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BOOK OF ABSTRACTS

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# Volcanic gas and particle monitoring using moss-bags on Vulcano Island, Italy

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## Abstract

Emissions of volcanoes and their depositions do have an immediate impact on their surrounding environment. In the present study, emissions and depositions of the active volcanic and geothermal system Vulcano (Italy) were investigated by active moss biomonitoring (Fig. 1) in the spring of 2012. Sphagnum moss bags were exposed for periods of 3 days, 3, 6 and 9 weeks. Soil and rainwater samples as well as meteorological data were also collected. After exposure, mosses were oven-dried, grinded and each sample was extracted either in deionized water or $HNO_3$ (with $H_2O_2$). Extraction solutions were analyzed by ICP-MS for total concentrations of Li, Mg, Sr, Ba, Cr, Mn, S, Fe, Co, Cu, Zn, Mo, W, Tl, As, Sb, Bi, I, and Se. Soil and rain water samples were analyzed for the same trace elements.

For elements such as As and Tl, deionized water extracts showed comparable concentrations to $HNO_3$ extracts, indicating either the absence of particles or the presence of water-soluble particles. Elements such as Pb, Ba, Se and Sr were only dissolved to about 10 % or less in deionized water, indicating a significant share of water-insoluble particle formation. Distribution patterns of emissions and depositions over the whole island of Vulcano allowed classifying all investigated elements into four groups based on their origin (Fig. 2). Lithium was found ubiquitously on the island thus likely is of either marine or geogenic origin (group a in Fig. 2). The elements Mg, Fe, Sr, Mn, Zn, Co, and W were found predominantly on the crater where bare soil was present, and were grouped as "soilborne elements" (group b). These elements are characterized by deposition close to their source of origin. Elements with higher concentrations at the fumarolic field were grouped according to their transport characteristics. The elements I, Se, Tl, Bi, Sb, As, and S were considered as true volatiles (group c) being found also further away from the fumarolic field than Pb, Cr, Mo, and Ba which were interpreted to be predominantly emitted as particles (group d).

Moss-bag biomonitoring proved to be an effective tool for the study of emission and deposition processes in active volcanic areas which also allows a classification of elements accumulated on the moss by their origin and distribution patterns.

Fig. 1.
Sampling station with moss bags on Vulcano Island

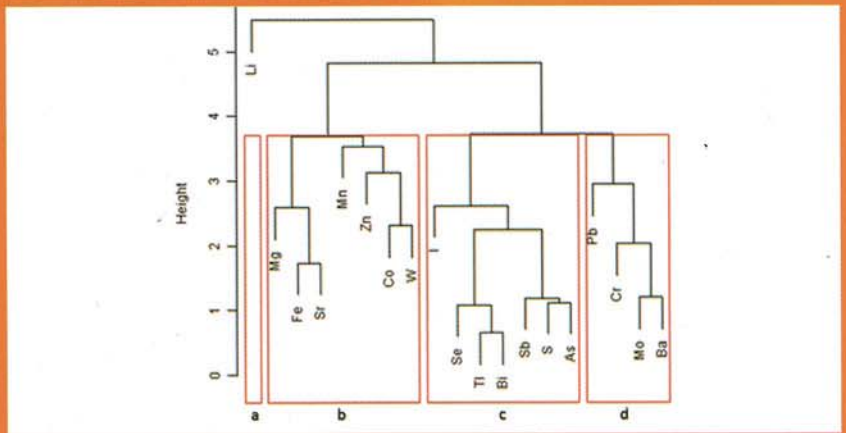


Fig. 2.
Element cluster in all moss bags Data for exposure times of 6 and 9 weeks were used and accumulated concentration per day was normalized by maximal concentration for each element before clustering.