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Atmospheric Chemistry and Physics Discussions

Interactive comment on "4D dispersion of total gaseous mercury derived from a mining source: identification of criteria to assess risks related with high concentrations of atmospheric mercury" *by* José M. Esbrí et al.

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The ACP-2019-1107 manuscript entitled "4D dispersion of total gaseous mercury derived from a mining source: identification of criteria to assess risks related with high concentrations of atmospheric mercury", offers an alternative for the characterization of environments contaminated by anthropogenic mercury gas. The manuscript contains original work and will be a valuable addition to the literature since report data of mercury obtained in different spatial region and temporal time (daily and different seasonal period).

The authors have studied the extent to which monitoring work must be extended to obtain sufficiently representative data. Ensuring the data representativeness in geochemical work has always been a major challenge. Working on soil geochemistry, this representativeness is highly dependent on heterogeneity for the elements studied, spatial distribution patterns, and aspects related to sample preparation and analysis. The gaseous character of mercury and atmospheric dynamics complicate the achievement of this purpose, and for this reason the manuscript proposes as necessary the extension in time and space of the monitoring works to ensure the representativeness of the data and thus be able to build a dispersion model of gaseous mercury in the study area. This approach of minimal monitoring work to do represents the main novelty of the manuscript and is adequately presented by the authors. Instead, there are limitations to this approach. The authors have selected a study area with passive mercury emission sources that are almost exclusively dependent on meteorology. It may be one of the simplest cases to monitor, but if the sources are active (for example, a chlor-alkali industry) or the emission sources are modified (for example, by remediation work on contaminated soils or mining environments), the constructed model shows weaknesses to offer useful data in a risk analysis context. The authors must explain these weaknesses of the model built in the discussion section or/and in the conclusions section. This explanation may be accompanied by a list of adaptation needs or its possible immediate application to different scenarios of interest: mercury contamination by artisanal gold mining, active industrial emissions (chlor-alkali industry, zinc ore smelters, etc) or including natural emissions of volcanism-related origin. Another important aspect to consider by the authors is the possibility of adapting this monitoring strategy to feed sufficiently representative data to models of dispersion of gaseous pollutants (Calpuff, ISC-Aermod, others). The role of wet and dry deposition and particulate mercury in the local mercury cycle must also be better explained. There are some details in the introduction and a reference by the same authors studying the topic is cited, but there are no references in the text to this topic.

The manuscript deserves to be published after this minor revision based on its novelty,

presentation and quality of the data provided.

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