S14-02 Mercury Emissions Associated with Volcanoes and Geothermal Sources

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There is some debate at present regarding the quantity of mercury naturally released by volcanoes and its relative significance to the natural Hg budget. In order to better understand the role of volcanoes in the global mercury budget a number of field campaigns were carried out to evaluate the Hg/S ratios in volcanic gases around the world. Measurements have been made of emissions of Masaya (Nicaragua), Etna and Vulcano (Italy), Tatun (Taiwan), Taal and Makiling (Philippines) and Kilauea (Hawaii, USA). Emissions from open vents, fumaroles, hot springs, bubbling mud pools and altered ground were investigated at these sites and concentrations of mercury elevated above background levels were observed on most occasions. A Lumex 915+ portable mercury vapour spectrometer was employed to record real-time gaseous elemental mercury (GEM) concentrations alongside a Multi-GAS sensor box developed to monitor SO_2, H_2S, CO_2, humidity, temperature and pressure. These measurements were carried out in parallel with the collection of GEM on gold coated sand traps, particulate Hg (Hg(p)) on quartz mini-traps, reactive gaseous Hg (RGM) on glass denuders and sulphur on filter packs. As observed in studies of background air Hg, most of the GEM was the dominant form in the volcanic gases. While RGM and Hg(p) represent only a few % of the Hg present, concentrations of these species in volcanic air was several orders of magnitude higher than levels observed in background and industrial air studies. Hg/S ratios were determined and used in conjunction with the SO_2 volcanic flux to estimate Hg fluxes. Hg/S ratios in open vent emissions at Masaya and Etna were between 10^{-6} and 10^{-5}. If representative of other volcanoes, these results suggest degassing of basaltic magma plays an important part of the global atmospheric Hg budget. With these new measurements, we shall critically revisit the status of the global volcanic mercury emissions budget, and its uncertainties.

Keywords: Atmospheric; Volcanic; Fluxes; Speciation; Natural