

Geochemical characteristics and distribution of deep saline groundwater in the Osaka Basin

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Osaka Basin is a Quaternary sedimentary basin and a large reservoir of groundwater in Japan. Groundwaters in the deepest part of the basin have been mainly used for hot spas, and saline waters, of which maximum Cl concentration was >15000 ppm, were occasionally found among those waters (Kajikawa, 2004; Nakaya et al., 2009). Here, the origin of saline groundwaters from the deepest part of the Osaka basin and its surroundings were studied by the major and minor chemical compositions and O, H and B isotope ratios.

Three-D mapping demonstrated that the highly saline groundwaters distributed in and just above the basement rocks of the basin, along Arima-Takatsuki tectonic line, beneath the Uemachi plateau and at the foot of Izumi mountains. All of these areas are closely related to active faults, implying that the faults play important roles as recharging paths of the saline waters. Groundwaters containing >100mg/L Cl were classified into two types based on the O and H isotope characteristics; ones were plotted in the mixing lines between seawater and local meteoric waters, and the others were similar to the so-called Arima-type brine, of which O isotope shift was characteristic (Matsubaya et al., 1974). Relationship between Cl and H isotope ratios of the former waters was clearly in the mixing lines between seawater and local meteoric waters. While, Li/Na ratios of these saline waters showed water-rock interaction at high temperature, however, seawater would be attributed to the salinity of those waters. The distribution of latter waters overlapped with the former waters, however, it seemed to be slightly in the southern part than the formers. The relationship between Cl concentration and H isotope ratios is more characteristics than that of H and O isotopes; H isotope ratios of the former group of saline waters are -50‰ to -60‰, regardless to the increasing Cl. Li/Na ratios and relationship between Cl concentration and B isotope ratios showed the mixing of seawater and local meteoric water.

From the results, saline groundwaters in the Osaka Basin would be originated from seawater and have undergone various processes to change chemistry and stable isotope characteristic.