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HYDROCHEMICAL AND ISOTOPIC CHARACTERISTICS OF KARST WELL WATER IN THE LONGZICI SPRING CATCHMENT AND ORIGIN

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Abstract

Karst water from Longzici Spring serves as the primary water source for agriculture, industry, and residents in Linfen, China. Investigating its pollution characteristics and origin is crucial for the optimal use of karst well water and ecological protection in the Spring Catchment. This study employed isotopic analysis and hydrochemical methods (Durov diagram, ion ratios, Gibbs diagram, S isotopes, and H and O isotopes) to explore the hydrochemical characteristics of karst well water in the Longzici Spring Catchment. The study revealed distinct hydrochemical fields in different zones, including the depth stagnant zone, recharge zone, runoff, and drainage zone. The karst well water in Longzici Spring was predominantly characterized as HCO₃·SO₄-Ca·Mg and SO₄·HCO₃-Ca·Mg water, with a SO₄²⁻ concentration ranging from 20.2~1384.5 mg·L⁻¹ (mean = 280.6 mg·L⁻¹). The main sources of SO₄²⁻ were identified as the dissolution of gypsum and oxidation of FeS₂ in coal strata. Notably, 22.3% of SO₄²⁻ originated from the oxidation of FeS₂. Isotopic analysis (H, O, and S) indicated that 85% of the karst water in Longzici Spring was affected by acid drainage from coal mines. Phreeqc simulations highlighted that the hydrochemical characteristics in the study area were primarily influenced by the dissolution of dolomite, halite, and gypsum, along with dedolomitization.

Key words: Gibbs diagram, hydrochemical characteristics, hydrogeochemical simulation, source of SO4²⁻, stable isotopes

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