

Characteristics of river water quality in the upper stream area of Kinigawa River

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This paper describes the result of water quality analysis and comparison with geological distribution in the upper stream area of Kinugawa river.

Water running off in a stream originates from rainwater and groundwater. Rainwater is considered to be soaked into the ground, interact with soil and rock through a long term and change to groundwater. Groundwater containing much ionic solutions comes out as seepage water of rock outcrops in a mountain area. It seems that water quality in a stream depends on that of seepage water as rainwater contains only dioxide carbon and air pollution materials.

We measured temperature, conductivity and pH at 71 sites, and collected 61 water samples in an upper stream of Kinugawa river in Nikko city, Tochigi, which covered 144 square kilometers.

The area is underlain by Jurassic sedimentary rock in the survey area. Granite intrudes, and is widely exposed in the north-eastern area. Neogene igneous rock and tuffaceous rock are widely exposed. Quaternary pyroclastic rocks distributed in the southern area.

We analyzed quantitatively ionic elements such as Cl^- , SO_4^{2-} , HCO_3^- , NO_3^- , Na^+ , K^+ , Ca^{2+} , Mg^{2+} , Si^{4+} , Fe, Mn, alkalinity and so on.

Water of Kinugawa river was generally classified into CaHCO_3 type, and tends to contain more sodium, chlorine and sulphate in a main stream. It suggested that the water was affected by hot spring water originating from Kawamata area. But it resulted that water samples had varieties in water type and ionic solutions in each branch of the stream as follows.

Firstly, most of water samples in igneous and tuffaceous rock area were divided into CaHCO_3 type, and didn't include much solutions. But water samples of Tamo-sawa, one of branches of Kinugawa river, were different and divided into CaSO_4 type. Besides, water samples of Tsuburigawa-sawa were done into NaHCO_3 type, while water samples of Fuka-sawa showed $\text{NaHCO}_3+\text{CaHCO}_3$ type.

Secondly, all water samples in an area underlain by granite were classified into CaHCO_3 type. Water contained more ionic solutions than that of igneous and tuffaceous rock area.

Thirdly, water samples of Oogoto-sawa where is underlain by Jurassic sedimentary rock was divided into $\text{CaSO}_4+\text{CaHCO}_3$ type. It was characterized of abundant calcium and magnesium. It showed more than 20 ms/m in conductivity. It was six times in maximum as much as that in other branches. As Oogoto-sawa provided much water flow, water quality in the down stream was widely affected in calcium, magnesium and sulfate contents.

These results indicate that the seepage mechanism of groundwater should be different even if it was in an area underlain by same rock group. We will clarify the hydro-geological structure and seepage mechanism controlling water quality in a stream in more detail in the near future.