

Assessment of natural radioactivity levels in waters from higher Ribeira Valley until the southern São Paulo State Coastal Plain

Joselene de Oliveira¹ & Sueli Carvalho de Jesus¹

¹Laboratório de Radiometria Ambiental, Gerência de Metrologia das Radiações, Instituto de Pesquisas Energéticas e Nucleares, São Paulo, SP, Brazil, 05508-000

Abstract

Ra isotopes provide fundamental information on the interaction of sediments, groundwater and estuarine waters. In this project, the distribution of natural Ra isotopes was studied in surface, groundwater and estuarine water samples collected from dry and wet seasons (2009 – 2010) campaigns performed in Ribeira Valley, Southern São Paulo State. The inventory allowed the application of Ra isotopes as tracers of fluvial and groundwater discharges to the Cananéia-Iguape estuarine complex. The exchange of groundwater/ surface water in Ribeira do Iguape River basin and related fluxes of several constituents for the Cananéia-Iguape estuarine complex mass balance is still not very well known. The results obtained in this research work evidenced that there is a prevalence of ²²⁸Ra isotope in all the set of samples analyzed. However, the activity concentrations of Ra isotopes determined from Higher Ribeira Valley through the Southern Coastal Plain of São Paulo are representative of natural background levels, showing low or minimal human intervention. In the set of samples collected along Ribeira do Iguape River, Cananéia and Iguape outlets, the higher concentrations of Ra were observed in bottom waters, indicating the diffusion of ²²⁸Ra from sediments recently deposited as a potential source of the increased concentrations of this isotope when compared with others. The activity concentrations of the short-lived Ra isotopes were negligible, lower than the limit of the detection. Fluxes of Ra for Cananéia outlet are strongly influenced by tidal oscillations, which modulate the increase and decrease of Ra concentrations in response of the respective increase and decrease of waters salinity. In Iguape outlet and in hydrochemical stations performed along Ribeira do Iguape River it was observed a linear relationship between the amount of suspended matter and the increase of ²²⁸Ra activity concentration. When we evaluate qualitatively the differences in behavior of both long-lived Ra isotopes, the concentrations of ²²⁶Ra have not shown similar distribution to ²²⁸Ra. This demonstrates negligible contribution from advective porewaters and groundwater to the studied scenario. Dominant fluxes of trace-elements, radionuclides and nutrients have their main sources centered on fluvial, sediments and suspended matter compartments.