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Determination of gaseous elemental mercury (GEM) emissions by a non-stationary static accumulation chamber. The case study of Portoscuso (South-West Sardinia)

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This work describes the methodology based on a non-stationary static accumulation chamber used for measuring the GEM emissions at the soil-atmosphere interface in some residential and agricultural areas of the Portoscuso Municipality (South-West Sardinia). After a preliminary risk assessment of soil contamination, the investigated areas highlighted potential significant human health risks for volatilization pathways related to total Hg content in the soil. The aim of this study is to use the GEM emission rate to estimate indoor and outdoor human exposure according to the specific use of the areas. Acceptable GEM emissions (AGEM), i.e. maximum emissions associated with an acceptable human exposure and health risk, were defined accordingly and compared with measured ones.
The measured GEM emissions probably constitute the sum of two contributions:

- a real flux of GEM *"through the* soil-atmosphere *interface"*. This flux is originated by the presence of sources (both natural and/or related to potential contamination) in the first meters of depth and is regulated by mainly advective mechanisms;
- a component produced *"at the* soil-atmosphere *interface"*, as a response to the action of UV radiation on divalent Hg (II) in soil particles.

In this study the contribution of each of these two components has not been evaluated; however the main results showed, at the scale of the single sample representative area (Thiessen polygon), few values (8 out of 163, about 5%) exceeding the AGEM values for the indoor scenario. These results are poorly indicative of a real unacceptable risk, given their extremely punctual extent not representative of a long-term human exposure. Conversely, GEM emissions for each macro-area showed a general compliance with acceptable thresholds emission (AGEM) computed for both outdoor and indoor scenarios.
Further investigations will be aimed at discriminating the two components that originate the measured GEM flux values.