

## Rock and soil geochemical processes

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## MAJOR AND TRACE ELEMENTS IN SEDIMENTS FROM VIRAÇÃO LAGOON, FERNANDO DE NORONHA ARCHIPELAGO, BRAZIL

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Fernando de Noronha is an isolated group of 21 volcanic islands and located in the South Equatorial Atlantic, approximately 545 km from Recife, PE, Brazil. This archipelago is a protected and isolated habitat with restrict access. Viração Lagoon, a small lake located at Fernando de Noronha Island, 20 meters above the sea level, is a pristine lake located in the main island. The local drainage is restricted and ephemeral, and no connection with the general insular drainage is

observed. Two sediment cores (27 and 41 cm-long) were extracted in this lagoon in 2000, in order to determine the chemical and mineralogical composition of the sediments. The sediments are made up of smectite, and Fe and Ti oxides. Trace elements As, Ba, Br, Co, Cr, Cs, Rb, Sb, Sc, Ta, Th, U, Zn and rare earths (Ce, Eu, La, Lu, Nd, Sm, Tb and Yb) were determined by instrumental neutron activation analysis (INAA). All samples, previously dried at 60°C, were passed through a 0.065 mm sieve. The cores were sliced at every two centimeters. For the multi elemental analyses approximately 200 mg of sediment (duplicate samples) and about 150 mg of reference material and synthetic standards were accurately weighted and sealed in pre-cleaned double polyethylene bags, for irradiation. Single and multielement synthetic standards were prepared by pipetting convenient aliquots of standard solutions (SPEX CERTIPREP) onto small sheets of Whatman no 41 filter paper. Sediment samples, reference material and synthetic standards were irradiated for 16 hours, under a thermal neutron flux of  $10^{12} \text{ n cm}^{-1} \text{ s}^{-1}$  in the IEA-R1 nuclear reactor at Instituto de Pesquisas Energéticas e Nucleares (IPEN). Two series of counting were made: the first after one-week decay and the second, after 15-20 days. The counting time was 2 hours for each sample and reference material, and 30 min for each synthetic standard. Gamma spectrometry was performed using a Canberra gamma X hyperpure Ge detector and associated electronics, with a resolution of 0.88 keV and 1.90 keV for  $^{57}\text{Co}$  and  $^{60}\text{Co}$ , respectively. The validation of this methodology was performed by means of Buffalo River Sediment SRM 2704 (NIST), Soil-7 (IAEA) and BEN (Basalt-IWG-GIT) reference material analysis. The major elements were determined by XRF technique at IG/USP and the validation was carried out by means of JB-1a and JG-1a (Geological Survey of Japan) reference materials analysis. Their concentrations are similar to those reported for NASC (North American Shale Composite),

except for Ba, REE, Cr, Zr and Zn, with higher concentrations. Enrichment factors for major and trace elements were calculated, using the composition of the surrounding rock (source of the sediments) as a normalizer. Results show that Cr, U, Th, Rb, and Zn are enriched and Hf, Co, Eu and Tb are depleted relative to the rock.

### TWO APPROACHES USING U ISOTOPES TO EVALUATE THE WEATHERING RATE. APPLICATION TO THE ITAPUAÇU GRANITE PROFILE, MARICA, RIO DE JANEIRO, BRAZIL

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A 8 m-vertical profile in a weathered granite near Lagoon Marica (Rio de Janeiro) was analysed for its <sup>238</sup>U, <sup>234</sup>U and <sup>230</sup>Th. The vertical profile of the <sup>234</sup>U/<sup>238</sup>U activity ratio shows regular evolution with radioactive equilibrium at the basis (U activity ratio = 1) and progressive decline towards upper levels as they underwent more and more weathering (ratio = 0.8).

In 1987, Latham and Schwarcz presented formulas that express the differential behaviour of <sup>234</sup>U, <sup>238</sup>U and <sup>230</sup>Th in weathered rocks as functions of the time (t) the sample in question has been subjected to weathering. They defined loss coefficients for <sup>234</sup>U and <sup>238</sup>U, respectively