

The stepwise surface environmental changes during the Ediacaran and Cambrian.

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The Ediacaran to Cambrian period was one of the most important intervals for the evolution of life. However, the scarcity of well-preserved outcrops of Ediacaran and Cambrian rocks still leaves ambiguity in decoding ambient surface environmental changes and biological evolution.

Recent paleontologists, mainly Chinese scientists, revealed that life on the Earth have evolved through multiple stages than previously proposed. Some of the metazoan fossils were discovered from Ediacaran sedimentary rocks. This suggests that Cambrian Explosion, in the broad sense of the term, already started from the Ediacaran, not from the Cambrian. Therefore, it is of increasing importance to decode surface environmental changes during the Ediacaran.

The Ediacaran to Cambrian strata in South China are almost continuously exposed, comprise mainly carbonate rocks with subordinate black shales and sandstones, and they contain many fossils, suitable for study of environmental and biological changes in the Ediacaran and Cambrian. We (Maruyama laboratory at Tokyo Institute of Technology) conducted drilling through the Nantuo, Doushantuo, Dengying, Yanjiahe and Shuijintuo Fms at three sites in the Three Gorges area to obtain continuous samples. We systematically analyzed some kinds of isotope ratios (carbon isotope ratios of carbonate and organic carbon, oxygen isotope ratios, nitrogen isotope ratios of organic matter, radiogenic strontium isotope ratios, calcium isotope ratios and molybdenum isotope ratios) and elemental concentrations (cerium, phosphorus, manganese and iron concentration in carbonate), using these core samples. The combination of these detailed chemostratigraphies enables us to decode the surface environmental changes and their causes in the Ediacaran and Cambrian. Most important discovery is that surface environment also had evolved through multiple stages during the Ediacaran and the Cambrian.

Some recent researchers suggest relationship between cosmic event, surface environment and life evolution. An estimation indicates high cosmic ray fluxes during the Snowball events. On the other hand, it is thought that cosmic ray fluxes had been low during the Cambrian. Molecular clock analyses also suggest relatively quiet interval for the genetic evolution during the Cambrian. These lines of evidence imply that biological evolution occurred when favorable environments for life was created.

I will talk about preliminary results in the speech.

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