

Mount Etna the major point source of metals in the Mediterranean basin: impact on atmospheric precipitation

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Mount Etna is a huge volcano in the Mediterranean basin and is located in the eastern part of Sicily. It is considered to be, on the long-term average, the major atmospheric point source of many environmental harmful compounds. Their emission occurs either through continuous passive degassing from open-conduit activity or through sporadic paroxysmal eruptive activity, in the form of gases, aerosols or particulate. Volcanic volatiles and aerosol emitted into the atmosphere fall on the Earth's surface as wet or dry deposition, and can influence the environment both at local and regional scale.

To estimate the environmental impact of magma-derived trace metals and their depositions processes, bulk deposition samples have been collected approximately fortnightly, using a network of 5 rain gauges located at various altitudes on the upper flanks close to the summit craters, from April 2006 to December 2007. Samples were analyzed for the main chemical-physical parameters (electric conductivity and pH) and for major and trace elements concentrations.

The data obtained clearly show that the volcanic contribution is always prevailing in the sampling site closest to the summit craters (~1.5 km). In the distal sites (5.5-10 km from the summit) and downwind of the summit craters, the volcanic contribution is also detectable but often overwhelmed by anthropogenic or other natural (seawater spray, geogenic dust) contributions. Volcanogenic contribution may derive from both dry and wet deposition of gases and aerosols from the volcanic plume, but sometimes also from leaching of freshly emitted volcanic ashes. In fact, in our background site (7.5 km in the upwind direction), after an ash deposition event high concentration of lithophiles elements (Si, Al, Fe, Ti) have been measured.

Sulphur, Chlorine and Fluorine, represent the main constituents that characterize the volcanic contribution in the bulk deposition on Mt. Etna, although high concentrations of many trace elements (Si, Al, Fe, Ti, Cu, As, Rb, Pb, Tl, Cd, Cr, U and Ag) display, in the site most exposed to the volcanic emissions, average concentrations of about two orders of magnitude higher than those measured in the background site (Mount Intraleo).