Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

BPT25-P05 会場:コンベンションホール 時間:5 月 24 日 17:15-18:30

シンクロトロン, コンピューター断層撮影による澄江動物化石観察
Observations of internal structures of the Chengjiang macrofossils with a synchrotron-CT technique at SPring-8

小宮 剛 [1*], 中尾 泰斗 [1], 韓 健 [2], 岡田 吉弘 [3], 佐藤 友彦 [1], 上杉 健太朗 [4], 星野 真人 [4]
KOMIYA, Tsuyoshi[1*], NAKAO, Taito[1], Jian Han[2], Yoshihiro Okada[3], SATO, Tomohiko[1], Kentaro Uesugi[4], Masato Hoshino[4]

[1] 東京大学駒場・総合文化研究科, [2] 西北大学、中国, [3] 東京工業大学, [4] （財）高輝度光科学研究センター (JASRI)
[1]Dept. Earth Science & Astronomy, Komaba, The University of Tokyo, [2]Northwest University, China, [3]Tokyo Institute of Technology, [4]Japan Synchrotron Radiation Research Institute (JASRI)

Earth is the unique planet, which is filled with a large variety and number of life. Recent active planetary expeditions and telescopic observations of extrasolar planets suggest allow us to expect possibility of life in other planets. But, presence of metazoan distinguishes biosphere of the earth from others. Conventional idea suggests that Metazoa suddenly appeared and drastically evolved in early Cambrian around 530 Ma, so-called Cambrian explosion. But, recent paleontological investigations in the Neoproterozoic showed some metazoan of sponges and cnidarian already appeared in the Ediacaran, and support cryptic emergence and early evolution of Metazoa in the Ediacaran. But, presence of such as the Chengjiang Lagerstatten provides the opportunity of well-preserved, various fossils, and constrains timing and rate of biological evolution.

The Chengjiang fauna comprises sponges, arthropods, cnidarian, echinoderms, molluscs, chordates and others, and is a key milestone to study early evolution of Metazoa. Some fossils still preserve biological tissue including eyes, gats, gills, notochords and others (e.g. Shu, 2008, Gondwana Research). But, most Chengjiang fossils are severely compressed so that their thickness is less than millimeters. In addition, key fossils are too few to observe internal cutting planes of the fossils. As a result, the internal structures are still obscure.

Recent X-ray micro-CT analyses of the microfossils yielded new methods to observe the internal structures (e.g. Donoghue et al., 2006, Nature). Compared with microscopic and SEM observations, this technique has two advantages of nondestructive analyses on any cross-sections of internal structures. We obtained preliminary observations of three-dimensional structures of the Chengjiang fossils including an echinoderm, a fish, arthropods with/without eggs, a mollusk, and a brachiopod with Synchrotron X-ray micro-CT at SPring-8 (beam line: BL20B2). The fossils range from 5 mm to 3 cm across in their sizes, whereas the host rocks ranges from ca. 5mm to 1.5 cm thick. The fossils are exposed on the surface of pale-brownish shales. The synchrotron CT observations shows it is possible to identify the fossils on the rocks with the CT images possibly because the fossils have higher density than the mother rocks. The thickness of the fossils is less than millimeters. It is easier to observe the fossils on thinner rocks compared with their sizes. Although preliminary, the three dimensional observation of the echinoderm, which possesses gill-like structures, shows a relict of internal cavity. Because the thickness of host rocks is thin, we could observe the structures of the arthropod, named as Isoxys, and the brachiopod, too. The synchrotron micro-CT technique provides a convenient and effective observation of internal structures for even completely compressed fossils.

キーワード: 澄江化石, カンブリア紀, SPring-8, コンピューター断層撮影
Keywords: Chengjiang fossils, Cambrian explosion, SPring-8, micro-CT