

Chemical and isotopic studies of hot springs in Toyama Prefecture, Japan for geothermal resources

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In Toyama Prefecture, high temperature hot springs exist in the eastern part. On the basis of chemical and isotopic (D and ¹⁸O) compositions, the hot spring waters in eastern part of Toyama Prefecture, central Japan can be divided into two groups; low and high salinities. Hot spring waters of the low salinity group are of meteoric origin and of Ca-HCO₃ type. Those of the high salinity group are a Na-Cl type and are inferred to be a mixture of sea water and meteoric water with oxygen isotope shift. The latter group is also characterized by high δ D values of ca. -20 ‰ and Cl concentrations of ca. 6,000 mg/L and the reservoir may be geopressured. In the study area, the Na/K and SiO₂ geothermometer temperatures are estimated to be between 100 to 200 °C and show high geothermal potentials. Satellite imagery was used to estimate the capacity of geothermal resources. The surface high-temperature anomalies were observed near the existing hot springs and also in a previously unknown high-temperature area. These anomalies indicate the emissions of gas or high-temperature fluid and the related alteration zone of geothermal systems. Using the estimated underground temperature and the volume of the geothermal reservoir, the stored heat capacity of geothermal resources in the study area is estimated to be 300MW.