

New Views on Old Surfaces and the Evolving Evolution of the Sequence Stratigraphic Paradigm

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Abstract

Sequence stratigraphy is an evolving field that has thus defied all attempts at formalization. Part of this resistance to stability is because central assumptions core to the science maintain scrutiny and occasionally undergo either modification or full refutation.

Of the three master surfaces that bind systems tracts (i.e., the subaerial unconformity [SU]; maximum regressive surface [MRS]; and maximum flooding surface [MFS]), two have recently seen substantive modification. Changes in assumptions for development of the SU and the MRS not only change their interpretive meaning, but also change how these surfaces are mapped. Newer views on scour of the sequence-bounding “subaerial unconformity” show that it does not actually record a surface of exposure and near complete bypass of sediment at lowstand as originally presumed, but rather records a composite surface formed by lateral migration and incision of rivers that ‘cut-and-cover’ the subaerial unconformity throughout regression.

This cut-and-cover process means that fluvial sediment is deposited above this surface throughout the regressive and transgressive phase. This has ramifications for interpretation of these surfaces and their bound deposits. First, since deposition occurs continuously over the SU during its formation, the subaerial unconformity is neither subaerial or an unconformity, is laterally diachronous, and can also have rocks above that are locally older than rocks elsewhere below. Second, since transport of sand lags transport of suspended load, regressive fluvial sediments disproportionately sequester the sandy fraction, and the assumption that large wedges of sandy sediment are deposited at lowstand is challenged. Lastly, the MRS is above the fluvial strata capping the SU and is not the same as the SU updip of lowstand onlap. These implications do not negate the usefulness of these surfaces, but do modify how these surfaces are used and sequence stratigraphy is executed.