

Hydrogeochemistry and isotopic composition of spring and stream waters in the eastern foot of Asama Volcano

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Shiraito Falls, which is a beautiful spring water fall, 3m high and 70m wide, is a major sightseeing spot in Karuizawa area. It has been believed that the falling spring waters are derived from groundwater recharged on the eastern slope of Asama Volcano, because of the large amount of discharge. However, the eastern part of Asama Volcano is composed of older flat volcano constructions so that most of main study area is topographically and hydrogeologically isolated from Asama Volcano. Therefore, It could not simply concluded that the groundwater discharging from Shiraito Falls is originated from Asama Volcano.

Spring and stream water samples were collected and major dissolved ions and stable isotopes of H, O, C of these water samples were measured to understand the origin of spring waters (especially Shiraito Falls) and groundwater flow system in the eastern foot of Asama Volcano. Furthermore, we are going to measure dissolved CFCs and SF₆ to discuss mean residence time of spring water.

Discharge rate and total dissolved solids (TDS) of springs located in the upper most reach of Yu River (Spring Group of Yu River: SGY), where Shiraito Falls is included, is higher than those in surrounding area (Spring Group of Surrounding area: SGS). Major chemical composition of SGY is Mg+Ca-SO₄+HCO₃ or Mg+Na-SO₄+Cl types, while that of SGS is Ca-HCO₃ type. Isotopic compositions of both spring groups are also different from each other. Delta-D and d¹⁸O of SGY are 4 and 0.6 per mil lighter than those of SGS. Delta-¹³C of SGY (around -10 per mil) is higher than that of SGS (below -15 per mil).

Mean recharge elevation of each spring water located in 1200-1300m a.s.l. was calculated by using recharge water line of Asama Volcano proposed by Suzuki (2003). As a result of the calculation, mean recharge elevation of SGY was 1680m (that of only Shiraito Falls was 1820m). From this result, it is concluded that spring waters of SGY are derived from groundwater recharged on eastern slope of Asama Volcano, since highest point of eastern foot area is about 1400m a.s.l.. Furthermore, the facts that SGY has higher water temperature, sulfate and chloride-rich in anion composition and d¹³C value close to that of volcanic CO₂ (-8.5 per mil) also indicate that the spring waters of SGY are the groundwater originated from Asama Volcano which is still active. It is estimated that the groundwater recharged on the eastern slope of Asama Volcano is intensively discharged at small area (SGY), since it flows through the buried valley which is eroded by Paleo-Yu River and buried by pyroclastic deposits. The spring waters of SGS are local groundwater recharged on the eastern foot of Asama Volcano, since the recharge elevation is low and effect of volcanic gas is not recognized in those geochemical characteristics.

The spring waters discharging from Shiraito Falls are concluded to be a mixture of SGY and SGS, because of the linear relationship between the water temperature and the amount of TDS. As a

result of this correlation, it is estimated that the mixing ratio of SGY to SGS is approximately 1 : 3
-4.

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hydrogen and oxygen isotopes, carbon isotope