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Abstract

Facies analysis and high-resolution sequence stratigraphy of the Lower Eocene shallow marine Ametlla Formation, Spanish Pyrenees

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ABSTRACT

The Lower Eocene Ametlla Formation of the Ager Basin, Spanish Pyrenees, is a rapidly deposited shallow marine unit formed in a setting characterized by syn-sedimentary tectonic activity. Mapping of the formation over a distance of 25 km was conducted according to sequence stratigraphical principles with emphasis on facies analysis. Twelve facies, grouped in five facies associations, have been recognized in the Ametlla Formation. The studied succession records a vertical transition from deltaic systems prograding onto a sediment-starved shelf, via estuarine deposits associated with incised valleys, to sandbar complexes in a tidal seaway.

In terms of sequence stratigraphy, three scales of genetic sedimentary units were recognized.

(1) At the regional scale, elements of two 3rd-order composite sequences (*sensu* Exxon) have been recognized. These include a 3rd-order highstand sequence set encompassing the lowermost part of the Ametlla Formation and the underlying Passarella Formation, and a 3rd-order transgressive sequence set that constitutes the middle parts of the Ametlla Formation. The sequence sets are separated by an unconformity with up to 35 m of incision that is interpreted as a major sequence boundary. It is argued that the incised valleys associated with this unconformity were infilled during landward-stepping of the shelfal depositional system. Basinwards, the unconformable surface becomes subhorizontal and is overlain by a 2 m thick oyster bed formed in a sediment-starved setting subsequent to flooding of the incised valleys (which still acted as sediment conduits). Sandstones dominate the transgressive sequence set, whereas the highstand sequence set is dominated by siltstones, particularly in the lower part. In the transgressive sequence set, an upward increase in

sand content and calibre is observed, relatable to punctuations of the transgressive trend by high-frequency sea-level fluctuations, and to downslope redistribution of sand.

(2) At the subregional scale, detailed mapping indicates the presence of five 4th-order sequences. The 4th-order sequence boundaries are associated with sediment bypassing and minimal erosional relief, and were created by forced regressions during periods of relative sea-level fall. Sharp-based sandstones overlying these unconformities are believed to have accumulated during subsequent rise of relative sea-level. Where 4th-order maximum flooding surfaces can be recognized, the sequences may be subdivided into a sandstone-dominated transgressive systems tract and a siltstone-dominated highstand systems tract.

(3) At the local scale, 2–9 5th-order parasequences are present within the 4th-order sequences. Superimposed parasequences are separated by flooding surfaces characterized by bioclastic accumulations, pervasive burrowing and extensive calcite cementation. The parasequences are commonly stacked in a landward-stepping manner.

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