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## Current approaches in the quantification of emissions from volcanoes

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Volcanoes represent one of the most important natural sources of pollutants to the atmosphere. Emissions of SO2 and other sulphur species have been the subject of particular attention, given the impact that volcanogenic sulphur may have on the Earth's radiative budget. Different approaches have been used to quantify global S fluxes: they are reviewed in this document, together with available measurements from continuously monitored volcanoes (e. g. Etna and Stromboli in Italy). Emission estimates for other substances (halogenated species, nitric acid, trace metals) are generally based on measured ratios to SO2-S emissions, but often available measurements are so scant that they do not allow generalization. In addition to "secondary aerosol", formed in the atmosphere by gas-to-particle conversion processes, volcanoes are also an importance source of "primary aerosol". Particle flux estimates have been published only for eruptions of individual volcanoes, and no global flux estimate is currently available. In order to improve our estimates of volcanic particles emissions, specific field experiments are of course needed, together with a better understanding of gas particle interactions between plume constituents and the ambient atmosphere.