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Paleogeomorphology and Facies Architecture of Pennsylvanian Trunk-Tributary Incised Valley Systems: New River Formation, Southern West Virginia

Lower Pennsylvanian (Westphalian A) strata in the Central Appalachian Basin consist of nonmarine and subordinate marginal marine strata that make up part of the Alleghenian clastic wedge. Depositional models that have been proposed for these deposits assumed no variability throughout the interval (e.g. entirely beach-barrier, tidal-straight, deltaic, or fluvial), but complex lateral and vertical facies relationships do exist. The economic importance of gas-bearing sandstone bodies and low-sulfur coal seams warrants a renewed look at the sedimentologic and stratigraphic framework of the New River Formation (NRF).

Sequence stratigraphic principles have been applied to the NRF through subsurface and outcrop analysis. Thick sandstone bodies are interpreted as incised-valley fill (IVF) deposits that developed in trunk and tributary valley systems. Widespread incision (up to 70 m deep) occurred within broad (up to 60 km wide), fluvial trunk systems in the NE-SW trending basin axis and in funnel-shaped tributary valleys (1-2 km wide, trending NW-SE) perpendicular to the Appalachian front. Valleys were initially filled with amalgamated, fluvial channel-sandstone deposits. Progressive marine influence resulted in upward transitions into tide- and wave-influenced estuarine deposits and thick coals. Fluvial to estuarine facies transitions are better-developed in the trunk systems than in the tributaries. The occurrence of deeply incised paleovalleys, juxtaposition of fluvial on underlying marine-influenced facies, and fluvial- to estuarine-facies transitions within IVF's favor allocyclic forcing mechanisms as primary controls on sequence development. The depositional framework developed here will allow for better recognition of important stratigraphic surfaces within predominantly nonmarine strata.