# Influence of Material Supply and Human Intervention from Mt. Kusatsu-Shirane Volcano on the Surrounding Water Environment

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## I. Introduction

In Japan, a maritime nation, it is important to understand the material balance and water balance between upstream and coastal areas. In order to manage the impact of forests, agricultural land, cities, factories, and other terrestrial ecosystems on the coast within a river basin, it is necessary to understand the entire basin (Mukai 2012). Groundwater stored in volcanic bodies, especially in volcanic areas, has long been used as an important water resource (Yamamoto 1995). On the other hand, acidic rivers around volcanic bodies have a great impact on the ecosystem, water source development, and flood control of the basin. The purpose of this study is to clarify the influence of substances supplied mainly from volcanic bodies on the water quality of rivers, lakes, and precipitation around Mt. Kusatsu-Shirane.

## II. Regional Summary

The Kusatsu Shirane Volcano area has a large amount of hot spring water, as typified by the Kusatsu Hot Spring, and hot springs with high temperature and strong acidity can be seen in various places. The acidic water seen in the Agatsuma River basin is caused by acidic hot spring water and acidic sulfur mine wastewater in the surrounding area, and a neutralization project has been carried out for the Yu River basin, where Kusatsu Hot Spring, one of the acidic sources, is the main stream (Oi et al. 1991).

## III. Research methods

Field survey items (Temperature, water temperature, EC: conductivity, pH, RpH, flow rate) were measured and sampled at about 45 rivers around Mt. Kusatsu Shirane from May 23 2017 to October 2019. After filtration in the laboratory, some samples were analyzed for dissolved ingredients (TOC, $Na^{+}$, $K^{+}$, $Ca^{2+}$, $Mg^{2+}$, $Cl^{-}$, $HCO_3^{-}$, $NO_3^{-}$, $SO_4^{2-}$).

## IV. Results and Discussion

In the basin of the Manza River, which is located at the western foot of the mountain, many rivers were affected by the inflow of groundwater with a high proportion of sulfuric acid, but in the mountain stream near the fumarole group, the water quality composition to which chloride was added was observed. Water composition affected by domestic wastewater is also observed.
In the small basins extending north and south at the southern foot of the mountain, the elevation of the headwaters and the distance from the crater are related to the concentration of calcium sulfate-type water quality. If the headwaters of the basin are close to the crater, the water quality of the river will contain many volcanic components, and if the headwaters of the basin are far from the crater, the volcanic components will weaken and the influence of the surrounding fields will appear.
The strongly acidic river (Yu River, Yazawa River, and Osawa River) in the Yu River basin to the east of the mountain is neutralized and flows down through aqueducts to the middle reaches of Shirasuna River and the junction of Shirasuna River and Agatsuma River, but the main stream of the Agatsuma River is strongly affected by this.

## V. Conclusion

Research on volcanic bodies with well-developed hydrothermal systems has been taken up in Japan and

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overseas, but many studies have focused on specific issues and targets, and few have discussed the water environment of the entire mountain body. By treating not only rivers affected by strong acid drainage but also mountain streams, lakes, and precipitation far from craters, we were able to evaluate natural and human impacts and discuss the target areas in a wide range of fields.

Keywords: Water Environment, Volcano, Mt.Kusatsu-Shirane, River, Hot Spring

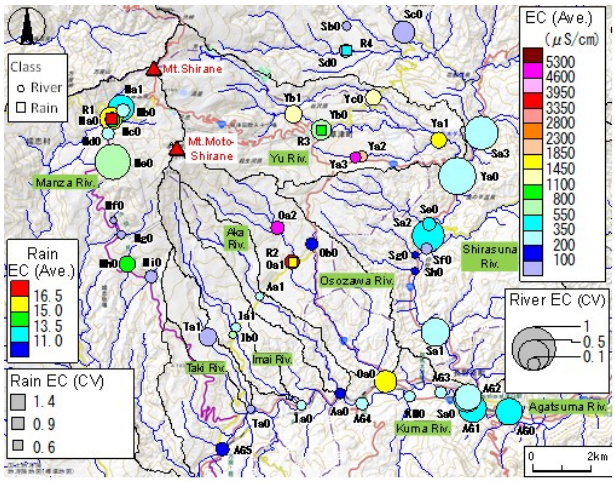


Fig.1 Spatial distribution of EC average

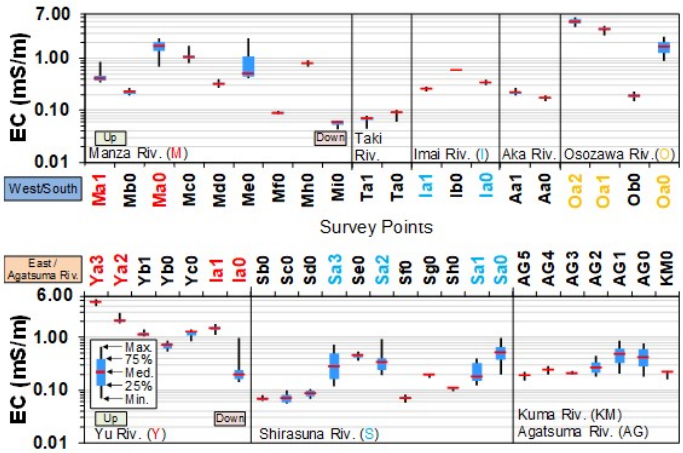


Fig.2 EC variation by basin (2017.05 – 2019.10)

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