Massive volcanism associated with large igneous provinces as a causal mechanism for a Cretaceous oceanic anoxic event

Junichiro Kuroda[1]; Nanako, O. Ogawa[2]; Hidekazu Tokuyama[1]; Hiroshi Kitazato[3]; Naohiko Ohkouchi[4]

[1] ORI, Univ. Tokyo; [2] IFREE; [3] IFREE, JAMSTEC; [4] JAMSTEC

Oceanic anoxic events denote periods of extremely high burial rate of organic carbon which led to deposition of organic-rich black shales in the global ocean. Most oceanic anoxic events are considered to be caused by rapid release of methane or massive volcanic degassing. However, direct evidence for causal mechanisms has so far been lacking. Here we find a 3 per mil negative shift in isotopic composition of sedimentary organic carbon within approximately 15,000 years at the onset of a black shale layer, deposited at the Cenomanian-Turonian boundary (93.6 Ma). At the same stratigraphic level, lead isotopic compositions in aluminosilicates exhibit significant shifts toward characteristic values of large igneous provinces formed around that time. These results directly indicate massive volcanism coincident with the onset of anoxic event. The carbon cycle in the ocean reservoir was perturbed by massive volcanic degassing of carbon dioxide, and the supply of volcanogenic aluminosilicates derived from large igneous provinces was enhanced. This abrupt release of volatile materials rapidly altered ocean-atmosphere chemistry and triggered the extreme climate event.