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Solubility of metals in aerosol samples from Mount Etna during the EPL-REFLECT campaign

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Volcanoes emit a chemically complex cocktail of gases and aerosols into the atmosphere, which can affect Earth's climate (1) and human health. The vast majority of volcanogenic fatalities involve the obvious thermal and physical injuries resulting from an eruption, but many of the emissions from volcanoes are toxic and include compounds such as sulfates and metals, which are known to disrupt biological systems (2). Yet, there is a lack of knowledge on the toxicity of compounds found in volcanic plumes and their fate in the atmosphere.

Research has focussed on the impacts of large-magnitude explosive eruptions. While emissions from many non-explosive eruptions are continuous and prolonged, their climatic and potential effects on human health have not been studied extensively. Once the plume disperses in the atmosphere, the aerosol particle components can mix and interact with oxidants and organic compounds present in the atmosphere. How these chemical components interact and how the interactions affect the Earth's climate, particle toxicity and human health is largely unknown especially for trace metals.

In the framework of the EPL-REFLECT (Etna Plume Lab – near-source estimations of Radiative Effects of volcanic aerosols for Climate and air quality studies), a field campaign on Mount Etna was done in July 2019 in which samples of atmospheric aerosol were collected during non-explosive degassing activity. Samples were collected both at the crater and in a transect following the volcanic plume down slope to the closest inhabited areas. Samples were analysed for trace metals and organic compounds, including solubility tests (3) to assess how tropospheric processing of the aerosol affects metal bioavailability and potentially the toxicity of the aerosol.

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