Geochemical mapping for upper Ara-river System, Chichibu Mountains area

Takaaki Fukuoka[1]; Kaori Aoki[2]; Haruka Kusuno[3]

[1] Rissho Univ.; [2] Faculty of Geo-Environmental Science, Rissho University; [3] Geo-envi., Rissho Univ.

Geochemical maps can express areal distributions of chemical elements in the earth's land surface and give information about the chemical background in the natural environment to assess the artificial environmental changes.

We analyzed the stream sediments which had been collected as a sample representing the geochemical characters in each drainage basin.A sampling site 1 per 1 km^2 was selected in the area which a mountain ridge was surrounding and at 100m upper point in the branch from the junction of main stream to avoid the contamination by floods.The stream sediment was sieved to 80 mesh on site and the fine fraction was reserved for analysis. In this study, natural dried samples were used for Instrumental Neutron Activation Analysis(INAA), and samples heated at 900 degrees were used for X-ray fluorescence analysis (XRF), Prompt gamma ray analysis (PGA) and Laser Ablation Inductivity Coupled Plasma Mass Spectrometry (LA/ICP-MS). All glass beads for XRF were also analyzed by LA/ICP-MS. Forty-five elements were analyzed by four methods.

The bedrock in this studying area is the Chichibu Paleozoic-Mesozoic Group which consists of sedimentary rocks such as sandstone, mudstone and limestone in places. A big ridge lies north to south across the center of studying area and divides the western area as the Nakatsu river, and the eastern area. Furthermore, the eastern area was divided to the Akahira, Susuki and Komori rivers by the ridges lying east to west. In the Nakatsu river region, Cenozoic granite intruded to the Paleo-Mesozoic sedimentary rocks and has produced the skarn deposits, the Chichibu mine which was opened 500 years ago. It is well known that the Chichibu mine produces gold, pyrite, magnetite, hematite and magnetic pyrite. Our geochemical map shows high concentration of iron, calcium, arsenic, gold and antimony around the mine in Nakatsu river region and their distributions are consistent with the basement geology.

Almost elements distribute homogeneously from the western part, Nakatsu river to the eastern area even though the big ridge divides studying area. However, gold, arsenic and antimony don't distribute to the eastern area and the concentrations of aluminum and potassium in the eastern area are higher than the western area. It means that the influence of the Chichibu mine is limited to the small area around it and also the distributions of elements reflect strongly the geochemical characters of sedimentary rocks in the eastern part.

Furthermore, strontium concentration in Akahira river is much higher than other area. Basement rocks in this area mainly consist of the Cretaceous mudstone which includes calcium carbonate fossils such as bivalvia, ammonite, belemnite, and so on. Strontium would be contained in such fossils as carbonate strontium.

In the upper area of Susuki river, high magnesium and chromium region was found. Magnesium and chromium constitute magnesiochromite ($MgCr_2O_4$). Highest concentration site is on the intruded volcanic rock area. It agrees with that magnesiochromites are found with ultrabasic rock. The ultrabasic rocks form the serpentine after the hydrothermal alteration and generally the metal deposits producing chromium in Japan associate with serpentinites. Though there is no serpentinites in the geological map, they might be found in above-mentioned area.

Boron concentration in the granites and tuff areas is lower than in the sedimentary rock area, and agrees with the basement rock distributions. However, it is not clear the reason that boron at a few sites concentrates much higher even though in sedimentary rock area of Susuki river.