Geochemical mapping of trace and rare earth elements in small rivers of North Osaka, Japan

EMILIE EVEN*[1], AKI NOJIMA[1], HARUE MASUDA[1], TOSHIRO YAMANAKA[2] AND TAKANORI NAKANO[3]

[1]Osaka City University,
(*correspondance: e.even@sci.osaka-cu.ac.jp)
[2]University of Okayama (toshiroy@cc.okayama-u-ac.jp)
[3]Research Institute for Humanity and Nature
(nakanot@chikyu.ac.jp)

The Rivers Yono, Ibaraki and Minoh, tributaries of Yodo River, flow across the Ibaraki granitic complex and the Paleozoic-Mesozoic sedimentary formations, in the northern part of the Osaka prefecture, Japan. Waters from these rivers have been used for domestic purposes and some trace metals have been reported in concentrations above the environmental standard limits. Previous studies have shown that the sedimentary rocks were the sources of trace metals, especially arsenic, whereas the sequence of granitic rocks is believed to be the source of rare earth elements. In addition to track back of the origin of trace elements, the transportation phases and the geochemical budget of trace metals along the river flow are examined as a first step to set up a simple transportation model. Here are presented first results.

Results showed that the geochemical patterns of riverbed sediments matched the pattern of the source rocks and controlled the river water geochemistry. Sediments from sandstone and quartz diorite contained high amount of trace elements and yielded high concentrations of trace metals but low concentrations of REEs in river water. Sediments originated from adamellite contain low trace elements but river waters flowing across this formation have the highest concentrations of REEs. O/H isotopes of water pointed at the meteoritic origin of water in the upper reaches of rivers and contribution of groundwater in the lower reaches. Fractionation regarding the different size pools of total concentration, 0.45μm and 0.22μm filtration showed that most of the trace elements were transported with suspended particles and within the <0.22μm phase. Temperature of river water seems to influence the concentrations of elements, as concentrations increased with increasing temperature along the year. The role of organic matter (likely as colloidal carriers) is limited since an inverse relationship was observed. Water mixing calculation with major and trace elements yielded accurate geochemical budget model (<5% error), where as redox sensitive species induce large errors of >15%, even on few meters distance along the flow path.