

Cretaceous paleoceanographic events recorded in sedimentary sequences from IODP Exp. 369 at southern high latitude: Oxygen and carbon isotope stratigraphy and implications from biomarkers

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Paleoceanographic perturbation at southern high latitudes during the Cretaceous greenhouse is one of the primary targets of IODP Exp. 369. Carbon and oxygen isotope stratigraphy of the important intervals including Oceanic Anoxic Event (OAE)1d, Mid-Cenomanian Event (MCE) and OAE2 recovered by the cruise indicates that global correlations of the events are not straightforward with the isotope stratigraphy. Short-term fluctuations of carbon isotope values larger than 0.5 permil presumably derived from orbital forcing, potentially masking the global signal near the MCE interval. Carbonate carbon isotope chemostratigraphy reveals the horizons of “onset” and “recovery” of the carbon isotope excursion (CIE) across OAE2 although the main part of the event could not be analyzed because of a “carbonate-free interval (CFI)” . A characteristic biomarker derived from haptophytes, tetracontadienone (C40:2 Et alkenone), was found in the CFI and provided an important target for carbon isotope analysis. The stratigraphic pattern of carbon isotope values of the alkenone filled one interval of the gap and showed a +2.5 to +3.0 permil positive excursion in addition to the magnitude of CIE observed with the carbonate (~4 permil CIE is suggested in total). It also showed that black organic-rich layers were stratigraphically located below the first peak of the globally known CIE of OAE2. Lycopane, a biomarker known from various anoxic sediments, and n-alkanes longer than C40 that characterized the black layers of the OAE2 interval were also found from the interval correlative to OAE1d from U1516, suggesting comparable paleoceanographic conditions during OAE1d and OAE2 in this region.

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