



Geochemistry and mineralogy 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 km², and with a length and width of 54.9 km and 29 km, respectively, and reaching an altitude of 1392 m. A geochemical survey of 337 of stream sediment samples from the island of Santiago (density ~ 1 sample per 3 km²) was conducted, following the guidelines of the International Project IGCP 259 at the sampling stage, and also in the subsequent stages of preparation, analysis, data treatment and mapping. The analysis were performed in the < 2mm fraction and 36 elements were determined: 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, Zn). Mineralogical composition of about 25% of the stream sediments samples was also studied. The mineralogical composition is dominated by primary silicate minerals such as feldspar, pyroxene and olivine, reflecting the mineralogical signature of the igneous rocks that support the island. The main secondary minerals are quartz, phyllosilicates (smectite, kaolinite, mica/illite), calcite and hematite. Leucite, apatite, nepheline, magnetite, titanomagnetite, ilmenite, chromite, garnet, zeolites, siderite, opal, barite, titanite, zircon, halite, aragonite, dolomite, brucite larnite and chlorite, most of them primary, were also identified. Chemical weathering is not intense in Santiago due to the semi-arid climatic conditions and the vigorous relief. Wind-transported materials, and some chemical weathering, can explain the presence of quartz, hematite, phyllosilicates, and calcite.

Stream sediments of Santiago island have higher contents in Cd, Co, Cr, Cu, Fe, La, Mg, Mn, Ni, P, Ti, V and Zn than those in the upper crust. The volcanic rocks of the island of Santiago, which make up most of the island, are alkaline basalt, basanites and trachytic-fonolitic rocks, rich in siderophile elements (Fe, Mn, Co, Cr, Ni) and in incompatible elements, namely REE and P. So, the observed enrichment in the stream sediment, relative to the continental crust, in these elements reflects the control of the parent rock in the chemical composition. The stream sediments of Santiago are impoverished in Ba, Ca, K, Mo, Na, Pb, Sc, Sr, Th, and U, which is due to the fact that the upper crust has a granodioritic composition, and is therefore rich in these elements.

The geochemical patterns obtained from spatial distribution maps were correlated with the nature of the parent rock and also some sources of contamination. The use of Principal Component Analysis allowed associations between chemical elements to be perceived, whether geogenic or anthropogenic in origin.