Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2016-474-RC2, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Overview of mercury dry deposition, litterfall, and throughfall studies" *by* L. Paige Wright et al.

Anonymous Referee #2

Received and published: 26 July 2016

The paper attempts to review the present understanding of mercury dry deposition and Hg flux through litterfall and throughfall. Overall, the manuscript appears to be put together in short order and there are numerous issues that need to be addressed before consideration for publication.

Specific comments:

Title. The paper has an unbalanced coverage of topics. For the most part, the manuscript mainly discusses dry deposition and Hg deposition caused by the litterfall/throughfall/rainfall is a very small part. The title should be changed to reflect the context of presentation. Line 5-9. What is the reason of using the median instead of the mean value? How many sites in Asia/America/Europe are included in the review? From the Table 1 and Figure 1, there are many studies that authors left out in this

Printer-friendly version

Discussion paper

manuscript. For example, there are at least 70 sites that have the litterfall Hg deposition flux documented in America and Europe, while only about 20 sites are reviewed by authors. Line 7. The median value of Hg input through litterfall is not likely to be 22.3 μg m-2 y-1 as authors suggested. This value falls in the lower range of the observed values in China. Much larger values have been reported in earlier studies. [Fu et al., 2015; Ma et al., 2015a; Ma et al., 2015b; Niu et al., 2011; Z W Wang et al., 2009; Zhou et al., 2013; Zhou et al., 2015]. Line 9-11. It is questionable that GEM deposition to canopy has important contribution unless the authors regard the multiple processes of vegetative uptake as "dry deposition." This is because the Hg in litter is a result of multiple processes: uptake (most Hg0 and an amount of deposited Hg2+), oxidation, re-volatilization of chemically bounded Hg, etc. In addition, Hg deposition through litterfall is also closely linked to litter biomass production. In fact, the litterfall biomass production is the primary cause for elevated Hg deposition from litterfall in subtropical/tropical forests [Fostier et al., 2015; Zhou et al., 2013]. Line 37-44. Hg uptake from the atmosphere can translocate to braches, stems, and roots [Siwik et al., 2010; Yin et al., 2013], which is not accounted for based on the estimate using litterfall data. This is also the reason for the litterfall Hg likely represents the low-end of the Hg dry deposition. Line 74-75. X Wang et al. [2014] should be included. Line 59-86. It is better to incorporate two paragraphs into one paragraph because of similar contents. It is also better to present the scheme in each model by a table for clarity. Section 2.1. An earlier review by [Gustin et al., 2015] have discussed the limits of modeling to simulate the GOM/PBM dry deposition, and an another review by [Zhu et al., 2016] also discussed the simulation of dry deposition of GEM. What is the difference in the manuscript compared to these earlier reviews? At the present form presented by authors, there does not seem to be any new information. Section 3.2-3.3. The earlier review papers by [Gustin et al., 2015] and [Zhu et al., 2016] have clearly presented and discussed. I cannot find any new information in current manuscript. Line 372-388. Why this information is important, and what is the difference among different methods? Can the results from different methods be compared? Line 397-402. It is necessary discuss

why the time schedule is important and the difference caused by sampling frequency. Section 4. Maybe a better presentation is to discuss the GOM/PBM dry deposition in America, then Europe, Asia, followed by the reasons for the observed differences in these regions. Line 482-484. It is questionable because the foliage from different tree species has distinctly different lifespan. Just multiplying the Hg concentration in fresh foliage by 1.5 for Hg deposition from litterfall may produce a large error. Line 495-499. Please add the site number in each region. Line 501-510. Although Hg concentrations in foliage are correlated with atmospheric Hg0 concentrations, the difference in litter Hg concentration cannot be solely explained by the disparity in atmospheric Hg0 concentration. For example, at comparable atmospheric Hg0 concentrations (1-1.5 ng m-3) [Fostier et al., 2015], mean litter Hg concentration in remote Amazon rainforest is 70% higher than the value in America. There are many factors to influence Hg accumulation in foliage. 520-521. Wang et al. (2009) show date for 3 sites only; and these sites are with very high GEM. How these data can be represented the data in entire Asia? Line 520-533. These information have been presented by [Fu et al., 2015], and there does not seem to be any new information. Line 521-546. What is the difference between the observations reported in Asia and USA? Section 6-7. Need to a more in-depth discussion for the difference between the observations reported in Asia and USA.

References

Fostier, A. H., J. J. Melendez-Perez, and L. Richter (2015), Litter mercury deposition in the Amazonian rainforest, Environ Pollut, 206, 605-610. Fu, X. W., H. Zhang, B. Yu, X. Wang, C. J. Lin, and X. B. Feng (2015), Observations of atmospheric mercury in China: a critical review, Atmos Chem Phys, 15(16), 9455-9476. Gustin, M. S., H. M. Amos, J. Huang, M. B. Miller, and K. Heidecorn (2015), Measuring and modeling mercury in the atmosphere: a critical review, Atmos Chem Phys, 15(10), 5697-5713. Ma, M., D. Y. Wang, H. X. Du, T. Sun, Z. Zhao, and S. Q. Wei (2015a), Atmospheric mercury deposition and its contribution of the regional atmospheric transport to mercury pollution at a national forest nature reserve, southwest China, Environ Sci Pollut

R, 22(24), 20007-20018. Ma, M., D. Y. Wang, T. Sun, Z. Zhao, and H. X. Du (2015b), Forest runoff increase mercury output from subtropical forest catchments: an example from an alpine reservoir in a national nature reserve (southwestern China), Environ Sci Pollut R, 22(4), 2745-2756. Niu, Z. C., X. S. Zhang, Z. W. Wang, and Z. J. Ci (2011), Mercury in leaf litter in typical suburban and urban broadleaf forests in China, J Environ Sci-China, 23(12), 2042-2048. Siwik, E. I. H., L. M. Campbell, and G. Mierle (2010), Distribution and trends of mercury in deciduous tree cores, Environmental Pollution, 158(6), 2067-2073, doi:10.1016/j.envpol.2010.03.002. Wang, X., C. J. Lin, and X. Feng (2014), Sensitivity analysis of an updated bidirectional air-surface exchange model for elemental mercury vapor, Atmos Chem Phys, 14(12), 6273-6287. Wang, Z. W., X. S. Zhang, J. S. Xiao, C. Zhijia, and P. Z. Yu (2009), Mercury fluxes and pools in three subtropical forested catchments, southwest China, Environ Pollut, 157(3), 801-808. Yin, R. S., X. B. Feng, and B. Meng (2013), Stable Mercury Isotope Variation in Rice Plants (Oryza sativa L.) from the Wanshan Mercury Mining District, SW China, Environ Sci Technol, 47(5), 2238-2245. Zhou, J., X. B. Feng, H. Y. Liu, H. Zhang, X. W. Fu, Z. D. Bao, X. Wang, and Y. P. Zhang (2013), Examination of total mercury inputs by precipitation and litterfall in a remote upland forest of Southwestern China, Atmos Environ, 81, 364-372. Zhou, J., Z. W. Wang, X. S. Zhang, and J. Chen (2015), Distribution and elevated soil pools of mercury in an acidic subtropical forest of southwestern China, Environ Pollut, 202, 187-195. Zhu, W., C. J. Lin, X. Wang, J. Sommar, X. Fu, and X. Feng (2016), Global observations and modeling of atmosphere–surface exchange of elemental mercury: a critical review, Atmos. Chem. Phys., 16(7), 4451-4480, doi:10.5194/acp-16-4451-2016.

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-474, 2016.