§2. Groundwater and Rain Water Monitoring around Tono Area

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Introduction

The purpose of this study is to investigate isotopic and chemical characteristics of shallow and deeper groundwater in the Tono area, Gifu Prefecture and the movement and source of the groundwater.

Sampling and analytical procedures

Water samples were collected at several places at Tono area in 100 ml and 250 ml plastic bottles. Water temperature, pH, EC (electrical conductivity), and ORP (Oxidation−Reduction Potential) were measured at the sampling site using a thermometer, a pH meter (Shindengen, KS-701), EC meter (Horiba, B-173) and Eh meter (TOA, RM-12P), respectively.

Hydrogen isotope ratios were measured using H_2 gas generated by reduction of the sample water with zinc metal at 490°C in a sealed quartz tube [1]. For determination of the oxygen isotope ratio, the water sample was equilibrated with CO_2 at 25°C [2], and then the isotope ratio of the CO_2 was measured. A dual-inlet stable isotope mass spectrometer (PRISM, Micromass) was used to measure both ratios. The results were reported relative to V-SMOW2 with an analytical precision at this period of 1 ‰ for δD and 0.1 ‰ for $\delta^{18}O$, respectively.

Results and discussion

The δD and $\delta^{18}O$ values of shallow groundwaters vary from -48.9 to -54.8 ‰ and from -8.0 to -8.7 ‰, respectively (Fig. 1). Most of the water samples in this study plot along a meteoric water line defined as $\delta D = 8\delta^{18}O + d$ [3,4] where d indicates the Y-intercept (d-excess). There are two meteoric water lines in Fig. 1, where d is 10 in summer and 30 in winter for precipitation in Gifu and Toyama Prefectures [5]. All samples in this study are plotted between the two meteoric water lines. This means that groundwater in the Tono area are mainly originated from precipitations in summer. Water samples with closed square (■) in Fig. 1 are collected from the same well (water depth; ca. 1,000m). There is no correlation between the water depth and the δD and $\delta^{18}O$ values.

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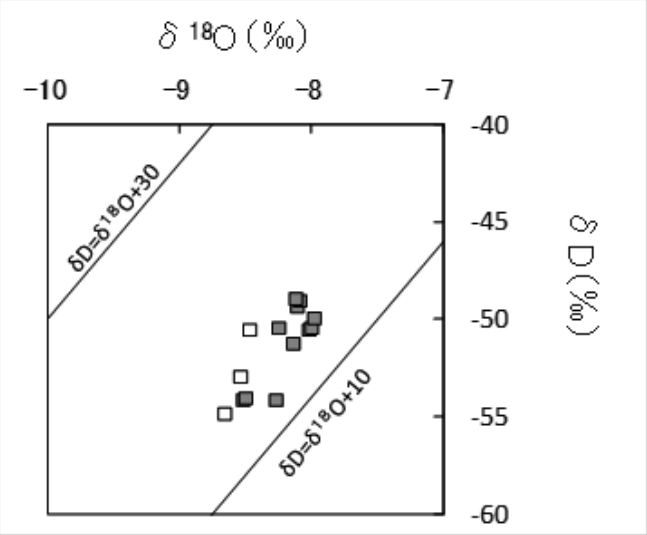

Fig. 1 Relationships between δD and$\delta^{18}O$ in water samples collected at Tono area