

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 #2

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Journal: ACP Title: Monsoon-facilitated characteristics and transport of atmospheric mercury at a high-altitude background site in southwestern China Author(s): H. Zhang et al. MS No.: acp-2016-506 MS Type: Research article Special Issue: Global Mercury Observation System – Atmosphere (GMOS-A)

General comments

The topic of the manuscript is important and pertinent to the special issue of the journal. The paper presents new data of long-term monitoring of air mercury and mercury speciation within GMOS network obtained at the Ailaoshan monitoring station, south-

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western China. The title clearly reflects the contents of the paper, the main points of the research tasks, methodology of the data acquisition and calculation are described in the Abstracts. The measurements have been made using unified GMOS standard operational procedures for total mercury and mercury speciation. The emphasis is on the study of the reasons of the atmospheric mercury variations, dependence on Indian Summer (ISM) and East Asia Summer (EASM) Monsoons, long-term atmospheric transfer, and discussion on characters and geographical location of mercury emission sources. The paper is based on comprehensive mercury monitoring and meteorological data for backward trajectory calculation, which have provided sound evidence of mercury transfer with ISM and EASM air masses and explanation of the air mercury variations in southwestern China based on monitoring at the Ailaoshan station. The obtained data, calculations, and discussions are well structured and presented in the text and Conclusions. The manuscript has a comprehensive reference list.

Specific comments

1). Commonly authors discuss a long-distance transfer for all mercury species, e.g., at lines 272-274: “These westerlies could take the Hg from South Asia and Southeast Asia into southwestern China. Thus, the dependence of atmospheric Hg species on wind was likely attributed to an interplay of regional sources and the long-range transboundary transport of Hg”. The drastic difference in the lifetime for air mercury species is well known. Gaseous elemental mercury (GEM, or Hg(0)) dominated in air has the longest lifetime in atmosphere (about one year) that provides really long-distance transfer for dozens thousand kilometers, whereas the lifetime of GOM is about 1 day, and it can be transported from its emission source to a distance only of 300-500 km. Thus, sources and origins of mercury species registered at the site can be different.

2). A reference to dependence of the GOM measurement on air humidity (lines 118-121 and 279-280): “Several previous studies reported that different GOM compounds (HgCl₂, HgBr₂ and HgO) have different collection efficiencies for the KCl-coated denuder surface, as high relative humidity can passivate KCl-coated denuder and make

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GOM recoveries decrease (Huang et al., 2013a;Gustin et al., 2015;Huang and Gustin, 2015)". "A new study reported that high RH could reduce the collection of GOM by the KCl-coated denuder (Huang, Gustin et al. 2015). This could be another reason why the GOM was low in summer". In this respect, it is very important to compare possible range of uncertainty of the GOM measurement due to humidity variation, with the GOM measured values to confirm or cast doubt on real reason of the GOM variations.

3). It is not clear what parameters were measured at the Ailaoshan station along with mercury and meteorological parameters, particularly, if the discussed CO concentration was measured at the station.

4). Authors mention SO₂ measurement only once, in Introduction. The monitoring data of acid gases (such as SO₂, NO_x) are very useful for mercury emission source identification, e.g. for separating mercury emitting by forest fires or biomass burning from coal combustion plumes. That can be useful for future research.

Technical corrections

1). Various writing, compare: 66 ... trans-boundary transport 68 ... associated trans-boundary transport

2). A misprint at line 84: 82 ... to establish a global 83 mercury monitoring network for ambient concentrations and deposition of Hg through ground-based 84 observational platforms and oceanographic aircraft campaigns (Sprovieri et al., 2013)

Obviously, here should be 82 ... to establish a global 83 mercury monitoring network for ambient concentrations and deposition of Hg through ground-based 84 observational platforms, oceanographic, and aircraft campaigns (Sprovieri et al., 2013)

3). Lines 110-111 PBM ($\leq 0.2 \mu\text{m}$) were removed using a 47 mm diameter Teflon filter (pore size $0.2 \mu\text{m}$). It seems, the correct should be PBM ($\geq 0.2 \mu\text{m}$) were removed, or PBM ($\leq 0.2 \mu\text{m}$) were collected

Conclusion

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The manuscript No acp-2016-506 can be accepted for Special Issue "Global Mercury Observation System – Atmosphere" (GMOS-A) with minor corrections.

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