The exchange of airborne mercury from a municipal landfill area

Min-Young Kim[1] · Ki-Hyun Kim[2*] · Gangwoong Lee[3]

(Seoul Metropolitan Research Institute of Public Health and Environment[1] ·
Dept. of Geoinformation Sciences, Sejong University[2] ·
Dept of Environmental Science, Hankuk University of Foreign Studies[3])

The cycle of mercury (Hg) from a gigantic landfill area (area ~ 2.72 km^2) was investigated by conducting micromerterological measurements of its exchange rates across soil-air boundary during the spring season of 2000. Based on this field campaign, we attempted to provide various insights into the Hg exchange processes, especially with respect to the decoupling of the mixed signatures of complex source processes. According to our analysis, the cycle of Hg in the study site appeared to be affected significantly by the vent processes; excessive amount of Hg was expected to be released via ventpipes penetrating up to 60 m depths of the deep landfilled waste layer. The influence of these vent source processes was reflected very sensitively by the windrose pattern. The data collected during the non-easterly winds were representing the typical pattern for a strong source area in which upward emission is predominant in both strength and frequency. On the other hand, the data collected from the easterly winds were characterized by excessive deposition of Hg which we suspect is due mostly to the nearest vent located easterly from our measurement spot. The magnitude of bidirectional fluxes in the present study is significantly high with values of 254±224 (N=71 emissions out of 79 fluxes quantified during non-easterly winds) and -1164±1276 ng m^{-2} h^{-1} (N=14 depositions out of 16 fluxes during easterly winds), respectively. If the computed emission rate is extrapolated, we estimate that annual emission of Hg from the study area can amount to approximately 6 kg which is comparable with the estimates for other areas around the globe under strong Hg-pollution.