B131-P004 **Room: Poster Session Hall** **Time: May 17**

Microbial activity and ocean chemistry recorded in 3,000 million-years-old sedimentary rocks from Steep Rock, Ontario, Canada.

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The present atmosphere and oceans of the Earth contain oxygen generated by oxygenic photosynthesis. How and when the Earth's early ocean became rich in oxygen is debated vigorously (Beukes, 2004). The history of ocean oxygenation is not clear and this problem is strongly linked to evolution of aerobic microorganism. The earliest life is considered anaerobic microorganism and anoxic condition continued in oceans after the appearance of the early life (Nisbet and Sleep, 2001). But oxygenic prototroph, such as cyanobacteria appeared at certain times in Archean and it began oxygenation of Earth's environment.

There exist two main purposes of this study. One is to reconstruct the redox condition of middle-Archean oceanic environments. The other is to examine the style of ecosystem in the middle-Archean oceanic environments.

Geological investigation of Steep Rock Group was performed during the summer of 2005. Steep Rock Group of northwest Ontario is situated in the Wabigoon Subprovince of the Superior Province, Canada. The Steep Rock Group (Smyth, 1891 etc.) includes an assemblage of ca. 3.0 Ga extrusive and intrusive igneous rocks and sedimentary rocks, comprises five formations: Wagita formation (clastics), Mosher Carbonate, Jollife Ore Zone, Dismal Ashrock, and Witch Bay Formation (metavolcanic). Mosher Carbonate contains diverse stromatolites morphologies, indicating that the biological productivity, including cyanobacteria, was high. Jollife Ore Zone contains Banded Iron Formations (BIFs), and the mechanisms of their deposition might have connected to redox conditions of contemporary Steep Rock ocean.

In addition to geological survey, detailed petrographic, X-ray diffraction, electron microprobe and X-ray scanning microprobe studies were performed to identify constituent minerals and elemental distributions in thin section scale. Concentration of organic matter and their carbon isotope compositions were also determined.

Through the course of investigation, new lithofacies, black chert and black shales were found to be situated in the middle layer of Mosher Carbonate and Jollife Ore Zone. Mineralogy, including siderite, Mn-oxide and V-oxides changes through the examined stratigraphy. This date might indicate the presence of redox boundary (chemocline) in the 3.0 Ga Steep Rock ocean. This chemocline is most likely corresponded to CCD.

The black shales contain high concentrations of organic matter and shows slightly low carbon isotopic ratio (TOC: 0.14~0.87wt%, d13CPDB=-32.5~-28.2per mil) compare to carbonates, including some stormatolites (TOC: 0.03~0.13wt%, d13CPDB=-26.1~-23.5per mil). These changes are roughly corresponded to change in nature of carbon sources for biological activities and the high biological productivity at around the chemocline in the Steep Rock ocean. While there is free oxygen above chemocline, deep ocean is anoxic, like the modern Black Sea.