Journal: ACP
Title: **A New Transport Mechanism of Biomass Burning from Indochina as Identified by Modeling Studies**
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Recommendation: accepted with major revision

General comments

In this manuscript, the authors hypothesized a new pollutant transport mechanism during the spring time when biomass burning, one of major ozone sources, frequently occurs over Indochina. The leeside trough of Tibetan Plateau and the mountains over Indochina provided a lifting mechanism for pollutants to transport from the boundary layer into the free troposphere. The pollutants, then, propagated downstream to Taiwan and East Asia with the prevailing wind (i.e., westerly). A tracer module was developed and incorporated into the WRF/CHEM model for pollutant simulations, which were used to investigate the pollutant propagation pathway. A high ozone episode was used to successfully demonstrate the hypothesis. The climatological pattern for the leeside trough of Tibetan Plateau and a sensitive study, which had no significant trough presence over Indochina, were used to further demonstrate the hypothesis.

The scientific contribution of the study is quite important. The scientific results and conclusions were presented quite clearly and concisely. The number of figures is reasonable, but the quality of some figures needs to be improved (see technical comments). Overall, this manuscript is quite interesting and is well presented, and is suitable for publishing in ACP. Below are some concerns from the reviewer.

Specific comments

1. A brief description of ozone formation related to biomass burning will help some readers, who lack background knowledge regarding this topic.
2. Page 13162, lines 9-10: "The upward warm advection on the eastern side of the leeside trough and …". The upward motion will not cause a warm advection due to adiabatic cooling unless the environment late rate is greater than dry adiabatic. Same for the downward cold advection.
3. Page 13163, Section 5: The authors showed the vertical profile for the simulated tracer over Northern Taiwan at 02:00 UTC on 10 April, 2005 to further demonstrate the role of the leeside trough on the vertical pollutant transport. There were two weather components that contributed to the tracer transport from Indochina to Northern Taiwan, i.e., the leeside trough at the eastern flank of the Tibetan Plateau and the westerly wind at 4-6 km. Therefore, a horizontal cross section of the simulated tracer at 650 hPa, such as Figs. 4c and 4d, from the sensitivity study will enhance the conclusion.
4. It will be useful if the accuracy of the fire frequency from MODIS data is provided.

Technical corrections

1. For any acronym, it has to be defined when it is used for the first time.
2. Page 13160: Which version of WRF/CHEM was used? Please specify.
3. Figure 2, caption: Add location information in the caption.
4. Figure 3: The quality of the figure (background map and station models) has to be improved. What exact field was plotted (geopotential height?)? Specify.
5. Figure 4, caption: Which level of information was plotted (650 hPa)? Add year information (2005?) in the caption. "The contour represents the wind speed …" should read "The thick contour lines represent the wind speed…". Reduce the number of wind vectors and increase the size of plotted wind vectors.
6. Figure 5, caption: Add the year information (2005?) into the caption. Line 4: "was denoted by solid line." should read "… was denoted by white solid line." (g) "Simulation vertical distribution of tracer concentration …" should read "Simulated vertical distribution of tracer concentration…"
7. Figure 6, caption: Again, add year information into the caption.
8. Figures 3, 5, and 6: It is difficult to read numbers in these figures on both x and y axes and legends. Need to use a larger font.