The characteristics and the factors controlling of groundwater quality at the foot of Mt.Asama

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1. Introduction

In generally, the chemical constituents of surface water and ground water (including spring water) derive mainly from precipitation, rocks and soil(Yoshioka,1984;Kitano,1984). Tamari et al. (1988) indicated that rocks and soil affected the chemistry of inland water by leached experiments from rocks. A lot of studies of Mt.Asama have been done since the Meiji era and many researches of ground water also has been done. But few researches had seen about the characteristics of ground water quality and volcanic body rocks. The purpose of this research is to clarify the relation wite rocks and soil and the volcanic history of Mt.Asama to the characteristics of ground water quality.

2. Outline of the field

Mt.Asama is one of the most famous active volcano in the world and situated between Gunma and Nagano Prefectures (Aramaki,1993). It is situated at the intersection Nasu volcanic zone and Fuji volcanic zone. Volume of Mt.Asama is 56km3 and the height of summit is 2569m, and Mt.Asama is strato volcano, but it has plural volcanic craters, lave domes, parasitic volcanoes, Onioshidashi lave flow and others.

3. Methods

Field surveys were carried out at 61 sites of spring water, surface water, well, and hot spring at the foot of Mt.Asama three times from May to December in 2004. The items of field survey were air temperature, water temperature, pH, RpH, EC, and gathering water samples.

Chemical analyzed components were major elements [ion chromatography (Shimadzu Co. LC-10)] and HCO3- (pH 4.3Bx method), SiO2 (Molibdosilicate yellow method), Fe2+ (1-10 phenanthoroline method) and Iron and Mn2+ (flame atomic absorption spectrophotometric method).

4. Results and conclusion

The results showed three water quality types as follow;

(1) Ca-HCO3, (2) Mg-SO4, (3) Ca-SO4

The first type(1) was seen at all over the foot of Mt.Asama, and type (2) was concentrated from the northeast area to the southeast. Types (2) and (3) were higher on water temperature and the concentration of dissolved ions were also higher. The relation between HCO3- and (Na++K++Ca2++Mg2+) showed three lines by the water quality types. Line of type (1) was straight line near the 1:1 line, but the line of types (2) and (3) lines were farther from the 1:1 line. The results suggested that SO2 originated from volcanic gas. More over, the ground water from old mountain body (Kurofu-yama) were lower than the new mountain body (Maekake-yama) on water temperature and the concentrations of SO42- and CO2. Consequently, these suggested that the chemistry of ground water was lesser influenced on volcanic activity from east to west.

Relation between Ca2+ and Mg2+ showed good correlation. Type (2) contained higher concentration of Mg2+ than type (1). It suggested that Mg2+ dissolved from hornblende (amphibole) and olivine deposited as volcanic products at the east foot of Mt.Asama.

Line of ground water in Oohinata differed from other water quality type. Perhaps, the ground water was mixture both type(1) at the south foot of Mt.Asama and type(2) at the east.

SiO2 and Iron concentrations of the north foot were lower than that of the south foot. The result showed that the shorter time in contact wite water and rocks and soil. Moreover, the difference of volcanic activity was important too.