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Isotope tracing and hydrogeochemical characterization of saltwater intrusion and submarine discharge in the Coastal Aquifers of Recife (Northeastern Brazil).

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The over-exploitation of groundwater and the difficulties in recharging the aquifers in the highly urbanized areas of Recife Metropolitan Region (RMR) has severely depleted the potenciometric levels of the aquifers in the last 20 years and increased their vulnerability to seawater intrusion. Many wells have been abandoned as a consequence of high salinity content in the groundwater. A monitoring program has been established to assess the groundwater salinity in the most extensively exploited area in Recife coastal plain.

Stable isotope data helped in understanding the behavior of groundwater recharge and mixing, but it is still not conclusive regarding the origin of salinization of the aquifer system in RMR. From the isotopic signature it can be said that the groundwater in the aquifer system has a three-fold component: fresh groundwater recharge component, old evaporated groundwater and saline waters. Ongoing detailed studies including δ^{18}O and δD ratios in surface, estuarine and sea-waters and ^{3}H groundwater dating are in course to better understand the recharge and mixing mechanism of groundwater in the RMR aquifer system.

On the other hand, the influence of submarine groundwater discharge (SGD) on nutrient and trace element cycling in the coastal ocean has been increasingly recognized, but little information about its driving forces is available. The current definition of SGD includes submarine fresh groundwater discharge (FSGD - the terrestrial component) and recirculated saline groundwater discharge (RSGD - the marine component). While FSGD is driven by the hydraulic gradient, RSGD incorporates recirculated water caused by wave set up, tidally-driven oscillations, current-induced pressure gradients, and convection. Since these terrestrial and marine driving forces are usually superimposed, it is difficult to separate their relative contributions.

Radon (^{222}Rn) is considered by oceanographers as a potential tracer of coastal and submarine groundwater discharge (SGWD). The use as tracers is based on the occurrence that radon concentrations in coastal discharge are a few orders of magnitude greater than in coastal seawater. This work aimed at studying radon and the major ions inland in the aquifers, in order to fill the gap of knowledge about their behavior before they reach the coastal discharge and evaluate the seawater contribution using mass balance modeling.