

Sources of deep saline groundwater in the Osaka Basin

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Osaka Plain is on a sedimentary basin >1500m deep, which is one of the large reservoirs of groundwater in Japan. In the deepest part of the basin, saline groundwaters, of which the highest chloride concentration is >15000mg/L , have been reported (e.g., Kajikawa, 2004; Nakaya et al., 2009). Source of the saline waters has not been clearly understood. In this study, groundwaters sampled from the Osaka basin and its surroundings were analyzed for chemical components and isotope compositions of water oxygen and hydrogen and dissolved boron to specify the origins of saline groundwater.

Based on the 3D mapping, highly saline groundwaters distributed in and just above the basement rocks of the Osaka Basin. Also, groundwaters containing >100mg/L Cl⁻ distributed along Arima-Takatsuki tectonic line, beneath Uemachi plateau and at the foot of Izumi mountains. Low chloride (<100mg/L) groundwaters ranged within δD : -60‰~-45‰ and $\delta^{18}O$: -9‰~-6‰, and the isotope ratios were plotted on the global meteoric water line (Craig, 1961). While, those isotopic characteristics of groundwaters with >100mg/L Cl gave two different trends from the global meteoric water line; one was on the area between the mixing lines of seawater and local meteoric waters, and the other was on the trend similar to the so called Arima brine, which gave the oxygen isotope shift. These characteristics were clearer for the relationships between chloride concentration and hydrogen isotope ratios, i.e., the latter ones have lower δD (-60‰~-40‰) than those of mixing water of seawater and local meteoric water. Except one from the southern area (Ishibotoke), which have been defined as Arima-type brine, the saline groundwaters with >1000mg/L Cl⁻ similar to the Arima brine did not show high-temperature water-rock interaction judged from low Li/Na ratio and boron isotope ratios, which showed the mixing of seawater. However, some of saline groundwaters plotted on the mixing area between seawater and local meteoric waters, especially from the basement granitic rocks experienced water-rock interaction at high temperature. Thus, the most of saline groundwaters in the deepest part of Osaka Basin would be originated from seawater, and had different evolution processes to obtain the unique chemistries.

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