THE IMPACT OF VOLCANIC EMISSIONS ON ETNA'S SNOW COVER

SERGIO CALABRESE[1], WALTER D'ALESSANDRO[2]*, ALESSANDRO AIUPPA[1], EMANUELA BAGNATO[1], SERGIO BELLOMO[2], LORENZO BRUSCA[2], MARCELLO LIOTTA[2], FRANCESCO PARELLO[1]

[1]*University of Palermo, Palermo, 90139, Italy*
[2]*Istituto Nazionale di Geofisica e Vulcanologia, Palermo, 90146, Italy*
w.dalessandro@pa.ingv.it

Volcanoes are one of the major natural sources of several trace elements to the atmosphere: They contribute to atmospheric pollution by increasing the amount of reactive and greenhouse gases and aerosols. In particular, Mt. Etna is considered to be, on longterm average, the major global 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. For several months during the year (generally December-May), the summit of Mt. Etna is under a thick blanket of snow. This huge reservoir of frozen water, interacting with the volcanic plume, accumulates a great quantity of volcanogenic elements during the winter. Samples of snow were collected at different distances from summit craters along an 8 km radial transects, in the 2006 and 2007 winters. Each snow sample was analyzed for 37 elements in the laboratory using IC, ICP-OES and ICP-MS techniques. The impact of volcanic emissions is clearly detectable considering the opposite trends of pH and TDS (total dissolved solid) measured in snow samples with increasing distance from their "source". The pH values range from 1.7 on the rim of the summit craters up to 7.6 at a distance of about 8 km, and TDS ranges from diluted samples (few mg/l) at distal sites, up to extremely concentrated samples (500 - 3500 mg/l) close to the emission vents. The acidity in precipitation around the volcano depends mainly on the concentrations of volcanogenic acid forming ions (SO2, HCl and HF), as well as on concentrations of mainly geogenic alkaline species, which may eventually neutralize the acidity. Regarding metals concentrations, there are orders of magnitude of difference between the different sites with decreasing values from the crater's rim up to the farthest sites (5-8 km from craters). In particular three groups of elements were extremely enriched (many orders of magnitude higher) at the summit craters with respect to the distal samples: Halogens (Br, Cl, F, I) and S ascribable to volcanic gas contribution; Al, Fe and Ti deriving from magmatic silicate particulate; and elements such as Se, Cu, As, Bi, Cd, Tl, Pb and Hg which are highly mobile in the high temperature volcanic environment.

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