

## Copper chemostratigraphy of the Ediacaran in the Three Gorges area, South China

\*Yechuan Geng<sup>1</sup>, Takeshi Ohno<sup>2</sup>, Shogo Aoki<sup>1</sup>, Shuhei Sakata<sup>2</sup>, Akira Ishikawa<sup>1</sup>, Tsuyoshi Komiya<sup>1</sup>

1. Department of Earth Science & Astronomy Graduate School of Arts and Sciences The University of Tokyo, 2. Department of Chemistry at Gakushuin University

The Ediacaran-Cambrian transition is characterized by several events such as emergence of metazoans and sudden changes of surface environment. Especially, the appearance and evolution of the metazoans in the Ediacaran are one of the most important issues of the evolution of life. Some candidates of causes of the drastic evolution were proposed, for example increase of oxygen contents of atmosphere and ocean, suppression and subsequent liberation of biological activity by the Snowball Earth event, and increase of marine nutrient contents, but they cannot fully account for the dramatic surface environmental change and biological evolution so that the cause(s) is still enigmatic. We focus our attention on the increase of marine nutrient contents because it also caused redox change of the atmosphere and ocean.

Copper is one of bioessential elements, which shows a vertical recycled- and scavenged-type profile in the modern ocean. The copper is incorporated into various proteins but hemocyanin is one of the most famous Cu-bearing proteins. The hemocyanin has a function, which transports oxygen throughout bodies of some invertebrate animals such as arthropods and molluscs. We study chemostratigraphies of copper contents and isotope ratios from the Ediacaran to the Cambrian in order to elucidate a geobiological cycle of copper through the Ediacaran. The copper chemostratigraphy will enable us to obtain new insights into the evolution of the life and environment. But, the stable isotope geochemistry of Cu is poorly known because of the lack of a suitable analytical technique.

We carried out on-land drilling of the sedimentary succession in Three Gorges area, South China to collect more continuous and fresher samples through the Ediacaran. In order to analyze the copper contents and isotope ratios, powdery samples were prepared from fresh-cut surfaces of the drill cores using a micro-drill with a 3 mm-diameter bit. The sampling points were carefully selected to avoid acquisition of late-stage diagenetic carbonate minerals and veins. The powdered samples were dissolved with HF-HNO<sub>3</sub>-HClO<sub>4</sub> acid digestion, and a split of the sample solution was diluted with 2% HNO<sub>3</sub>. We analyzed the Cu, Zn, Ni and Ti contents with ICP-MS, housed at Gakushuin University.

And the next step, we are going to analyze the isotope data of all the samples from Doushantuo formation. Each sample was subsequently dissolved in 1 ml of 10 N HCl and insoluble particle was centrifuged out. The separation of transition elements on strongly basic anion exchange resins in hydrochloric media follows a connective procedure (Kraus and Moore, 1953). Van der Walt et al. (1985) demonstrated that the macroporous form (AG MP-1) of strongly basic anion exchange resins has higher distribution coefficients for Cu(II), Fe(III) and Zn(II) in concentrated HCl. We will measure the Cu isotope compositions on a MC-ICP-MS.

We have got the concentration data from Doushantuo Formation's Member 1 to Member 4. The concentration of Cu increased in ca.580Ma, when the Gaskiers Glaciation was determined. And decreased in ca.550Ma, when is in the middle of Shuram Excursion. And then at the end of Doushantuo Formation, the concentration of Cu increased sharply. About the variation of Ni and Zn, we found that there is a same pattern with Cu. Because the samples were also analyzed for the concentration of iron and manganese, and iron isotope values of pyrites (Sawaki et al, 2016), we directly compared between the concentration of Fe, Mn and Cu. We suggested that in oxic marine environment, the concentration of Cu had been increased, and in anoxic marine environment, it had been decreased. Because that molluscs

appeared from ca.550Ma, and the arthropods which belong to the Ediacara Fauna appeared from ca.580Ma , we consider that the concentration variation of Cu in seawater,have important correlation with the appearance and evolution of the metazoans in Ediacaran.

Keywords: Copper, Ediacaran, concentration, Isotope, seawater