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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Transport of the 2017 Canadian wildfire plume to the tropics and global stratosphere via the Asian monsoon circulation" *by* Corinna Kloss et al.

Anonymous Referee #2

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Kloss et al. (2019) reported the transport pathway of Canadian wildfire plume. This study suggests that Asian summer monsoon can effectively transport the plume to tropics mainly from the eastern side of the anticyclone airflow. Similar findings are reported in a previous paper (Wu et al., 2017, ACP). In Wu's paper, a volcanic plume is transported equatorward via the Asian summer monsoon. Effectively this is another case study on the transport pathway in the upper troposphere and lower stratosphere associated with Asian summer monsoon anticyclone. I find this study interesting and useful to communities because it reveal some details in the transport of the 2017 Canadian wildfire, an record-breaking extreme fire event that reached the stratosphere in recent decades. Some suggestions are attached.

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Discussion paper

Page 6 starting from Line 15: "...in the whole NH >40N mid to end of August..." I am not sure I understand Fig. 1B, is there any data shown from mid to end of August 2017? "The aerosol signature descends with 2 mm in altitude per second" Could you please draw a line on Fig.2B to show the decline slope? It is hard to tell by eyeball. "Hence, the descent of the aerosol is due to sedimentation" Well, I believe sedimentation plays an important role. However, what about the longitudinal dilution and cross-latitude transport from higher latitude to lower latitude (not necessarily happen in ASM region)? How do those affect the 5 km/month rate derived in the manuscript?

Fig.1E: From OMPS, ATAL is mostly in troposphere; while from SAGEIII (Fig.2A,4A), ATAL's peak extinction is above 15km. Please explain why OMPS' ATAL is lower.

Any stratospheric adjusting is taken into consideration in RF calculation especially for the 2017 fire plume with absorbing substance?

In terms of equatorward transport of the plume, any other mechanisms/pathway can happen? For example, can the plume be lifted higher in the stratosphere in mid-hight latitudes, and then been transported to the tropics? Is there any way you can quantify/compare the relative fraction of plume transported to tropics via the two ways respectively?

Fig.4 I am a little lost here: a. In 4A, which is ATAL and which is fire? b. Is CO in 4B and 4C associated with fire at all? From Fig.3, authors suggest that ASM barrier prevents fire smoke mixed in; If CO can be mixed in, why not aerosols?

Minor: Fig.3, why there are 2 identical color bars?

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