This study focuses on the biogeochemical investigation of sedimentary sequences from two sites (1207 and 1213) at Shatsky Rise (ODP Leg 198) in the NW Pacific. ODP Leg 198 recovered organic-rich sediments deposited during the lower Aptian Oceanic Anoxic Event (OAE1a), one of the global episodes of enhanced carbon sequestration during mid-Cretaceous. The recovery of these critical intervals provides the opportunity to investigate variations in productivity and preservation of organic matter (OM), which may reflect perturbations in the carbon cycle linked to changes in the ocean-climate system.

Cores from Sites 1207 and 1213 offer a pelagic record of OAE1a from the Pacific that permit assessment of temporal variations in elemental, molecular, and isotopic compositions of OM through the progression of the event. OAE1a comprises 45 cm of finely laminated, dark brown radiolarian claystone at Site 1207, and intermittent organic-rich units that include clayey and radiolarian porcellanites at Site 1213 (Bralower et al., 2002a).

Preliminary results indicate exceedingly high organic carbon contents (C$_{org}$ up to 34.7%), which are among the highest values ever recorded for pelagic Cretaceous sediments. The abundance of short chain $n$-alkanes (C$_{13}$–C$_{19}$) with odd/even predominance, and the presence of suites of polycyclic steroidal and hopanooidal hydrocarbons, provide evidence of the algal and bacterial origin of OM from sediments corresponding to OAE1a (Fig. 1a). The abundance of steroidal components (particularly sterenes and sterones) suggests that OM from the Shatsky Rise includes major contributions from eukaryotic sources, consistent with an environment characterized by significant phytoplankton productivity (Fig. 1a, b). The oldest alkenones ever reported (Bralower et al., 2002b) have been found at Site 1213 (Fig. 1b). These compounds are diagnostic of OM derived from representatives of the haptophyte algae among the calcareous nannoplankton (Bralower et al., 2002b). The presence of 2-methylhopanes and 2-methylhopanones indicates cyanobacterial contributions to the OM (Fig. 1a, b, respectively) and their prevalence is perhaps related to nitrate- or iron-limited conditions during deposition of OAE1a. The cores from both sites show marked stratigraphic variability in the relative abundances of components derived from specific algae (e.g., eukaryotes, haptophytes, dinoflagellates) and bacteria (including cyanobacteria). These differences, which are independent of C$_{org}$ values, are suggestive of temporal fluctuations in phytoplankton populations and microbial activity.

These results provide evidence of the biological origins and abundance of the OM in these OAE1a intervals. The study of these organic-rich sediments facilitates assessment of high-resolution fluctuations (i.e., cm-scale) in biogeochemical compositional characteristics. The observed stratigraphic variations in productivity, depositional conditions, and carbon cycling help interpret the causes and persistence of enhanced organic carbon sequestration during OAE1a.
REFERENCES


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**Figure 1.** Biomarker occurrences and distributions in the Lower Aptian organic-rich sediments from Shatsky Rise: GC-MS traces of (a) aliphatic hydrocarbon and (b) ketone fractions