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HYDROGEOCHEMICAL APPRAISAL OF GROUNDWATER QUALITY FOR DRINKING AND IRRIGATION PURPOSES IN A LOW-TEMPERATURE GEOTHERMAL FIELD OF SOUTHEASTERN TÜRKİYE

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Abstract

This study aims to evaluate heavy metal contamination and the influence of geothermal fluid on groundwater and drainage channel quality in the semi-arid region of southeastern Türkiye. Groundwater samples were collected from the Karaali geothermal field and four adjacent wells during all four seasons of 2018 and analysed for major ions, hydrogeochemical characteristics, and physicochemical parameters. Irrigation water suitability was assessed using the sodium adsorption ratio (SAR), while industrial applicability was evaluated through the Langelier Saturation Index (LSI) and Ryznar Stability Index (RSI). Drinking water quality was determined using the entropy-weighted water quality index (EWGQI). The weighting analysis showed that Na^+, Ca^{2+}, Cl^-, SO_4^{2-}, HCO_3^-, and EC were the dominant parameters shaping groundwater quality. Hydrogeochemical facies indicate that geothermal fluids are characterized by Ca–Na–HCO_3–Cl–SO_4 water types. Corrosion tendency was observed in all wells except the geothermal source during summer, whereas the Karaali geothermal water exhibited the highest annual scaling tendency (LSI = 0.80). SAR results showed that all samples with values <8 were classified as good-quality irrigation water. According to EWGQI, 25% of samples fell into Class II (good), 65% into Class III (moderate), and 5% into Class IV (poor). Heavy metal analyses of the Karaali geothermal fluid revealed As, Mo, Ni, Se, and V concentrations of 44.0, 146.4, 114.0, 153.1, and 2405.8 ppb, respectively, which exceed irrigation water limits, and based on the Turkish Standards (TS 266 2005), the elevated As, Ni, and Se levels indicate that the geothermal water does not comply with national drinking water standards.

Key words: drinking water quality, EWGQI, groundwater quality, geothermal fluid, irrigation water quality, scale effect

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