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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Elevated large-scale dust veil originated in the Taklimakan Desert: intercontinental transport and 3-dimensional structure captured by CALIPSO and regional and global models" *by* K. Yumimoto et al.

Anonymous Referee #2

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General comments

The unique topography of the Tarim Basin has long been a matter of discussion in relation to the dust intercontinental transport. Many works have been suggesting the connection between the dust event over the Taklimakan desert and the elevated dust layer but often involved speculations. This study addresses the question as to how the dust particles are generated and transported into high altitudes over the Taklimakan desert, by conducting a comprehensive analysis on the elevated and extensive dust layer (dust veil, so called by the authors) observed in May 2007. The numerical (both

regional and global) models were employed to simulate the dust generation and transport. Ensemble of SYNOP data, networks of state-of-the-art passive and active remote sensors were used to validate the model outputs.

In some parts, more relevant works can be credited and added in the reference list. In terms of the use of the language, the overall message can be conveyed to the readers, however, proofreading by a native English speaker or one with equivalent knowledge is recommended. The structure of the manuscript can be also rearranged. Otherwise, the title of the paper well reflects the subject of the paper, which is within the scope of ACP. The methodologies employed in the paper are also highly relevant and therefore, this paper should be accepted subject to minor revision.

Specific comments

14455, 17-19: "However, direct observational evidences of the Asian dust intercontinental transport to Europe. . ." This sentence does not make sense in the context. Consider rephrasing.

14455, 25-28: More recent works can be credited with regards to the aerosol direct and indirect effects.

14456, 2: Rephrase "..., which in turn can influence the plankton and dimethyl sulfide (DMS) emissions.".

14457, 1: On what basis the occurrence of the dust storm was confirmed? SYNOP report?

14457, 25-14458, 2 and 14458, 8-9: The logic behind the strategy to limit the dust sources to those over Taklimakan desert remains rather vague and not very convincing. Later in the paper, authors attribute the underestimation of dust loadings (with respect to CALIPSO measurement) in the model simulations solely to the limited horizontal and vertical resolutions. Can you entirely exclude the possibility that the underestimation results partly from other dust sources and aerosol types missing in the simulation? I

presume that the models can keep a good track of dust particles emitted from different source regions. Wouldn't it be more convincing if you can also show that there was only minor contribution from the surrounding deserts (Gobi in particular)?

14460, 2: Consider switching the order of sections 3.1 and 3.2 unless there is a good reason to show them in the current order. It would be more readable if dust emission from the source is proven, then the transport. When doing so, change the structure of the abstract and concluding remarks, as well as order of the figures accordingly.

14462, 2: Is dust emission from Saharan desert taken into account in the SPRINTARS?

14465, 4: Both "upper troposphere" and "free troposphere" appear in the paper but it is difficult to picture where exactly the authors are referring to. It would be very interesting to know the structures of the troposphere over these highly complex terrains. Authors may state more precisely how they define the free troposphere and its height range. This is especially important for the current work where it is supposed to show the detailed mechanism by which dust from the ground is transported into such high altitudes.

14465, 13-20: Perhaps another figure with a closer look on the cross sections for 21 May-190843 path (both the CALIOP and RC4 dust extinction coefficients) can be added to help compare the two dust layers.

14467, 2: Can you refer to other works making estimates on the amount of dust transported by major dust events? This would help readers to get a better idea on the significance of the dust veil in May 2007. Discussion on the uncertainty range is also missing with respect to the estimated dust loadings.

14467, 4-7: It may not be within the scope of this work, but it is generally well accepted that such dust veil would more or less affect the global radiative budget. The question then is how much. It would be more informative if the estimates on the regional radiative effects are presented. Also, it would be very interesting to know if authors have any

clue on the contribution of the Taklimakan desert (relative to other major sources) as the source of the global background dust.

Technical corrections

14454, 10: change "km / d" to "km / day". This should apply to the rest of the manuscript.

14457, 6: "procedure" may not be the right word. Use "processes" instead. The word is misused elsewhere in the manuscript.

14469, 6: Year is missing. 1984?

14469, 18: Is the work by Hara et al., (2008) cited in the paper?

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 14453, 2009.