

**Depositional Environments and Sequence Stratigraphy of Upper
Mississippian Strata in the Central Appalachian Basin**

Daniel J. Miller

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Kenneth A. Eriksson, Chair

Richard K. Bambach

J. Fred Read

Stephen E. Scheckler

Erik P. Kvale

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Blacksburg, Virginia

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by

Daniel J. Miller

(ABSTRACT)

The Upper Mississippian Hinton, Princeton, and Bluestone formations of southern West Virginia constitute a wedge of strata that filled the Appalachian basin over a ~7 million year time interval. Seventeen transgressive-regressive sequences comprise the study interval in the basin depocenter. Five sequence types defined by the degree of incision and the thickness/ character of dominant facies include: 1) major incised valley-fill to coastal plain, 2) major incised valley-fill to deltaic, 3) minor incised valley-fill, 4) coastal plain, and 5) marine-dominated sequences.

Transgressive and highstand deposits within several sequences contain tidal rhythmites. The prodeltaic Pride Shale member (Bluestone Formation) preserves a hierarchy of submillimeter-to meter-scale cycles that reflect a spectrum of tidal periodicities. The abbreviated character of these microlaminated rhythmites is suggestive of a distal, subtidal setting wherein neap tides were of insufficient strength to transport sand/ silt. Decimeter-scale bundling of semimonthly cycles is ascribed to seasonal fluvial discharge. Meter-scale, multi-year cycles may reflect the 18.6-year lunar nodal cycle.

Sequence development likely reflects fourth-order (~400 k.y.), Gondwanan glacioeustatic cycles. The character and relative stratigraphic position of paleoclimatic indicators within the sequences suggests a link between eustasy and patterns of global-scale atmospheric circulation. Calcic vertisols and lacustrine carbonates in coastal plain successions are suggestive of seasonal, semiarid climatic conditions during highstand progradation. Leached paleosols and coals that underlie sequence boundaries and occur within estuarine fills are suggestive of humid conditions during late highstand through early transgression. This pattern may reflect fluctuations in monsoonal circulation whereby the latitudinal shift of seasonal moisture was restricted to the equatorial zone during glaciations.

The fourth-order sequences stack into two (2-4 Ma) composite sequences that consist of: 1) a basal retrogradational interval comprised of a major paleovalley-fill sequence overlain by a thick aggradational sequence set made up of fluvial/ coastal plain sequences (TST); 2) a marine interval that demarcates maximum flooding; and 3)(where preserved) a progradational sequence set consisting of minor incised valley-fill sequences (HST). These composite sequences document accommodation change that may reflect global tectono-eustasy.

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