

Geochemical and isotopic map of Asahi and Yoshii Rivers, Okayama Prefecture

Katsuyuki Yamashita^{1*}, Ayaka Onishi², Takahiro Kamei², Yoko Kurihara², Hitoshi Chiba¹

¹Graduate School of Natural Science and Technology, ²Department of Earth Sciences, Okayama University

The Asahi and Yoshii Rivers are the two of the three largest rivers in the Okayama Prefecture, flowing broadly from north to south in the central and eastern region of the prefecture. The water from the rivers supports both industrial and agricultural activities in the prefecture. Thus, a quantitative knowledge of their water sources and circulation process(es) through construction of detailed geochemical map is essential. Here we report the results of geochemical analyses of more than 200 samples collected from the two rivers and their tributaries during March 2011 to December 2012. All samples were filtered with 0.2 micrometer filter prior to the analyses for major dissolved constituents (F, Cl, NO₃, SO₄, Br, PO₄, Ca, Mg, Na, K), trace elements and O-H-Sr-S isotopes.

The results obtained so far have revealed that there are systematic changes in the deuterium excess (DE), Sr isotope ratio and the concentrations of elements such as Ca, Mg, Sr and Ba from the upstream towards the downstream.

The DE is generally high in the upstream (>20) and gradually decreases towards the downstream (<12). The seasonal variation in the DE was less than 5 permil. The regional change in the DE is interpreted to be the result of difference in the air mass contributing to the meteoric water of different locations.

The Ca, Sr, Ba concentrations of the river water, on the other hand, is low in the northern region and increases towards the south. With the exception of few locations (e.g. southern region of the Kagamino City), Sr isotope ratio also increases towards the south. Because the change in the Sr isotope ratio is broadly correlated with changes in the age and types of rocks exposed in the river basin, the variation in the Ca, Sr, Ba concentrations may be closely related to the water-rock interactions.

We also observed a systematic increase in the NO₃ and SO₄ concentrations from the upstream to downstream. The S isotopic composition, on the other hand, was high in the north and low in the south. Since NO₃ and SO₄ concentrations tend to increase abruptly in the densely populated region, these variations may reflect a change in the degree of human influence such as breakdown of fertilizers used for agricultural activities.

Keywords: Geochemical map, Asahi River, Yoshii River, Okayama Prefecture, Trace element, Isotope

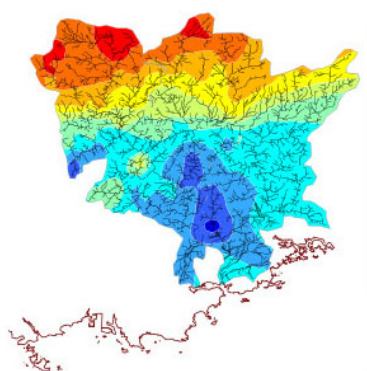


Figure 1. DE of waters from the Asahi and Yoshii rivers
(RED=high BLUE=low)