Recommendations for Classifying Sequence Stratigraphic Surfaces and Units

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Summary

The International Subcommission for Stratigraphic Classification appointed a task group to review the sequence stratigraphic literature and to make recommendations regarding sequence stratigraphic classification and terminology. This poster presents some of the results of the work of the task group and offers two different options for sequence stratigraphic classification. It also provides a number of recommendations regarding definitions and terminology for various sequence stratigraphic surfaces and units and for choosing an appropriate classification option for a given study.

Two different approaches to sequence stratigraphic unit classification have arisen. A material-based approach uses only material-based surfaces for unit definition and a mixed time-based/material-based approach uses both material-based and time-based surfaces. In the material-based approach, a depositional sequence is defined as a unit bound by a combination of a subaerial unconformity (SU), unconformable shoreline ravinement (SR-U) and maximum regressive surface (MRS). The sequence is subdivided into two systems tracts, transgressive systems tract (TST) and regressive systems tract (RST) with the maximum flooding surface (MFS) as their mutual boundary. In this approach, a genetic stratigraphic sequence is defined as a unit bound by maximum flooding surfaces and it too is divided into a TST and a RST. Parasequences are defined as small scale units bound by maximum regressive surfaces.

In the mixed time-based/material-based approach, two time-related surfaces, basal surface of forced regression (BSFR) and correlative conformity (CC), are also used for bounding sequence units. In this approach, a depositional sequence is defined as a unit bound by a combination of subaerial unconformity, unconformable shoreline ravinement and correlative conformity. It is divided

into four systems tracts – lowstand systems tract (CC–MRS), transgressive systems tract (MRS-MFS), highstand systems tract (MFS-BSRF) and falling stage systems tract (BSFR-CC). A genetic stratigraphic sequence is defined in the same way as that in the material-based approach (MFS for boundary) but it is subdivided into the same four systems tracts as the depositional sequence.

The availability of the two classification schemes provides stratigraphers with two options for delineating sequence stratigraphic units. We believe this ensures interpretation level matches the data at hand. Importantly it also alleviates the problem of force fitting data to an inappropriate classification scheme. This problem has occurred often in the past due to the extreme difficulty of reliably identifying the two time-based surfaces in many situations of insufficient data.

Twenty recommendations for sequence stratigraphic surface and units classification are offered.

1. That the main material-based surfaces used in sequence stratigraphy be called subaerial unconformity, shoreline ravinement, regressive surface of marine erosion, maximum regressive surface and maximum flooding surface.
2. That the two time surfaces used in sequence stratigraphy be called the basal surface of forced regression (time surface equivalent to the start of bas level fall) and correlative conformity (time surface equivalent to start of base level rise)
3. That a sequence be the primary unit of sequence stratigraphy and that it be a generic unit defined as “a unit bound by a specific type of unconformity and its correlative surfaces”.
4. That correlative surfaces be considered surfaces which join with the end(s) of the defining unconformity, and with each other, so as to form a single, through going boundary.
5. That specific types of sequences be defined and named on the basis of specific types of unconformities.
6. That the sequence type, which employs a subaerial unconformity as its defining type of unconformity, be named a depositional sequence.
7. That the sequence type, which employs a maximum flooding surface as its defining type of unconformity, be named a genetic stratigraphic sequence.
8. That sequences be divided into component units called systems tracts. A systems tract is another generic unit in sequence stratigraphy and is defined as “a component unit of a sequence which is bound by sequence stratigraphic surfaces”.
9. That specific types of systems tracts be defined on the basis of specific combinations of bounding surfaces.
10. That a transgressive systems tract (TST) be defined as a unit bound by a subaerial unconformity, unconformable shoreline ravinement and/or maximum regressive surface below and a maximum flooding surface above.
11. That a regressive systems tract (RST) be defined as a unit bound by a maximum flooding surface below and a subaerial unconformity, unconformable shoreline ravinement and/or maximum regressive surface above.
12. That a lowstand systems tract be defined as a unit bound by the correlative conformity below and the maximum regressive surface above.
13. That a highstand systems tract be defined as a unit bound by the maximum flooding surface below and a subaerial unconformity, unconformable shoreline ravinement and/or the basal surface of forced regressive above.
14. That a falling stage systems tract be defined as a unit bound by the basal surface of forced regression below and the correlative conformity above.

15. That a parasequence be defined as a small scale sequence stratigraphic unit bound by maximum regressive surfaces and/or correlative surfaces excluding unconformities. Furthermore, that a lithostratigraphic boundary between a sandstone/limestone below and a shaly lithology above, be called a flooding surface and that it be allowed as a proxy for a parasequence boundary when available data (e.g. mechanical logs) do not allow the MRS to be reliably delineated.
16. That two distinct options be available for sequence stratigraphic classification; one based solely on material based-surfaces for unit boundaries and one based on a mixture of time-based surfaces and material based surfaces.
17. That stratigraphers choose the appropriate classification option based on the nature and abundance of the available data. Of prime importance in this decision is the determination if sufficient data are available to allow the reliable and consistent delineation and correlation of the two time surfaces.
18. That stratigraphers do not try to force fit their data to the mixed time-based/material based classification option by using diachronous facies boundaries as proxies for the two time surfaces.
19. That sequence boundaries and sequences in a given basin be organized into different classes (orders) on the basis of the interpreted relative magnitude of the boundaries. The largest magnitude boundaries would be assigned to the first order.
20. That sequence stratigraphic units not be formalized