[JJ] Evening Poster | B (Biogeosciences) | B-CG Complex & General

[B-CG09]Decoding the history of Earth: From Hadean to the present

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The latest results of Earth's evolution and geological processes through 4.6 billion years from Hadean to Modern, based on various approaches including fieldworks, chemical analyses, experiments and computer simulation, will be presented. In this session, we aim to discuss and understand causal relationships and interplay among the evolution of Earth's deep interior, changes in the surface environments, and development and evolution of life. Wide-ranging topics are accepted.

[BCG09-P10]**Sulfur isotope transition and development of Euxinia at ˜1.8 Ga:**
The Nuvilic Formation, Povngunituk Group, Cape Smith belt, Canada

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Ocean redox condition was changed dramatically between 1.9 and 1.8 Ga (e.g. Anbar and Knoll 2002; Poulton et al., 2010). In general, the absence of the Iron Formation orebodies, which was formed until 1.88 Ga and regenerated since 0.7 Ga, related to the ocean environmental transition from ferruginous (rich in Fe^{2+}) to sulfidic (rich in H_2S) condition at about 1.8 Ga. This transition was accompanied by the sulfur isotope change (Poulton et al., 2004). However, the detailed period and trigger of the environmental transition are not clear because of poor data. It is needed to obtain more geochemical data from several geologic zones to better understand the environmental changes linked to ocean redox condition in the Paleoproterozoic. In this study, we found a large sulfur isotope transition from -5 to +15 ‰ which is likely to relate to the ocean environmental transition, from the Nuvilic Formation, Povngunituk Group, Cape Smith belt, accumulated at ˜1.8 Ga.

Our sample is the drilling core 718.3333 (50 m) which consists of an alternation of sandstone and black shale. These sediments are accumulated at northern continental margin of the Superior craton. Based on upward fining structures, the core is subdivided into 3 units (Lower, Middle and Upper units). The Lower unit is about 10 m and includes 1 m thick sandstone and greyish-black shale. The Middle unit is about 25 m and consist of thin sandstone (<10cm) and black shale layer which characterized by thin sulfide layer. The Upper unit is about 10 m and contain about 30 cm sandstone layer and black shale which is also characterized by layered sulfides.

Organic carbon isotope ratio (δ$^{13}C_{org}$) ranges from -33 to -28 ‰ through the core. At the sand dominated portion of the Lower unit, δ$^{13}C_{org}$ value shows -28‰ and decrease to the -32 ‰ of the Middle unit sand dominant portion. In the Middle and Upper unit, δ$^{13}C_{org}$ range from -32 to -30 ‰.

Sulfur isotope (δ^{34}S) has wide range values from -5 to +15 ‰. δ^{34}S is +13 ‰ at the sand dominated portion of the Lower unit, and subsequently, decrease dramatically to the -5 ‰ at the sand dominant sequences of the Middle unit. Through the Middle unit, δ^{34}S change from -5 to +15 ‰. In the Upper unit, δ^{34}S value is steady at +10 ‰. Sulfur-Total Organic Carbon (S/C) weight ratio of the core is 0.30 on average, and it indicates the Nuvilic Formation was formed in marine environment.

The transitions of the Lithology, δ$^{13}C_{org}$ and δ^{34}S value mentioned above are likely to reflect ocean environmental change. The change in color of the black shale from greyish-black to black indicates decreasing of the oxygen concentration in the ocean. Laminated sulfide layer implies sulfidic ocean, where hydrogen sulfide in the water column reacts with iron and syngenetic precipitates as pyrite. δ$^{13}C_{org}$ of the core is comparative with δ$^{13}C_{org}$ value fixed by modern cyanobacteria, purple sulfur bacteria and methanogenic bacteria , implying the contribution from these bacterial activity. High δ^{34}S value suggests the activity of the sulfate reducing bacteria in the sulfate poor environment. Negative excursion of δ^{34}S at sandstone dominated portion of the Middle unit was occurred by a large influx of sulfate followed by the activation of bacterial sulfate reduction. In this study, we concluded that increasing seawater sulfate caused active bacterial reducing and it resulted in the formation of sulfidic marine environment at 1.8 Ga.