Comprehensive Analysis of Pennsylvanian-Permian Hermosa Group Stratigraphy in the Paradox Basin

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[1]Paradox Basin Data

Abstract

In the Paradox Basin (PB) of the Four Corners region, the Hermosa Group includes all strata between the regional Leonardian (Kungurian) angular unconformity, which lies at the base of the Cutler, Organ Rock, White Rim and/or equivalent formations, and the regional Pennsylvanian basal Atokan or Morrowan (Bashkirian) angular unconformity at the top of older rocks (Mississippian to Precambrian depending on location). Of the recognized 81 fourth-order cyclic sequences, 10 are Wolfcampian, 8 are Virgilian, 13 are Missourian, 22 are Desmoinesian, and 28 are Atokan in age based on abundant paleontological data. Most of the PB cycles can be adequately correlated to equivalent Midcontinent cyclothems. Cyclic Morrowan, Chesterian, and Meramecian strata are just northwest of the PB in the fault-separated Emery Uplift (Sag) area; age-equivalent cyclic strata were likely deposited in the PB prior to being completely eroded away during the Atokan. Most of the identified cycles within the Atokan to Wolfcampian strata can be traced to all parts of the PB, including the lithospheric foredeep adjacent to the Uncompahgre Uplift. Each cyclic sequence is highly complex yet bundles of sequences and their strata are highly repetitive and predictable. Sequence boundaries, disconformities, and lowstand, transgressive and highstand system tracts and their lithofacies can be identified and mapped. Non-marine strata include siliciclastics deposited in eolian, fluvial and deltaic environments. Marine strata include organic-rich shales and dolostones, siliciclastic wedges, shelf carbonates, rim carbonates, carbonate grainstones, and biohermal mounds. Evaporites include dolostone, anhydrite, halite and potash deposited in repetitive restricted inland seas and playas. During the late Pennsylvanian and early Permian along the western margin of the large Uncompahgre Uplift, prograding clinoforms of coarse-grained deltaic and fluvial sediments overwhelmed available accommodation space in the coastal areas and adjacent seafloor, advanced out into the foredeep and beyond to shelf areas and between salt anticlines; overloading and deforming the underlying evaporites, and promoting additional growth of the salt anticlines and diapirs.