

Depositional Sequence Boundaries in Carbonate Strata – Problems and Proposals

Ashton Embry*
Geological Survey of Canada, Calgary, AB
aembry@nrcan.gc.ca

Summary

A depositional sequence boundary is defined as a subaerial unconformity (SU) and correlative surfaces. Correlative surfaces are surfaces which join with the end(s) of the SU, and with each other, so as to form a single, through going sequence boundary. A number of proposals have been published regarding what combination of surfaces constitutes a scientifically valid and practical depositional sequence boundary in carbonate strata.

One of the first boundary proposals was based on a carbonate shelf/slope/basin physiographic setting and joined the SU with the facies boundary below all strata which were deposited after base level had fallen below the shelf edge. As clearly shown by Hunt and Tucker (1992), such a boundary is not scientifically reasonable because strata deposited during base level fall must be placed below the sequence boundary to ensure a single, continuous sequence boundary.

Another popular choice is a combination of the SU and the base of a shallow water carbonate unit as proposed by Burchette and Wright (1993) for a ramp setting. This combination is also not reasonable because of the high diachroneity of base of the carbonate unit. It is also not scientifically acceptable because, due to the fact that it forms during base level fall, it does not join with the end of the basin margin unconformity (SU or SR-U).

Another proposal used part of the SU and the time surface at the start of base level fall. This has no practicality because such a time surface has no characteristic physical attributes which allow its recognition. Furthermore, such a boundary would result in most of the basin margin unconformity being inside the sequence rather than on its boundary, thus violating the basic definition of a depositional sequence.

Yet another proposal joins the SU with the time surface at the start of base level rise. Again this sequence boundary is not practical because such a time surface has no characteristic physical attributes which would allow it to be recognized consistently and with reasonable objectivity in most settings.

It appears the only practical and scientifically acceptable depositional sequence boundary for carbonate strata is a combination of an SU with an unconformable shoreline ravinement surface and a maximum regressive surface. Occasionally the maximum flooding surface replaces the MRS and can also form part of the boundary. Such a boundary also is applicable in mixed carbonate and siliciclastic regimes and allows a regional depositional sequence boundary to be correlated from carbonate –dominant areas to siliciclastic-dominant ones.

References

Burchette, T. and Wright, V.P., 1992, Carbonate ramp depositional deposits. *Sedimentary Geology*, v.79, p. 3-57.

Hunt, D. and Tucker, M., 1992, Stranded parasequences and the forced regressive wedge systems tract: deposition during base level fall. *Sedimentary Geology*, v. 81, p. 1-9.