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THE GEOCHEMICAL ORIGIN OF WATER SALINITY IN THE DRY ZONE OF SRI LANKA

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This study focuses on Netivagama village in Mihintale, Anuradhapura District, where water scarcity is exacerbated by elevated salinity levels (Average = $1759.24 \text{ mg L}^{-1}$), exceeding World Health Organization (WHO) standards. Salinity is influenced by ions, such as Ca²⁺, Mg²⁺, CO₃²⁻, HCO₃-, Na⁺ and Cl⁻, primarily originating from the weathering of silicate rocks in the Wanni complex. This area comprises metamorphic rocks, such as charnockitic gneiss, hornblende biotite gneiss and granitic gneiss, as well as vein quartz and pegmatites, which are metamorphosed at upper amphibolite to granulite facies metamorphism. Petrographic analysis reveals moderate weathering of minerals, accelerated by hot temperatures in the dry zone, releasing the above ions into the environment. Temperature fluctuations between 28 °C to 32 °C characterize the region, with the northeast monsoon from December to January and the southwest monsoon from May to July influencing rainfall patterns. The study area, characterized by flat terrain, is recharged by two nearby reservoirs. While the main fracture patterns lie in north-south and north-west directions, minor fractures can be observed along the north-east direction. Water movement is slow due to the flat terrain and syncline fold structure, leading to high retention times that allow for the mixing and concentration of ions in groundwater. The predominant water type, Ca-HCO₃, constitutes over 85% of shallow and deep groundwater, with some occurrences of non-dominated cation-HCO₃, Mg-HCO₃, Na-K-HCO₃, and Ca-Mg-Cl types. Groundwater isotopes deviated from the local meteoric water line indicate moderation in precipitation due to geochemical processes or anthropogenic activities such as agriculture. This study underscores the importance of protecting recharge areas, particularly the nearby reservoirs, for sustainable groundwater management.

Keywords: Dry zone, Granulite-facies, Metamorphic terrain, Silicate minerals, Syncline fold structure

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