We intended to mean that northwesterly current from Kazakhstan turn into two branches when it reaches the east side of Tianshan Mountain, while One current branch moves to the east continuously and another branch turns to northeasterly wind toward the TP because of topographic blocking due to the high elevation. To descript it more accurately, we change 'whereas another current curves northeast' to 'whereas another current turns into northeasterly wind toward the TP' (15017, L27-28).

6. 15018, L15-16: Is the westerly wind correct? I cannot understand what you mean. Response: We are appreciated for your comments and sorry for such a simple mistake. And 'a westerly wind' is changed to 'easterly wind' (15018, L16).

7. 15018, L18-15019, L21: The dust mass concentration is depicted in Figures 8 and

ACPD
15, C6898–C6906, 2015

"aerosol mass concentration" should be changed to "dust mass concentration". Response: Thanks for the referee's kind advice and we have made correction according to the referee's comments. All these 'aerosol mass concentration' have been changed to 'dust mass concentration' (15018, L18; 15018, L27; 15019, L16).

8. 15018, L27: Is "9 km" correct? The dust cannot be observed at 9km in Figures 8a2 and b2. Response: To express more accurately, we have modified this sentence. 'On 22 August, the dust was transported upward to 9 km, and the aerosol mass concentration around the outbreak location weakened (Fig. 8a2).' is changed to 'With the development and transportation of the dust particles in the following two days, the particles were transported to higher and even upward to 9 km (Fig. 8a3 and 8b3).'

9. 15018, L28: Where is the outbreak location in Figure 8a2. Response: In this version, we wanted to mean that the outbreak location is the place where the dust event began to outbreak on 21 August (at approximately 78âŰęE, 37âŰęN). However, according to the comments from Referee #2, "The dust simulations and its spatial extent around 40N shown in Figure 3 does not very well compared with OMI observations", the simulation was re-conducted with a tuned parameter for regional model. Basing on the new result, we modified this sentence to be 'With the development and transportation of the dust particles in the following two days, the particles were transported to higher and even upward to 9 km (Fig. 8a3 and 8b3).'

10. 15018, L28: Where is the dust transported eastward from 70 to 80E in Figure 8a2? Response: We have changed 'from 70 to 80 °E' to 'over the region from 70 to 80 °E' (15018, L28). 11. 15019, L4: The large updraft near the southern slope of TP is not observed in Figures 8b. Response: Although it is weaker than the updraft near the northern slope of TP, the updraft still can be found over the southern slope of TP, as the red boxes shown in Fig. B4.

12. 15019, L10: "the east area of the TP" Response: Here, we want to distinguish that the area we analyzed is located in the east of the TP instead of part of the TP, so we

ACPD
15, C6898–C6906, 2015

think ‘the area east of the TP’ shouldn’t be replaced by ‘the east area of the TP’.

13. 15019, L16: Where do the aerosols begin to extend southeastward? The northern or southern slopes? Response: We have rewritten this sentence. ‘The aerosol mass concentration began to increase and extend southeastward on 21 August.’ is changed to ‘With the development and transportation, dust mass concentration over the northern slope began to increase and extend southeastward on 21 August.

We have checked the manuscript and revised it according to the comments. We submit here the revised manuscript as well as a list of changes. If you have any question about this paper, please don’t hesitate to contact me at the address below. Thank you and best regards. Sincerely yours, Yuzhi Liu

Corresponding author: Name: Yuzhi Liu E-mail: liuyzh@lzu.edu.cn

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/15/C6898/2015/acpd-15-C6898-2015-supplement.zip

---

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 15005, 2015.

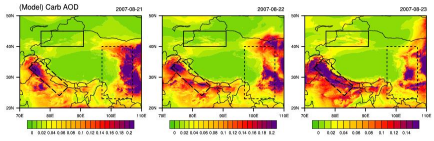

Figure B1 Distributions of the simulated AOD of carbon from 21-23 August 2007

Fig. 1.

ACPD
15, C6898–C6906, 2015

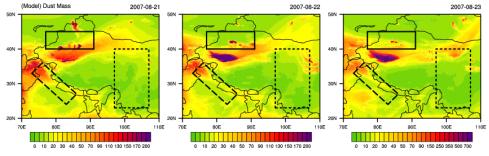

Figure B2 Distributions of the simulated dust mass column loading (units: mg m^{-2}) from 21-23 August 2007.

Fig. 2.

ACPD
15, C6898–C6906, 2015

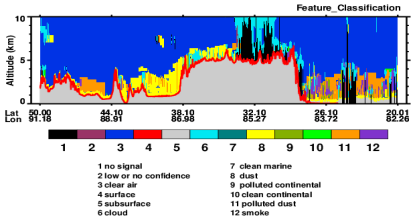

Figure B3. Feature classifications of particles in the atmosphere on 22 August 2007 along the trajectory of the CALIPSO satellite indicated in Figure 1

Fig. 3.

ACPD
15, C6898–C6906, 2015

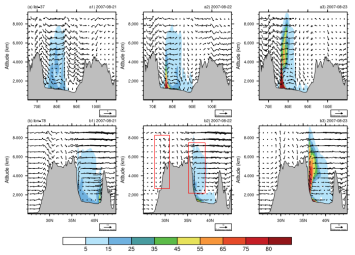

Figure B4. Cross-section of the **(a)** vertical-longitude and **(b)** vertical-latitude distributions of the simulated dust mass concentration and wind vectors from 21 to 23 August 2007.

Fig. 4.

ACPD
15, C6898–C6906, 2015