

Distribution of trace elements in 3 small rivers and the surrounding geology in the North Osaka prefecture, Japan

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The Rivers Yono, Ibaraki and Minoh, that are tributaries of the River Yodo in the northern part of the Osaka prefecture, Japan, flow across the Paleozoic-Mesozoic sedimentary formations and the Ibaraki granitic complex. 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 granitic sequence of quartz diorite, granodiorite and adamellite is believed to be the source of rare earth elements (REEs). In addition to track back of the origin of these 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 distribution of the source rocks. The geochemistry of trace elements in river water is likely controlled by the weathering of riverbed sediments. River sediments from sandstone and quartz diorite contained high amount of trace elements and yielded high concentrations of trace metals in river water but low concentrations of REEs. Comparatively, river sediments originated from adamellite contain lower amounts of trace elements but river waters flowing across this formation showed to have the highest concentrations of REEs. O/H isotopic ratio in river water pointed at the meteoritic origin of the water in the upper reaches of rivers and the contribution of groundwater in the lower reaches. The fractionation of trace elements regarding the different size pools of total concentration, 0.45 μ m and 0.22 μ m filtration showed that most of the trace elements were transported within the <0.22 μ m phase. Temperature of river water seems to influence the concentrations of elements, as concentrations increased with increasing temperature throughout 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.

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