

Sequence Stratigraphy of Late Paleozoic Cyclothems; A Signal of Sediment Undersupply, Large-Magnitude Sea-Level Changes and Low Accommodation

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Abstract

Cyclothems are stratal rhythms comprising repetitive vertical successions of sandstones, heterolithic (thinly interbedded) sandstones and mudrocks, mudrocks, limestones, and coals, in many cases with pedogenic overprinting of these lithologies. They record repetitive alternations of shallow marine and coastal to nonmarine environments of deposition. They are typical of Carboniferous and Permian paleotropical successions across Euramerica. Controversy endures as to whether cyclothems were formed under external forcing or rather were the product of mainly autogenic processes. Careful mapping and correlation of cyclothem strata and use of a sequence stratigraphic methodology allows a fuller understanding of these enigmatic rhythms. Depositional sequences can be identified and correlated over 100s of km, based on the recognition of regionally extensive disconformity surfaces and the continuity of key marker beds. Erosional surfaces preserve deeply incised valleys, separated by relatively flat interfluvial surfaces represented by pedogenically modified strata. Sequences bounded by these surfaces are 30 m in thickness, varying considerably in thickness and facies composition but nonetheless preserving predictable arrays of facies that record deepening and shallowing trends. Because of the limited thickness of cyclothems, it is difficult to apply the accommodation succession concept to these deposits. Rather, cyclothem sequences are thin, incomplete, condensed, strongly top-truncated, and have a ragged blanket geometry. Although the term “cyclothem” has been used in a

variety of contexts, a definition of the term limited to successions that were deposited (1) on low-gradient pericontinental shelves in paleotropical regions, (2) as far-field products of Gondwanan glacial growth and decay at various timescales, and (3) under conditions of low sediment supply in most cases, and (4) under low accommodation limited by slow, passive subsidence is herein preferred.