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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Assessing contributions of natural surface and anthropogenic emissions to atmospheric mercury in a fast developing region of Eastern China from 2015 to 2018" *by* Xiaofei Qin et al.

Anonymous Referee #1

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The manuscript entitled "Assessing contributions of natural surface and 1 anthropogenic emissions to atmospheric mercury in a fast developing region of Eastern China from 2015 to 2018", investigated the temporal variations of GEM, and developed a receptor model based method to quantify the contribution of natural surface mercury emission. The quantification of emission sources are significant to understand global mercury cycle. The development of the receptor model is one significant output of this study. However, the approach and the results is doubtful. It is true that when temperature increase, we can observe high GEM and NH3 emissions from natural sources. O3

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Discussion paper

is a typical secondary pollutant formed from VOCs and NOx, which mainly originates from photochemical reactions of anthropogenic pollutants and is impacted by temperature. The increase of temperature can also promote the generation of O3 as well. But the simultaneous changes of these three are not entirely the contribution of natural source emissions. Take a simple example. Both NH3 and mercury can participate between gas and particle. The increase of temperature will promote the generation of both NH3 and GEM. In addition, high temperature in summer generally promote the generation of O3. Thus, the simultaneous increase of NH3, O3, and GEM may occur due to atmospheric reaction process. Therefore, using O3 and NH3 as tracers of the natural emission of GEM will introduce a relative large uncertainty. The problem is that we do know how large the uncertainty will be, because we cannot exhaust this kind of examples considering the variable sources and generation pathways of these three air pollutants and the complicated impact from temperature. The results are also confusing. The author stated that “As for the other resolved factors, …. of Pb and SO42-”(Line 255-261). The explanation of the factors is too arbitrary and lacks enough support. For example, the authors pointed out that the factor with high loadings of Ca was assigned to cement production. However, there are several anthropogenic Ca emission sources if the authors investigated the heavy metal emission inventory, such as the ferrous metal smelting. Ferrous metal smelting is also one significant emission sources around Shanghai. From this aspect, the anthropogenic sources resolved by using the developed model can not be supported by the emission inventory. Due to the question of current receptor model and their definition of different factors, I think the authors need to carefully verify their results or use other source resolution methods to determine the sources.

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