

Facies Architecture of the Upper Pennsylvanian Oread Cyclothem, Subsurface Southeastern Kansas and Northeastern Oklahoma

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The archetypal Oread Cyclothem consists of three minor cyclothem and change drastically in lithology, thickness, and depositional environment at the southern margin of Kansas Shelf. Our subsurface study area extends from the outcrop belt, covering 1,900 km² in Chautauqua and Cowley counties, Kansas, and Osage and Kay counties, Oklahoma. Based on outcrop analogs, the three-dimensional facies architecture of the Oread Cyclothem is reconstructed by interpreting eight cross sections and eight isopach, log facies, and paleogeographic maps using 100 wireline logs, cuttings, and cores.

Limestones thin and change into calcareous sandstone and shale to the south. The thick, phylloidal algal mound-rich Plattsmouth Limestone thins abruptly into siliciclastics where it onlaps the Heebner Shale deltaic systems. Carbonate deposition was controlled by depositional topography and proximity to the southern siliciclastic source. Regressive siliciclastic deposits in the minor cyclothem consist of an upward succession of shelf and prodeltaic, delta-front, and fluvial facies. The thin shelf shale of the maximum-transgressive Heebner Shale juxtaposes southern deltaic systems with a steep (0.5°) prodeltaic slope. The delta lobes are oriented east-west, suggesting that northward progradation was diverted to the west. Incised valley systems in the regressive Jackson Park Shale interval are well developed and, in places, cut through underlying Kereford Limestone. Valley-fill sandstones are blocky, stacked, and up to 40 m thick. Valley development occurred at the end of Oread cycle, coinciding with maximum sea-level fall. Depositional topography, sea-level fluctuations, and oceanic upwelling were the dominant controls on the facies architecture of Oread Cyclothem and its minor cyclothem.