REE in topsoils and rocks from Santiago island (Cape Verde)

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A geochemical survey of soils, stream sediments and rock samples from the Santiago Island (Cape Verde) was performed in order to compile an environmental geochemical Atlas, following the IGCP 259 - "International Geochemical Mapping" recommendations. Santiago is the major island of the Cape Verde archipelago (991 Km^2) and a maximum elevation of 1394 m at Pico da Antónia. The geomorphology of this island varies significantly, with flat areas along the coast and high slopes in the inner part of the island. The geology of Santiago island is mainly characterized by alkali basaltic rocks and respective pyroclastic products. Quaternary sediments and calcareous sedimentary rocks also occur in small areas, especially near Praia, São Francisco and Tarrafal bays. The main geologic units, from the newer to older ones are: sedimentary Quaternary formations (SED), the Monte das Vacas formation (MV), the Assomada formation (ASS), the eruptive complex of Pico da Antónia (PA), the Orgãos formation (FO), the Flamengos formation (FLA) and the Ancient Internal Eruptive Complex (CA).

In this work the total contents of rare earth elements (REE) in 259 topsoils and 163 rock samples, representing all the geological formations of Santiago island are given. The REE contents were determined in soils (< 2 mm fraction) and rocks using instrumental neutron activation analysis (INAA). Reference samples of sediment and soil (GSS4 and GSD9) from the IGGE from the People's Republic of China were used as standards. Irradiations were done in the core grid of the Portuguese Research Reactor. Relative precision and accuracy are in general within 5%.

The present work aims to contribute to the understanding of the REE geochemistry in topsoils, from different geomorphological units/geological formations from Santiago Island, and their correlation with the respective parent rock material. REE patterns of both topsoils and rocks present a fractionation between light REE (LREE) and heavy REE (HREE); no significant anomalies of Ce and Eu occur. A tendency for higher amounts of REE in soils relative to rocks within the same geological formation is observed.

In the particular case of topsoils the higher amounts of REE (specially the LREE) occur in the CA formation. The samples from the SED formation also have high REE contents, mainly the middle and HREE. Special attention should be taken on several samples with quite high levels of REE, which can be probably related with the presence of a carbonatite source nearby, or located upstream in the case of sediments.

REE in topsoils appear to be good fingerprints of carbonatite occurrence.

This work contributes to the compilation of information regarding the geochemistry of soils and rocks from Santiago, achieving a better characterization of this island, which is relevant for the construction of the environmental geochemical Atlas of Cape Verde.

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