Natural radioactivity in the island of Santiago (Cape Verde)

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The island of Santiago is located in the Cape Verde archipelago, 800 km W from Dakar, Senegal. The archipelago has volcanic origin and one of the islands (Fogo) still exhibits active volcanism.

A geochemical study was carried out to characterize radionuclides in the geological environment, in a section of the Santiago island that includes the town of Praia (130,000 inhabitants). A total of 30 samples from representative geological units were collected and their U, Th and K contentes determined with an Ortec NaI(Tl) 3" gamma spectrometer at the Laboratory of Natural Radioactivity of the University of Coimbra (Portugal). Additionaly, a total of 43 CR39 passive detectors were placed in dwellings of this town, during 2 months, to evaluate exposure to radon gas. The detectors were processed with an automated Radosys system, after chemical etching.

Four main geological formations were studied, the old eruptive complex (CA), mainly composed of basic veins (ca. 9 Ma); the Flamengos formation (FF), composed of submarine basaltic lava sequences (ca. 4.5 Ma), the eruptive complex of Pico da Antonia (PA), composed of basaltic lava sequences and pyroclasts of submaribe/subaerial nature (2-3 Ma), and the Monte das Vacas (MV), composed of pyroclasts (0.7-1.1 Ma).

The average uranium content determined is quite silimar in the several formations (CA – 2.0 ppm; FF – 1.4 ppm; PA -1.7 ppm; MV – 1.9 ppm). The minimum concentration observed was 0.4 ppm (PA) and the maximum 3.7 ppm (CA). Thorium content shows an higher average value for CA (6.2 ppm), and similar values for FF, PA and MV (4.9, 4.8 and 5.4 ppm, respectively). The same trend was observed for K_2O, with CA showing higher values (2.9%) and the remaining formations similar contents (1.3, 1.1 and 1.9%, respectively).

The low uranium concentrations measured and the mild climate of the region allow to antecipate reduced indoor radon activities. This was indeed confirmed, with an average activity of 39 Bq/m3 obtained (range from 7 up to 93 Bq/m3). From these results we can conclude that human exposure to natural radiation in the region is lower than world average.