

## Changes in Patterns of Cyclicity in Upper Carboniferous through Lower Permian (Virgilian–Sakmarian) Depositional Sequences in the North American Midcontinent

Darwin R. Boardman, II  
Geology Department, Oklahoma State University, Stillwater, Oklahoma

Analysis of Virgilian–Sakmarian North American Midcontinent depositional sequences cropping out reveals major changes in the nature of the cyclothermic-scale depositional sequences and patterns of cyclicity that are considered to result from allocyclic as well as autocyclic mechanisms.

Lower Middle Virgilian (Douglas, Shawnee, and basal Wabaunsee) strata are grouped into mixed composite carbonate-siliciclastic sequences with a regular pattern of minor to major depositional sequences that have the thickest sequence containing well-developed marine condensed sections represented by nonskeletal phosphatic black shales. Incised valley fills and laterally extensive paleosols are well developed during lowstands.

Upper Virgilian (Wabaunsee and Admire) strata are grouped into mixed composite carbonate sequences-siliciclastic sequences with a regular pattern of between two to three minor to intermediate sequences with no marine condensed sections but with updip maximum marine flooding surfaces that are either fossiliferous gray shales or phosphatic and glauconitic wackestones. Also, an upward trend towards more minor cycles is noted. Incised valley fills and laterally extensive paleosols are well developed during lowstands.

Lower Council Grove strata are grouped into mixed composite carbonate-siliciclastic sequences with a pattern of minor to major depositional sequences that have the thickest sequence containing well-developed marine condensed sections represented by black shales or laterally equivalent black shaly, phosphatic, and glauconitic wackestones. No nonskeletal phosphate is denoted in these sequences. Lowstands denoted by well-developed paleosols are represented in the majority of the outcrop belt with incised valley fills restricted to the Oklahoma part of the outcrop belt.

Upper Council Grove strata are grouped into mixed composite sequences with a pattern of minor to intermediate depositional sequences that have the thickest sequence containing no marine condensed sections but only minor condensation at the level that corresponds to maximum marine flooding.