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Spatial distribution of elemental concentrations in the stream sediments of Ikuno area, Hyogo Prefecture, Japan

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Geochemical map based on chemical analysis of stream sediments are well established. Stream sediments are mixtures of rocks, sediments and soils from the drainage basin upstream of the collection site. These stream sediments are useful for estimation of average chemical composition of surface materials. Some natural processes are needed to be concerned for data analysis and interpretation. Weathering and sedimentation processes from the source rocks may modify the chemical compositions of stream sediments. They might also be modified by bioactivities, including human activities. Nowadays, geochemical maps have been used as a basis for environmental assessment in many countries and regions [1)].

Geochemical map of stream sediments has been prepared in the Ikuno and surrounding areas, the central part of Hyogo Prefecture, Kinki Province, southwestern Japan. This area consists of late Cretaceous volcanic rocks (rhyolite, dacite and andesite), plutonic rocks of Paleocence-early Eocence, Carboniferous, Permian (granodiorite, diorite and gabbroic) and accretionary complex, and sedimentary rocks of early-middle Jurassic accretionary complex and late Pleistocene-Holocene (gravel, sand, mud sandstone and shale), and also many mineral occurrences in this area. There are more than nine closed mines for Au, Ag, Cu, Pb, Zn, Fe, W and As, including two famous historical mines, namely Ikuno and Akenobe mines [2)].

Stream sediments were collected using an 83-mesh (180 μm) sieve in wet condition at each sampling site [3)]. A total of 156 stream sediments over an approximately 1300 km^2 in this area were analyzed for 22 elements (Al, Ca, Fe, K, Mg, Mn, Na, P, Si, Ti, Ba, Co, Cr, Cu, Ni, Pb, Rb, Sr, V, Y, Zn, Zr) by X-ray fluorescence spectrometry (XRF) and loss on ignition.

Spatial distribution patterns of elemental concentrations in stream sediments in the Ikuno area are controlled by 3 main factors; surface geology, spot deposition of ore minerals, and local distribution affected by sedimentation of the heavy minerals in the basin. The correspondence of elemental concentrations in stream sediments to parent lithology is clearly shown by median comparison of each bedrock types. The spatial distribution as influence of ore depositions mostly have higher in mean value than their median, related to some higher concentration spots around mining areas. Significant enrichment

concentrations of Pb, Zn, Cu, Cr, Ni are strongly correlated with mineral occurrences in this area (Fig. 1). The Kolmogorov-Smirnov test result showed that Pb, Zn, Cu, Cr and Ni do not follow normal distribution pattern because some extremely high concentrations are found in the mine areas. The concentrations of Zr in stream sediments are elevated at the basin in the southeastern and northern parts of research area because of heavy mineral sedimentation (zircon and garnet).

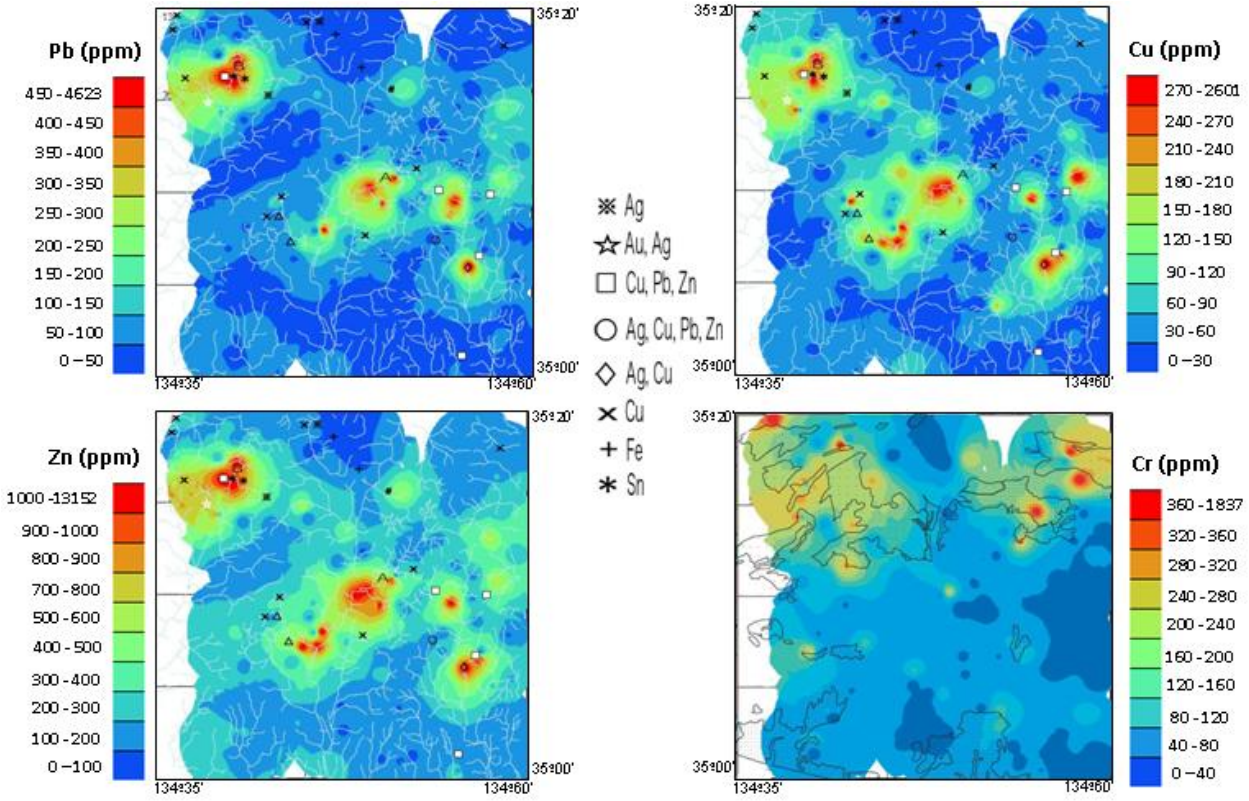

Fig.1 The geochemical map of elements in the second factor; Pb, Zn, Cu and Cr.

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2) Yoshikawa, T. *et al. Quadrangle Series 1:50,000 (Okayama)*. **2005**, 12, 47, 48pp.
3) Tanaka, T. *et al. J. Earth Planet. Sci., Nagoya Univ*. **1994**, 41, 1–31.