Response to Cretaceous Cenomanian/Turonian OAE2 in souothern high latitude

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At the Cretaceous Cenomanian/Turonian (C/T) boundary, a short-term event is known where sediment rich in organic matter is deposited under extended area of ocean. This event is called Oceanic Anoxic Event 2 (OAE2) and considered to be one of the strong and best studied perturbations of carbon cycle during the Phanerozoic. At OAE2, carbon isotope ratios of sedimentary organic carbon and carbonates show a unique positive excursion (CIE), which is identified throughout the world. Most studies on OAE2 have been undertaken for the Atlantic Ocean, the Tethys Sea and epicontinental seas of Europe and North America. Although the Pacific Ocean was the largest ocean on the Earth during the Cretaceous period, little is known about its response associated with OAE2.
To understand the influence of surface carbon cycle disturbances on ocean and terrestrial realms in southern high latitude Pacific, a comprehensive organic geochemical study on samples extracted from outcrops comprising C/T boundary segments was carried out. These outcrops are situated near Blenheim in Marlborough, South Island, New Zealand (high latitude of paleo-Pacific Ocean).
The homohopane Index (HHI) obtained from biomarker analysis produced remarkable data that was never known from OAE2 interval elsewhere– periodic fluctuations of suboxic (anoxic) and oxic environments at the sea floor. The correlative interval of the earliest phase of OAE2 shows strong oxygen depletion then rapid and prominent shift from anoxic to oxic condition. Dramatic decrease of sterane/hopane (S/H) ratio is found nearly in conjunction with but ~100 kyr posterior to HHI drop . This diminished and/or reduced feature of the eukaryote-derived biomarkers is an indication of decreased transportation of marine organic matter to the ocean floor and namely shrank marine productivity. Such environmental change through the water column might lead to oxic instead of anoxic sea bottom conditions during OAE2 interval. As it cannot explain the oxic bottom condition preceding to the diminished productivity, bottom water oxygenation with exotic cold water inflow is more likely to explain these marine biomarker fluctuations through the OAE2 interval.
Relative concentration of terrestrial polycyclic aromatic hydrocarbons (t-PAHs) across the OAE2 interval indicates southern Pacific high latitude climate to have gradually turned into a condition with frequent wildfire just before OAE2 interval. Thereafter, the frequency dramatically decreased coincident with the onset of the CIE and low through the OAE2 interval then increased after it. Higher plant parameter made from aromatic diterpenoids derived from conifer and cadalene shows a decreasing trend throughout the section, and are especially lower during OAE2 interval. It suggests coniferous plants were diminished in the flora during OAE2 interval.
From biomarker parameters related to oceanic and terrestrial environments, both ocean and terrestrial realms in southern high latitude Pacific appear to be changed significantly during the OAE2 interval. The environmental change in this region during OAE2 was largely different from the Tethys Sea and other sites, indicating that the mechanism of OAE2 was more complicated than thought previously.

Keywords: Cretaceous, Cenomanian, Turonian, OAE

