Sulfur and Chlorine isotopes in volcanic products at Mt. Etna, Italy

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Mt. Etna volcano is characterized by a persistent volcanic plume and by a complex fumarolic field. Two types of fumaroles were identified: low-temperature fumaroles, which are dominated by CO_2 with minor amounts of SO_2 and H_2S, and negligible chlorine contents, and high-temperature fumaroles, which are strongly air-contaminated and characterized by appreciable amounts of volcanogenic carbon, sulfur, and chlorine [1, 2].

Sulfur and Chlorine isotopic compositions ($\delta^{34}S$, $\delta^{37}Cl$) of fumarolic and plume gases collected at Mount Etna volcano during 2008–2011 are compared to those of volcanic rocks. While low-temperature fumaroles are affected by postmagmatic processes that modify the pristine isotopic signature of sulfur and remove chlorine [2], high-temperature fumaroles and plume gases allow to constrain the $\delta^{34}S$ of magmatic SO_2 to ~0 ± 1‰, being systematically 1–2‰ lower than that of S dissolved in Etnean melts [2].

Chlorine dissolved in rocks shows an isotopic composition partially overlapping with that of high-temperature fumaroles and plume gases defining a narrow range of $\delta^{37}Cl$ range of ~0 ± 0.7‰ for magmatic chlorine [3].

While sulfur fractionation ($\alpha_{gas\text{-}melt}$) depends on the speciation of sulfur, thus providing a useful information on the redox conditions of the Etnean plumbing system, chlorine hexibits neglegible fractionation during degassing of magmatic bodies. Accordingly, isotopic fractionation model for sulfur and chorine during magma degassing provide inferences on the mantle source of Etnean magmas and physico-chemical conditions in the shallower system.

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BC/OC ratios : A new metrics to mitigate Emissions, Health and Radiative Impacts. Focus on African megacities.

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Fossil fuel and biofuel emissions of particles in Africa are expected to significantly increase in the near future, particularly due to rapid growth of African cities. Air quality degradation is then expected with important consequences on population health and climatic/radiative impact.

In this work, we show the central role of black carbon to organic carbon ratios (BC/OC) to characterize African anthropogenic emissions and impacts:

- a new BC and OC African anthropogenic emission inventory adapted to regional specificities has been constructed for the years 2005 and 2030.
- BC and OC radiative impacts in Africa have been modeled with TM5 model and Penner *et al*.. (2011) radiative code for these inventories for 2005 and 2030 and for two emission scenarios: a reference scenario and a ccc* scenario including regulations. In this study we will show that enhanced heating is expected with the ccc* emissions scenario in which the OC fraction is relatively lower than in the reference scenario.
- results of short term POLCA intensive campaigns in Africa in terms of aerosol inflammatory impacts on the respiratory tract through in vitro studies. In this study, organic carbon particles appear more biologically active than BC particles.

Quite importantly, air quality improvement obtained through regulations in the ccc* scenario with higher BC/OC ratios are accompanied by stronger heating impact. BC/OC ratio variations may be considered as a standard reference index to study air quality, health and climatic impacts.

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