Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)


BPT23-11 Room:411 Time:April 30 11:45-12:00

# Geochemical study on the variation and stability of atmospheric oxygen in Paleoproterozoic

NAKAMURA, Umi[1*] ; SEKINE, Yasuhito[1] ; TAJIKA, Eiichi[1] ; GOTO, Kosuke T.[2] ; SENDA, Ryoko[3] ; SUZUKI, Katsuhiko[3] ; TADA, Ryuji[1] ; MARUOKA, Teruyuki[4] ; OGAWA, Nanako O.[3] ; OHKOUCHI, Naohiko[3]

[1]The University of Tokyo, [2]AIST, [3]JAMSTEC, [4]University of Tsukuba

Atmospheric oxygen level is considered to have dramatically increased during the early Paleoproterozoic (i.e., 2.4-2.2 Ga). Severe glaciations occurred at least three times in this same interval. The rises of atmospheric oxygen have been indicated just after the second (Bruce) and third (Gowganda) glaciations (Sekine et al., 2011 EPSL, 2011 nature comm.). However, the atmospheric oxygen level between the two glaciations remains unclear.

In this study, we investigated the evolution of redox conditions of the atmosphere and oceans between the second and third Paleoproterozoic glaciations, by analysing redox sensitive elements, such as osmium (Os), rhenium (Re), and molybdenum (Mo), and stable isotope analyses of organic carbon and sulfur for the sedimentary rocks from the Huronian Supergroup, Ontario, Canada. We found no enrichment of redox sensitive elements in these rocks. The Re-Os data yields an isochron age of 3089 +/- 98 Ma, which is significantly older than the depositional age of the Huronian Supergroup (˜2.45-2.2 Ga; Young et al., 2001 Sediment. Geol.). The obtained Re-Os isochron age indicates that Os and Re in the sediments were mainly supplied as detrital components originally formed at ˜3.1 Ga without any significant disturbance of Re-Os system during chemical weathering and sediment transport. This, in turn, implies that Os and Re were highly depleted in the seawater at the time of deposition, suggesting that oxidative weathering did not occur in the time interval between the second and third Paleoproterozoic glaciations. This conclusion is supported by the little varition of $d^{34}S$ and low abundance of other redox sensitive elements in the sediments.

Together with the geochemical data from the previous studies, we suggest that atmospheric oxygen level increased shortly after the second Paleoproterozoic glaciation, but then, returned to low levels. In the aftermath of the third glaciation, a shift to an oxidizing atmosphere would have occurred.