

THE PRESENCE OF VOLCANIC ASH IN WESTERN GREECE AND ITS ASSOCIATION WITH THE ERUPTION OF THE ETNA VOLCANO, ITALY. CONSEQUENCES ON THE ENVIRONMENT

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EXTENDED ABSTRACT

In this work, the volcanic ash, which covered several regions of Western Greece and especially the islands of Ionian Sea (Kefalonia), is studied. Small ash amounts also found as fine-grained particles in the rainwater during the rainfall on 5/11/2002. The ash is a volcanic material with diameter of the order <5 to 50 μm which is transported in great distances by winds. Under the influence of the prevailing winds, it was moved in the eruptive cloud and deposited on the surface ground of Kefalonia and Zakynthos islands and on some other parts of Greece under the influence of gravity.

The ash examined in the electronic microscope, appears in the form of glassy grains, with a spherical or elongated shape. The SEM qualitative analysis of the grains showed the presence of the following elements: Na, Mg, Al, Si, P, K, Ca, Fe, S, Cl, Mn, Ti, Si. The results of the analysis showed that the following minerals may be present: aluminosilicates, silica, iron minerals and some sulphur and chlorine volatile compounds. Quantitative analysis of two ash samples, after digestion with strong acids HCl, HNO₃, HF, HClO₄, was carried out using the method of atomic absorption spectroscopy. The mean chemical composition of these two ash samples is: Cu 173 ppm, Zn 204 ppm, Ni 69 ppm, Co 42 ppm, Mn 1148 ppm, Cr 140 ppm, Pb 169 ppm, Cd 2 ppm, Fe 5.38 %, Mg 2.02 %, Ca 7.71 %, Na 3.25 % and K 11.4 %. It is obvious, from this analysis, that the ash is enriched in potassium, characterizing it as an ash with high potassium content. Based on G.L.C. guidelines the Etna ash is characterized as: (a) uncontaminated according to the Pb and Zn concentrations, (b) slightly contaminated according to the Cu and Cd values and (c) contaminated according to the Ni and Mn concentrations.

In order to prove if the volcanic ash, which traced in the rainfall on 5/11/2002, influenced the chemical composition of the rainwater, chemical analysis of three rainwater samples collected on 14/10/2002, 5/11/2002 and 6/11/2002 was performed. The results of the analysis showed that SO₄⁻², NO₃⁻, Cl⁻, Na⁺, K⁺, Ca⁺², Mg⁺² concentrations and the conductivity of the rainwater of the rainfall on 5/11/2002 are higher than the corresponding ones of the rainwater of the previous (14/10/2002) and the next rainfall (6/11/2002).

Finally, the trajectories were estimated, three days backwards of the rainfall on 5/11/2002, using the model HYSPLT of NOAA, for different heights in the atmosphere. The model's results reveal trajectories over the area of the Etna volcano, and this is an indication that the rainwater of the rainfall on 5/11/2002 had been enriched with constituents of the ash from the Etna volcano eruption.

Key words: volcanic ash, Mt.Etna, wet deposition, dry deposition, rainwater chemistry, environmental impact, Athens, Greece.