Relationship between microbial activities and surface environments on the Precambrian Earth

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The Precambrian period was an important age to determine the course of the biological evolution on the Earth. The Precambrian Earth was the world of the microbial life forms, and also often stayed in the extreme environments. The relationship between the surface environments and microbial activities on the Precambrian Earth is discussed in this study.

Several significant geological events occurred during the Precambrian age. That includes: (1) global glaciating at 2.2 and 0.7 Ga (possibly 2.7 Ga); (2) radical change of stable isotope compositions of marine carbonates, marine organisms and diagenetic sulfides in sediments; (3) abundant phosphates in marine sediments deposited after the glaciating periods; (4) contemporary deposition of banded iron formation during glaciating.

These facts (particularly (4)) indicate that Fe-flux into Precambrian oceans was generally high and the C-S-P flux changed through the Precambrian glaciating periods. In order to increase the Fe-flux into oceans, submarine hydrothermal activities are reasonably considered. However, the modern style of hydrothermal activities may have not changed the Fe- and other element flux significantly in the Precambrian oceans.

Many geological incidents indicate that the submarine hydrothermal activities were occurring under high PCO2 conditions. Existence for the abundant carbonate banded iron formation is a supportive evidence for the high PCO2 oceanic environments. Kakegawa (2002) pointed out that Fe and P becomes more mobile during hydrothermal alteration of oceanic crusts under high PCO2 conditions. This promises high Fe and P flux into Precambrian oceans, if Kakegawa (2001) is correct.

It is considered that microbial activities in the Precambrian oceans directly responded by periodical supply of Fe and P by the submarine hydrothermal processes, resulting in abnormal excursion of stable isotope compositions and the environmental change. It is reasonably suggested that many of Precambrian microorganisms were dependent on the hydrothermal activities. Decrease of submarine hydrothermal activities and its replacement to the continental flux allowed