

Geochemical features of groundwaters around the southern Itoigawa-Shizuoka tectonic line, western Kofu Basin

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Over the last few decades, drilling of thermal wells for hot spring bathing purposes were performed extensively on a deep aquifer at the depths more than 1000m in the non-volcanic area of Japan. Around the southern part of Itoigawa-Shizuoka Tectonic Line (ISTL), western Kofu Basin of central Honshu, many numbers of ground waters from drilled wells have been used for hot spring bathing. Some of these waters have high salinity, up to more than sea water salinity level, but their genesis and the formation mechanism of water quality have not been clarified previously. In this study, chemical and isotopic compositions of hydrogen (D/H), oxygen (¹⁸O/¹⁶O) and sulfur (³⁴S/³²S) of several ground water samples from, such as, natural spring and drilled wells around the southern part of ISTL, western Kofu Basin were analyzed in order to discuss the origin of waters and the formation mechanisms of water quality.

Temperature of the samples was up to 48.8 °C, and the pH is between 6.4 and 9.7. The waters were subdivided into a Ca-HCO₃ type, Ca·Mg-HCO₃ type, Na·Ca-HCO₃ type, Na-HCO₃ type, Ca-SO₄ type, Na-Cl·HCO₃ type, and Na-Cl type. Among these, Na-Cl type was the most dominant water quality and maximum Cl concentration of the samples was up to about 23000 mg/L.

Due to plot of Na and Cl concentration of groundwaters were distributed along with mixing line between rain water and sea water, Na-Cl type water, which is dominant water quality type in the study area were appears to be derived from mixing of rain water and sea water end-members. δD and δ¹⁸O plot of the low salinity waters were distributed along with the Global Meteoric Water Line, supporting that the low salinity end-member is originated from rain water. However, δD and δ¹⁸O values of the waters which have high salinity (more than sea water salinity) were low compared with modern seawater values. The Mg/Cl and SO₄/Cl ratio of these high salinity waters were very low compared with modern sea water, whereas the Ca/Cl ratio is higher than modern sea water. These chemical and isotopic characteristics of the sample waters indicate that the high salinity end-member of the study area is altered sea water.

Keywords: Itoigawa-Shizuoka tectonic line, deep fluid, water quality, formation mechanism