

## ***Interactive comment on “Impacts of atmospheric transport and biomass burning on the interannual variation in black carbon aerosols over the Tibetan Plateau” by Han Han et al.***

**Anonymous Referee #2**

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This study elucidated the impacts of meteorology and biomass burning on the seasonal and on the interannual variation in black carbon (BC) aerosols over the Tibetan Plateau (TP) based on 20-year GEOS-Chem simulations and HYSPLIT model. They found that over 90% surface BC in the TP comes from South Asia and East Asia. Both biomass burning and Asian monsoon played important roles in the variations in BC over TP. The results can contribute to the understanding of aerosols over TP and the manuscript is well written. However, there are still a few shortcomings that needs to be substantially revised.

General comments:

The induction section is vague without any quantitative description. From line 69 to 112, every sentence can be quantitatively expressed. Without these values from previous literatures, readers cannot fully get to background of this study.

There are some studies that explored the seasonal and interannual variation in BC over the TP, as the authors listed. The authors should compare the results in this study with those previous findings. Are they consistent? If not, why?

The authors only evaluated seasonal variation and spatial distribution of the BC. However, this study focused more on the interannual variation. Can the author find more data supporting the simulated interannual variability, like concentration or AAOD from surface measurement or satellite? Otherwise all the findings are based on model simulations and not fully convincible.

This study combined GEOS-Chem results and HYSPLIT model to attribution the BC from different source regions. Many studies did the sensitivity simulation with emissions from sources turned off. The emission perturbation method is more straightforward to me, since the backward trajectory method need to assume the decay time and the source region should be close to TP. What are the advantages and disadvantages between these two methods? In addition, I suggest the author to perform two more additional simulations with emissions from South Asia and East Asia turned off and compare the results with HYSPLIT outputs.

Specific comments:

The authors discussed a lot of the impacts from South Asia and East Asia. Southeast Asia has more biomass burning than South Asia. How the emissions from this region affect BC in TP?

Line 134: Anthropogenic emissions in 2000 were used. Since the past two decades, anthropogenic emissions have changed a lot, especially over South Asia and East Asia. The emissions out of date could cause large biases to the results. Also, the

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biomass burning emissions only cover 1997–2011. The authors should discuss the uncertainties related to the emissions.

Line 136: The GEOS-Chem has a finer resolution over East Asia. Why the authors only use 2-degree version?

Line 178: It can also be due to the less emissions in 2000.

Line 193: The meteorological data for GEOS-Chem (MERRA) and HYSPLIT (NCEP/NCAR) are different. Will different meteorological data used in this study produce biases?

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