

白亜紀海洋無酸素事変2発生時における大規模火山活動と太平洋の環境変動のリンクージュ。

Linkage between LIPs formation and environmental changes in Pacific during the Cretaceous OAE 2.

*西 弘嗣¹、高嶋 礼詩¹

*Hiroshi Nishi¹, Reishi Takashima¹

1.東北大学学術資源研究公開センター 東北大学総合学術博物館

1.The Center for Academic Resources and Archives, The Tohoku Museum Tohoku University

Mid Cretaceous period (120-90 Ma) is characterized by the greatest value in the rate of ocean crust production over the past 150 million years. During this period, a lot of Large Igneous Provinces (LIPs) were emplaced in the Pacific, Atlantic and Indian oceans. Since the emplacement ages of the Cretaceous LIPs are concurrent with the Oceanic Anoxic Events (OAEs), various hypotheses explaining the linkage between the LIPs and OAEs have been proposed since the end of 1980's. A popular hypothesis attributes the high productivity and thereby ocean anoxia to the increased supply of biolimiting metals into photic zone during the LIPs formation (e.g., Snow et al., 2005). Another hypothesis explains the reason of increased productivity that elevated sea level as well as $p\text{CO}_2$ by LIPs eruption caused increase in global warming and continental runoff, which delivered terrestrial nutrient to ocean surface (e.g., Monteiro et al., 2012).

In order to understand linkage between large volcanic eruption and environmental change during OAE 2 (94 Ma), we examined the OAE 2 intervals of the Great Valley Group and the Yezo Group exposed in California, USA and Hokkaido Japan, respectively. The former sequence was deposited in the continental slope of eastern Pacific while the latter was in the continental slope of western Pacific. The samples were analyzed for total organic carbon content (TOC), degree of pyritization (DOP) and assemblage of benthic foraminifera. The analytical results were correlated with the Os isotope stratigraphy and U-Pb zircon ages of tuffs obtained from the same samples by Du Vivier et al. (2015). Os isotope of the studied sequences exhibit abrupt decrease 35,000 year before the onset of the OAE 2 and gradual increase 200,000 years after the onset of the OAE 2 (Du Vivier et al., 2015). Based on the results of benthic foraminifera, TOC and DOP analyses, most of the studied sequences exhibit oxic environment in both sections. However, two short term dysoxic intervals were identified. One is the interval from the onset of the OAE 2 to 50,000 year after onset of the OAE 2, and another is that from 200,000 to the 300,000 after the onset of the OAE 2. The two dysoxic intervals are identical between the western and eastern Pacific, and accord well with the horizons of increase in Os isotope ratio. These evidences suggest that increased runoff caused the depletion of dissolved oxygen in the ocean at least in the eastern and western Pacific continental margins during the OAE 2.

References

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キーワード：白亜紀、LIPS、OAE

Keywords: Cretaceous, LIPS, OAE