

Sedimentary facies and depositional evolution of the Middle/Late Cambrian inner and mid-shelf setting of southeastern Arizona

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The lowest part of the Cambrian succession of southeastern Arizona consists of high-energy shallow-marine, medium- to coarse-grained sandstones of the Bolsa Formation. They are abruptly overlain by the Abrigo Formation which consists of mixed carbonate and siliciclastic facies that comprise an overall shallowing-upward succession.

The depositional environments of the Abrigo Formation are interpreted as wave-dominated and strongly influenced by storm processes. Eight facies associations are recognized. Deposited in lower offshore setting are: (1) thin-bedded nodular lime mudstones bioturbated by *Planolites* with sporadic lenses of intraclastic rudstone; and (2) laminated claystone or lime mudstone occasionally intercalated with lenticular-bedded siltstones and small-scale hummocky cross-stratified, fine-grained sandstones. These are overlain in turn by upper offshore deposits consisting of: (3) laminated mudstone or lime mudstone interbedded with small-scale hummocky cross-stratified, fine-grained sandstones with common gutter casts and intraclastic rudstone. This is succeeded by offshore transition deposits comprised of: (4) hummocky cross-stratified sandstone regularly interbedded with laminated mudstone or lime mudstone; (5) bioclastic grainstone and packstone, and oolitic-oncolitic packstone; and (6) lime mudstone, wackestone with rare stromatolites. These are overlain by lower-middle shoreface deposits consisting of: (7) amalgamated hummocky cross-stratified, medium-grained sandstone, locally with intraclastic rudstones. This facies is followed by: (8) trough cross-stratified, medium-grained sandstone interbedded with thin mudstones, deposited in upper shoreface environment.

The lowest part of the Abrigo Formation is interpreted as having been deposited in an offshore setting under lowstand conditions. Subsequent sea level rise resulted in retrogradation during the development of a transgressive systems tract, followed by shoreface progradation during highstand systems tract embracing the upper part of the formation.

Sedimentary processes recorded in the mixed carbonate–siliciclastic systems of inner- and mid-shelf settings are relatively poorly understood with respect to modern facies interpretation. A better understanding of the sedimentary processes that prevailed during the deposition, as well as the geometry of the facies are key to optimized oil and gas exploration.