Diachronous Erosion Surfaces and Sequence Stratigraphic Practice

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Abstract

Diachronous erosion surfaces (i.e., some deposits above the surface are older than some deposits below) may be more common than is generally appreciated. Such surfaces are readily generated by migrating zones of erosion flanked by zones of deposition. Small-scale examples include ripples and dunes, migrating river or submarine channels with overbank deposition, and transgressive shorefaces. On a larger scale, diachroneity can be generated by migrating tectonic uplift (e.g., Sabine Arch), shallow marine currents (e.g., Frontier Fm., Wyoming), and deep marine currents (e.g., Atlantic margin). Further complications result from branching and anastamosing erosion surfaces: one branch may be synchronous but another diachronous.

Erosion surfaces between shallow marine clastics and overlying nonmarine (typically channelized) clastics are frequently interpreted as sequence boundaries, thus implicitly rejecting diachroneity. Problems with this approach are illustrated by published interpretations of the late Pleistocene Lagniappe delta in the Gulf of Mexico: (1) basinward continuation of the sequence boundary into the correlative conformity is ambiguous; (2) progradational marine sands of the HST have no feeder channels; (3) from highstand to lowstand, the depocenter actually shifts landward, to the incised valley complex; (4) the large quantity of sand that would have been removed to create the erosion surface is not accounted for, either within the study area or farther basinward. If the erosion surface is viewed instead as a diachronous surface resulting from normal deltaic progradation, these problems are eliminated. Chronostratigraphic significance of sequence boundaries interpreted in similar depositional settings should be reconsidered; use of multiple working hypotheses is recommended.