

EGU22-8253

<https://doi.org/10.5194/egusphere-egu22-8253>

EGU General Assembly 2022

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Mercury released from newly formed volcano influence concentrations in the surrounding ocean

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Volcanic and geothermal areas are important natural sources of mercury, with mercury concentrations in volcanic gases above the atmospheric background. Individual volcanoes exhibit variable degassing features and behavior, leading to considerable uncertainty in global geogenic mercury fluxes estimations. Likewise, studies on mercury emissions from submarine volcanic and hydrothermal sites are scarce. Nevertheless, information on those natural inputs is needed to better estimate the anthropogenic mercury enrichment, and thus for the implementation of the Minamata convention.

During Spring 2021, the GEOFLAMME campaign took place at the northern end of the Mozambique channel, where we examined the influence of volcanic inputs from a volcano that had formed less than 2 years ago near Mayotte Island. Water samples were obtained with a trace metal-clean CTD rosette and all-titanium high-pressure samplers using the remotely operated vehicle Victor 6000 on board R/V Pourquoi pas?. Total mercury was measured on board via Cold Vapour Atomic Fluorescence Spectroscopy (CV-AFS) following the EPA method 1631. Exhaled fluid samples from titanium samplers followed the same analytical scheme, but at the shore laboratory.

Mercury levels measured from water column showed increased concentrations near the seafloor. Total mercury measured in fluid samples from the different venting sites showed concentrations 3 to 60 times higher than surrounding seawater.

Our study provides new insight to the understanding for mercury biogeochemistry, the interactions between magmatism, tectonics and fluids circulation processes, as well as the implications on the physical-chemical properties of the water column. It also improves our knowledge on present-day mercury cycling in the marine environment using field-based data. Ongoing work will attempt to quantify seafloor mercury inputs to the vicinity of the Mayotte Island.

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