Early Tortonian Shallow Shelf Calcarenitic Deposits under Tidal Influence: Facies, Architecture and Quantification, Agua Amarga Basin, Almería, SE Spain*

L. E. Gomis Cartesio¹, M. Esteban², J. Gerard², and R. Salas¹

Abstract

The study area is located in Agua Amarga Basin in the southeastern part of the Iberian Peninsula in the postorogenic Neogene basins superimposed on the reliefs of the Betic Range intensely affected by Neogene Volcanism even during the time of deposition.

A sedimentology, sequence stratigraphy and paleogeography study, was made for the preparation of an integrated conceptual model of the lowermost section filling of the Agua Amarga Basin (early Tortonian, Late Miocene). There are two major facies associations, the carbonate-dominated facies (coarse-medium-grained, bryozoans, molluscs, foraminifera, echinoids and red algae calcarenites-calcirudites, with muddy lamination) on the one hand and, mixed facies consisting of volcanic and volcano-sedimentary facies (sandstones and conglomerates of composition volcanic or volcanic-carbonate) on the other hand. Interpreted depositional environments includes aeolian; fluvial floodplain; fan deltas or alluvial fan volcano-sedimentary deposits; delta; estuarine-protected level, supratidal; shoals/barrier islands; channels/tidal channels; washover-fan; muddy intertidal; calcarenites from intertidal-subtidal bars. Marginal marine to shallow marine are predominant. Taking into the results from earlier field research, facies associations, correlation between log sections and the architecture can be interpreted as the infill of a small gulf or estuary where sedimentation is not even associated with the natural or tectonic irregularities of the basement. The embayment morphology amplifies the tidal action and control on sedimentation. The area was protected, confined and restricted and for this reason, the tidal calcarenite deposits are well preserved.

Analysis of stacking pattern (facies succession) and lateral variation supports sequence analysis and the interpretation of systems tracts. The filling of the basin over the volcanic basement consists of: (1) fluvial facies refilling preexistent valleys (LST); (2) intertidal facies, washover-fan or ebb-deltas towards the west, filling the spaces exceeding the volcanic paleohigh thresholds (TST); (3) more open and no confined environments with subtidal facies progradation (HST+FSST); (4) barrier island and estuary fill (toward west paleocurrents, associated with closed environments) (LST+TST); (5) paleokarsts and paleosols (FSST+SB); and (6) transgressive facies (TST).
Early Tortonian shallow shelf calcarenite deposits under tidal influence. Facies, architecture and quantification. Agua Amarga Basin, Almería. (SE Spain)

1. Regional setting

2. 2 Objective

A sedimentology, sequence stratigraphy and paleogeography study, was made for the preparation of an integrated conceptual model of the lowermost section filling of the Agua Amarga Basin (early Tortonian, Late Miocene).

3. Facies associations and Interpreted depositional environments

There are two main facies associations:
1. Carbonate-dominated facies (intermediate- to coarse-grained, with bryozoans, molluscs, foraminifera, echinoids and red algae calcarenites-calcirudites, with volcanic or volcanic-carbonate). Carbonate-dominated facies are observed.
2. Mixed-facies consisting of volcanic and volcano-sedimentary facies (sandstones and conglomerates of composition volcanic or volcanic-carbonate). Volcanic and volcano-sedimentary facies are observed.

4. Sequence stratigraphy and Depositional model

Schematically, sequence stratigraphy and history of the study area can be summarized in the following points:
1) Fluvial valleys initiation over volcanic basement and vulcanoclastics deposit formation (low sea level).
2) Washover fan and sandy intertidal platforms towards the west, filling the spaces exceeding the volcanic paleothresholds (rising - high sea level).
3) Active open and no confined environments with subtidal facies progradation (high - rising sea level).
4) Some marginal areas, aeolian and progradational deltaic facies are observed.
5) Barrier island and estuary fill (toward west palaeocontacts, associated with closed environments) (low - falling sea level).
6) Channel and beaches facies deposition (high-lowering sea level).
7) Transgression of U2 on U1 (high-lowering sea level).

5. Discussion and Conclusions

6. References