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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Monsoon-facilitated characteristics and transport of atmospheric mercury at a high-altitude background site in southwestern China" *by* Hui Zhang et al.

Anonymous Referee #1

Received and published: 3 August 2016

This paper presents TGM, GOM and PBM measurements over 1 year from a high altitude site in southwestern China. The authors have carried out a very thorough cluster and concentration weighted trajectory analysis of the data obtained and are able to attribute various findings to the influence of the seasonal monsoon. This is very nice work and these new measurements should be published, however the manuscript would benefit from a bit of restructuring and tidying up to make the conclusions clearer and so publishing should be subject to the following changes.

General comments 1. It needs to be clear that the monsoon is the driving force for the higher emissions rather than other seasonal factors such as lower oxidants, or higher source emissions. Please make sure the following questions are answered

clearly within the text. Are anthropogenic TGM events from inland China seen only in ISM/EASM conditions? Are biomass burning emissions (high CO) from South and Southeast Asia only seen in non-ISM or in all conditions?

2. Please be consistent when using TGM or Hg. Total Gaseous Mercury (TGM) was measured not Hg (e.g. Line 296 High Hg should be high TGM and Line 317 elevated Hg should be elevated TGM etc?) except during the GOM/PBM campaigns when Hg would have been measured instead. Any emission data would obviously be in terms of Hg.

Specific comments Abstract Towards the end of the abstract Lines 27-33 please separate the discussion of ISM, EASM and non-ISM, it comes across a bit confused (some more specific comments on the abstract are below).

Results and discussion The results section needs better headings, the monsoon discussion comes into all of the sections and so the sections are not as cleanly divided as first appears. I would suggest restructuring the results section starting with a discussion of the data compared to other sites and seasonal variation of the data, followed by the cluster analysis, CWT analysis and then a section on case study periods.

3.1. TGM, GOM, and PBM in ISM/EASM and non-ISM conditions. For this section merge the present Sections 3.1.1. and the seasonal discussion of GOM and PBM from Section 3.1.3. Move Figure 5 to Figure 3. When merging try not to repeat yourselves, in this section concentrate on discussing the statistics from Table 1 and the references to the old Figure 5 rather than on the interpretation of the data with respect to the monsoon. 3.2. Effect of the monsoon on the measurements (old Section 3.1.2). Include discussion on monthly TGM anomalies (old Figure 3), monsoon-facilitated effects, and finish with wind direction analysis (old Figure 4). 3.3 Cluster analysis (old Section 3.2) 3.4. Potential source regions of atmospheric Hg (old Section 3.4) rename Figure 15, Figure 8. 3.5 High TGM event case studies and the influence of monsoons, (old Section 3.3), use subheadings of dates to split case studies and reference to dif-

ferent figures?

Table 1 Could you possibly include CO statistics in the table?

Figures Figure 1: Can the position of ALS be made a little clearer? Figure 2: Can this be made clearer, widen plot to show the length of spikes? What is the time resolution of data? Figure 5: Are the GOM concentrations significantly higher in the ISM period? Figure 6: What sampling time do these points represent, hourly measurements or are they just from during the high Hg events? If these show all the data then these wind plots are not very convincing, most of the data comes from the SW but it is not clear from these that the higher events are all from the SW. The data looks better in the annotated trajectory plots, you could remove these and associated text in lines 265-274?

Technical corrections Lines 20-22, Quote some numbers to illustrate the higher concentrations in the ISM /EASM compared to the non-ISM period. Line 30 Consequently, southwestern. . .. . .. sentence not needed as stated earlier in the abstract. Line 32 Change "should be" to "are thought to be" Line 40, remove "Therefore" and add instead "The monsoonal climate has the potential to strongly affect. . .. . ." Line 57, remove "pose an" and just use "can impact other regions". Line 59, change "has" to "have". Line 61, remove "/regarding" Line 91, what height were you measuring at? Line 144 Are 500m trajectories valid? Line 92, Refer to Table 1 for seasonal breakdown of temperature and rainfall. Line 129, do you mean May to September and October to April for ISM and Non-ISM conditions respectively? Lines 165-171, Which comparison sites are located at a similar altitude to ALS? Are they all "background sites"? Line 160, What time resolution is plotted in Figure 2? Line 172 and Line 174, How long do the peaks last, is the length of time different for the ISM and non-ISM period, does this indicate different sources for each period? Line 175, "adjacent" not "adjacently" Line 233, remove "monsoonal" Lines 261 and 262, remove "wind" Line 267, "influencing" Line 344, remove "meanwhile"

Figure 7: Clusters defined here should then be referenced in subsequent figures. . .. 9, 10, 11, 13 relate to cluster analysis? Figures 11, 13, Where was the fire data from, please reference?

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