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Large 224Ra and 228Ra disequilibrium indicates intense groundwater processes in the Cabo Frio coastal system

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Input of subterranean water, referred to as Submarine Groundwater Discharge (SGD), typically is a mixture of infiltrated seawater and terrestrially derived freshwater and includes all advective fluid flow between the land and the continental shelf, regardless of the source or composition of the fluids (Smoak et al., 2013; Burnett et al., 2003). A substantial flow of nutrient and metal input via SGD, which may contribute to coastal eutrophication, has been document in recent studies (Sanders et al., 2012; Santos et al., 2008). Direct measurements (e.g. seepage meters) of SGD are difficult on a regional scale. However, radium isotopes have been shown to be powerful tools to quantify SGD fluxes and indicate the sources (Sanders et al., 2012). The direct parent of each radium isotope is a thorium isotope. Thorium is strongly adsorbed to sediment and provides a source of radium, which is generated on a range of time scales. In freshwater, radium is strongly adsorbed to particles. However, under reducing conditions, low pH and/or increasing salinity, radium can be released into solution. These characteristics make radium an excellent tracer of brackish SGD and a net flux of nutrients and metals to the ocean. The coastal plain in the region of Cabo Frio and its surroundings consist of Quaternary deposits of continental sediments, coastal lagoons and marine sands forming a large coastal aquifer. During the winter of 2012 and summer of 2013 was performed a physicochemical characterization and measurements of radio isotopes in groundwater along a transect perpendicular to the beach. The high radio activities associated with the imbalance exists between the 224Ra and 228Ra can be useful tools in understanding the role of submarine groundwater discharge in this region highly productive and high marine biodiversity.