AAPG Annual Meeting
March 10-13, 2002
Houston, Texas

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Productivity-Controlled Peritidal Carbonate Cycles in a Super-Greenhouse Climate in the Aftermath of the End-Permian extinction, the Lower Triassic (Olenekian) Great Bank of Guizhou, South China

Formation of shallowing-upward peritidal carbonate cycles are commonly interpreted as controlled by sea-level fluctuations. Lower Triassic peritidal limestone from an isolated platform in south China exhibits cycle hierarchy and spectral signals suggesting Milankovitch climate forcing, but also facies patterns incompatible with a strict sea-level control. The succession contains 84 cycles, 0.2 - 7.4 m thick, that shallow upward from subtidal grainstone and packstone facies to Renalcis mounds capped by intertidal ribbon rock. The subtidal facies contain a low-diversity biota of cyanobacteria, echinoderms, bivalves, gastropods, lingulid brachiopods, spirorbids, and ostracodes. Ribbon rock contains alternating lime mud and fine peloidal laminae, scour surfaces, ripple cross lamination, lime-mud drapes, and rarely microbial laminite and prism cracks. The cycles exhibit hierarchical thickness variations that define a three-order hierarchy correlatable between sections. Spectral analysis of facies and cycle thickness variations yielded well-defined peaks closely matching Milankovitch periodicities of short eccentricity (megacycles), obliquity (hemicycles), and precession index (individual cycles). Incompatible with strict sea-level forcing is the rarity of supratidal facies and its preferential occurrence in thick cycles rather than thin ones. We hypothesize that low bio-abundance and bio-diversity following the end-Permian mass extinction caused carbonate productivity to be sensitive to environmental perturbations, such as hyposalinity, eutrophication, or anoxic and/or CO2-charged water. Milankovitch climatic and oceanographic processes modulated such fluctuations in water quality, thus carbonate productivity and cycle thickness patterns. Anoxic flooding on the platform is supported by preliminary sulfur isotopic data and our hypothesis is being tested through analysis of carbon isotopes and redox sensitive elements.