

HYDROGEOCHEMISTRY, AND OXYGEN AND HYDROGEN ISOTOPE COMPOSITIONS OF A MULTI-LAYERED AQUIFER SYSTEM IN THE METROPOLITAN AREA OF RECIFE, PERNAMBUCO, NE BRAZIL

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ABSTRACT: The Boa Viagem (BV), Barreiras (BA), Beberibe (BE), and Cabo (CA) aquifers are part of the Pernambuco and Cabo sedimentary basins, which constitute a multi-layered aquifer system. A hydrochemical and stable isotopic (^{18}O and ^2H) study was carried out in the main aquifers of the metropolitan area of Recife (state of Pernambuco, Brazil) within the framework of the water sustainability project. The goal of the study was to identify the main hydrogeochemical processes controlling their chemical content, to get further information into the water quality as well as to differentiate between fossil and contemporaneous recharge. For such purpose, a large database of physical-chemical (over 1000 analyses) and stable isotope (ca. 45 analyses) from the Water and Climate Agency of Pernambuco (APAC) / Water resources secretariat (SRH) and an additional of 100 physical-chemical and 15 isotopic analyses were used. On one hand, measurements of physical parameters (e.g., pH, and electrical conductivity) in general are within the World Health Organization (WHO) recommended allowable limits. On the other hand, about 60% of the analyzed water is good for drinking based on the chemical parameters, and mainly TDS, Na, and Fe exceed the maximum permissible values for drinking. Na^+ was the dominant cation and Cl^- was the dominant anion for all aquifers. The dominant hydrochemical facies was $\text{Na}-\text{Cl}-\text{HCO}_3^-$ for the BV aquifer, $\text{Na}-\text{Cl}-\text{SO}_4^{2-}$ for the BA aquifer, and $\text{Na}-\text{Ca}-\text{Cl}-\text{HCO}_3^-$ for the BE and CA aquifers. The chemical variation of the analyzed samples could be ascribed to water-rock interaction and revealed rock weathering together with minor salinization as the dominant processes controlling the major ion composition. Consequently, the chemical composition of the studied aquifers seems to be strongly influenced by the lithology. Nevertheless, cation exchange also played some role and was a significant process. The analyzed water samples of the multilayer aquifer system show considerable variation in isotopic content. The stable isotope of the groundwater ranges from -1.98 to 0.36 ‰ and -1.8 to +6.9 ‰ for $\delta^{18}\text{O}$ and $\delta^2\text{H}$, respectively. These isotopic features of the studied aquifers suggest that most of the groundwater recharged from local precipitation, which evaporates prior to infiltration. However, quite a few samples as evidenced by major ion composition also suggest mixing with saline water.

KEYWORDS: MULTI-LAYERED AQUIFER SYSTEM; HYDROGEOCHEMISTRY; O, H STABLE ISOTOPES