Geochemical background of stream sediments of Santiago island, Cape Verde

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The island of Santiago is the largest of the Cape Verde archipelago, covering an area of 991 km^2, and with a length and width of 54.9 km and 29 km respectively, and reaching an altitude of 1392 m. Climatic conditions and erosion are some of the natural problems of the Cape Verde archipelago. Furthermore, human influence on the surface environment has often proven to be inappropriate and pollutant. These factors cause innumerable consequences in terms of contamination of soil and both surface and subterranean water. Knowledge of the natural geochemical variability is essential for the proper resolution of economic, environmental, planning, medical and legal issues. The need for building a database of georeferenced geochemical information that comprises the surface environment of the island of Santiago was the prime motivation for carrying out this study. A geochemical survey of 337 of stream sediment samples from the island of Santiago was conducted, following the guidelines of the International Project IGCP 259 not only at the sampling stage, but also in the subsequent stages of preparation, analysis, data treatment and mapping. Levels were determined, in the fraction < 2mm, of 36 elements: 9 major elements (Al, Ca, Fe, K, Mg, Mn, Na, P, Ti) and 27 trace elements (Ag, As, Au, B, Ba, Bi, Cd, Co, Cr, Cu, Ga, Hg, La, Mo, Ni, Pb, S, Sb, Sc, Se, Sr, Th, Tl, U, V, W and Zn). Granulometric analyses were also carried out, and the mineralogical composition of about 25% of the stream sediments samples was studied. 83 rock samples taken from various formations on the island of Santiago were also analysed, the levels of K_2O, Na_2O, Fe_2O_3(T), MnO, Sc, Cr, Co, Zn, Ga, As, Br, Rb, Zr, Sb, Cs, Ba, Hf, Ta, W, Th and U having been determined. The geochemical patterns obtained from spatial distribution maps were correlated with the nature of the parent rock, and some of contamination. The interpretation of the results was carried out not only by observation of the geochemical maps, but also after statistical analysis of the data gathered, and supported by a wide range of available information. The use of Principal Component Analysis allowed associations between chemical elements to be perceived, whether geogenic or anthropogenic in origin. Spatial distribution maps of various multi-element indices of environmental importance were also drawn up, such as the Al/(Ca+Mg+K) Acidification Index, the Combi Index, the Environmental Risk Assessment Index, and the Enrichment/Contamination Indices for several groups of elements considered primary pollutant metals.

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