

A Personal Perspective on Sequence Stratigraphic Nomenclature

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The objective of sequence stratigraphy is to determine layer by layer how sedimentary successions are put together, from the smallest elements to the largest. We are interested in all of the physical surfaces that at different scales separate one depositional element from another, and it could be argued that disagreements about how elements are defined and combined are secondary to the overall task at hand. However, it is clear that stratigraphy represents more than a series of random events. In many cases there exists a definite hierarchy in layering patterns. We need interpretive nomenclature that acknowledges such patterns. There are also circumstances in which the sedimentological significance of a particular surface is unclear or of limited interest (for example, in a study focused on biostratigraphy). We need descriptive nomenclature that acknowledges such uncertainty and the diverse objectives of stratigraphers. Any attempt to recast sequence stratigraphy in purely descriptive terms ignores what has been learned from a quarter-century of stratigraphic research. Any attempt to impose universal interpretive nomenclature equally fails to match the needs of the broader stratigraphic community.

The present lack of consensus about appropriate terminology stems in part from a literal reading of Mitchum's (1977) definition of a *depositional sequence* (or *sequence*, for short): "a stratigraphic unit composed of a relatively conformable succession of genetically related strata [and] bounded at its top and base by unconformities or their correlative conformities." The lack of specificity concerning the character of bounding unconformities appears to permit the selection of unconformities of any character. However, a survey of mainstream sequence stratigraphic literature makes it clear that a much more specific meaning has emerged: a sequence boundary is a surface of subaerial degradation associated with such features as 1) the lowering of a stream's equilibrium profile (valley incision); 2) subaerial exposure and erosion of marine sediments (including the development of karst in carbonate sediments and rocks); 3) abrupt upward shoaling of depositional facies (including sharp-based shorefaces); and 4) abrupt basinward shifts in the locus of sedimentation, in some cases accompanied by marine mass wasting and sediment gravity flow (so-called "lowstand" sedimentation). An intermediate view is that objective mapping of the most prominent regional unconformities (for example, in seismic reflection data), without particular regard to their character, leads inexorably to the interpretation of sequence boundaries that in fact have these specific characteristics. One difficulty with this view is the confusion engendered about whether sequence stratigraphy is essentially an exercise in classification or whether an interpretation is falsifiable. The latter is true. A second difficulty is that while many (even most) regional unconformities prove to be interpretive sequence boundaries, comparable surfaces exist also at a smaller scale. It is the character of the unconformities that makes them sequence boundaries, and not their regional persistence.

We are nevertheless left with two options. One is to regard a sequence broadly as a stratigraphic unit defined on the basis of bounding unconformities, making it necessary to find adjectives to distinguish descriptive from interpretive units. That is the path taken provisionally by a majority of the Working Group on Sequence Stratigraphy of the International Subcommittee on Stratigraphic Classification. The second option is to regard a sequence as an interpretive unit only, modifying the definition of Mitchum (1977) to take account of insights that emerged since the publication of that paper. My personal preference is the latter because it is consistent with the concepts and practices of mainstream sequence stratigraphy and because obvious nomenclature already exists for descriptive entities. According to that view, sequence boundary and sequence (interpretive) correspond with unconformity and unconformity-bounded unit (descriptive). Ironically, the most heated debate revolves around terminology for intervals bounded by unconformities. Yet it is the surfaces that are of most interest in sequence stratigraphy. These considerations lead to the following scheme.

Unconformity-bounded unit—"a succession of strata bounded by unconformities without regard to their character or lateral extent."

Unconformity—"a composite surface of erosion and/or nondeposition separating older from younger sediment or rock bodies."

The concept of an *unconformity-bounded unit* encompasses the *synthem* of Chang (1975) and Salvador (1987), and is approximately equivalent to the *allostratigraphic unit* of the North American Commission on Stratigraphic Nomenclature (1983). An *allostratigraphic unit* is bounded by *stratigraphic discontinuities* that are commonly but not necessarily unconformities according to the way in which the term unconformity is conventionally used.

Sequence—"a relatively conformable succession of strata bounded by unconformities of subaerial erosion/nondeposition or their submarine equivalents and by genetically correlative conformities."

Sequence boundary—"an unconformity characterized by subaerial erosion/nondeposition, or its submarine equivalent, and its genetically correlative conformity."

The intent of this definition is to permit the extension of a sequence beyond the point at which one or both boundaries cease to be unconformable. The interpretation of a sequence does not require correlative conformities to be present within a particular area of study.

The sequence is an interpretive unconformity-related unit, and essentially the stratigraphic element upon which modern sequence stratigraphy is based (Mitchum, 1977).

References

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