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Abstract title

FIRST APPLICATION OF ACTIVE BIOMONITORING TECHNIQUES (MOSS-BAGS) TO MAP THE DISPERSION OF VOLCANIC EMISSIONS

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Abstract

Biomonitoring may be defined as the use of organisms and biomaterials (biomonitors) to obtain informations on certain characteristics of a particular medium (atmosphere, hydrosphere etc.). In particular, mosses accumulate large amounts of trace metals, making them good bioaccumulators to estimate atmospheric pollution. The moss-bags technique, introduced in the early 1970', has become very popular. Such active biomonitoring technique is particularly useful in highly polluted areas and has been extensively used in industrial and/or urban areas to examine deposition patterns and to recognize point sources of pollution.

The main objective of this study, which represents the first application of the moss-bags technique in an active volcanic area, was to test its efficacy in such environment. Complementary objectives were: to determine the different behavior and the geographic dispersion of volcanogenic elements emitted from Mt. Etna; to check the usefulness of a simpler analytical techniques (leaching instead of mineralization of the moss samples).

A mixture of Sphagnum species was picked in a clean area, treated in laboratory (washed, dried and packed) and exposed in field for 1 month. Sites were chosen considering the prevailing wind at Mt. Etna's summit. Milled samples were analyses for major and trace elements concentrations, after microwave digestion (HNO_3 + H_2O_2), by ICP-MS and ICP-OES techniques. The same elements were also analyzed after simple leaching with deionized water (1/50 weight ratio for 4 hours). Leaching solutions were also analyzed by IC for F, Cl and SO_4.

Analyses clearly showed the efficacy of the moss-bags technique also in this peculiar environment. Several elements were strongly enriched in the mosses exposed to the volcanic emissions. The highest enrichment was measured on the rim of the summit craters, but evidences of metals bioaccumulation were also found in down wind sites, at several km from the volcanic source. The accumulation factor (exposed/unexposed moss) allowed us to distinguish a group of elements (Tl, Bi, Se, Cu, As, Cd, S), which are highly mobile in the high temperature volcanic environment. Also alkali metals showed a significant increase in their concentrations, probably because of their affinity for the halide species carried by the volcanic plume.

Also the simple and cheap leaching technique gave important indications on the plume dispersion pattern, especially for highly volatile elements (F, Cl, S, Tl).

Presentation mode

POSTER

Choice of session

1st OPTION	I1 - Fluid geochemistry in geothermal and volcanic environments: methods and applications for geothermal prospection volcanic hazard and environmental impact.
2nd OPTION	GEO8 - Geochemistry and Volcanology