

Interactive comment on “Soil-atmosphere exchange flux of total gaseous mercury (TGM) in subtropical and temperate forest catchments” by Jun Zhou et al.

Anonymous Referee #1

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Zhou et al., studied Hg evasion from a subtropical forest and a temperate forest, and they found that fluxes showed strong positive relationships with solar radiation and soil temperature, and negative correlations with ambient-air TGM concentration in both subtropical and temperate forests. They highlighted more attention should pay to the legacy Hg stored in terrestrial surface as a more important increasing Hg emission source with the decreasing air TGM concentration recently. Generally, this study demonstrates some interesting observation in forest air-soil flux exchanges, and these new finding can help us to better understand the Hg fluxes. But I have some concerned issues need the authors to further polish this manuscript before accept. (1) Many studies have suggested that solar radiation and soil temperature have strong ef-

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fects to induce soil Hg evasion from soil. Authors also have stated these earlier studies results. To me, I am not surprised these results. There are significant correlations among temperature and solar radiation. The effects of these environmental factors on Hg₀ flux are confounded. However, the synergistic effect from multiple factors leads to hard determine the individual effect of each parameter. Recently, I also read a subtropical forest air-soil Hg₀ flux study in China (Yuan, Wei; Wang, Xun; Lin, Che-Jen.; Sommar, Jonas; Lu, Zhiyun; Feng, Xinbin, Process factors driving dynamic exchange of elemental mercury vapor over soil in broadleaf forest ecosystems. Atmos Environ 2019, 219, 117047). They used SEM equations to demonstrate the temperature is the key parameter to shape the soil Hg₀ evasion. I wonder does temperature play the similar role in this study as Yuan's study, and I also suggest using similar SEM to further demonstrate the effects from atmospheric Hg₀, landuse, environmental parameters. (2) There are several forest air-soil Hg fluxes studies in subtropical regions in China, such as Yuan 2019, and Yu et al., 2020 (Subtropical Forests Act as Mercury Sinks but as Net Sources of Gaseous Elemental Mercury in South China, Environ Sci Technol). I suggest authors should compare their results to those studies to support your several hypotheses. (3) The most interesting results in this study is that air-soil flux varies with the landuse, and distinctly different compensation point for each landuse. However, authors just depicted these results without further explanation and hypothesis.

Line 24, "estimates" grammar wrong. Line 25, "soil-atmosphere exchange, soil-air gaseous Hg" why repeat twice? Line 27-28, "showed patterns of both emission and deposition at five study plots, with an area-weighted net emission rate of 3.2 and 0.32 $\mu\text{g m}^{-2}\text{hr}^{-1}$ for the entire subtropical and temperate forests, respectively". This sentence is confused, which forest is a Hg sink or source? Line 29-31 rephrase this sentence because of very hard to understand. Line 35 rephrase "at" to "in" Line 51 rephrase this sentence because of unclear Line 94 I did get your logic flow here when authors stated "serve as sources of previously deposited Hg". Line 101, I recently read several subtropical forest studies in China, and authors stated "scarce" is not right. Line 116. Wrong sentence for "Dongling (MDL)..."

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