

## High-Resolution Gray-Scale and Geochemical Analyses of a Micro-Laminated Upper Cenomanian Black Shale Sequence from ODP Hole 1260B on the Demerara Rise

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We conducted a high-resolution gray-scale and stable isotopic analysis of the sub-millimeter laminations present in a 4 m interval of mid-Cretaceous black shale from Hole 1260B (ODP Leg 207) on the Demerara Rise, western tropical Atlantic, to investigate depositional variations of these organic-carbon-rich strata. The results of gray-scale digital image spectral analysis reveal cyclic patterns that are related to orbital and suborbital depositional changes during the latest Cenomanian (94 Ma). Study of thin sections showed that the basic pattern of the laminae is couplets of alternating dark organic rich layers and white biogenic carbonate layers. The composition of the dark organic-rich layers appears to include the remains of some kind of microbes that have a chain-like structure, perhaps cyanobacteria. From our combination of gray scale and thin-section analyses, three notable cyclic events are evident in the black shale interval: (1) meter-scale cyclic events implying ~40 ky time intervals, (2) centimeter-scale cyclic events indicating 1~2 ky time intervals, and (3) millimeter-scale cycles indicating 300~700 yr time spans. In addition, 20 ky and 100~250 yr cyclic events are weakly expressed. Our high-resolution geochemical analysis of a typical 10-cm section of the black shale sequence was done at 1-millimeter intervals. Carbonate-free organic carbon concentrations fluctuate between 14 and 34 weight percent as sediment color varies. Despite the gray-scale and carbon-concentration variations, organic carbon and nitrogen isotopic compositions remain in the narrow ranges of -28 and -26 permil and -2 and -1 permil, respectively. The relative constancy of the isotopic compositions indicates that marine organic matter production was strongly influenced by nitrogen-fixing microbe.

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주요어 : Cenomanian Black shale, Demerara rise, Isotope geochemistry, Micro-lamina, Biogeochemical cycles

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