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The rhythm of the eustatic changes as a control of the depositional architecture in Mesozoic deltaic deposits (Iberian-levantine and Maestrat basins, Spain).

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Introduction

From the upper Jurassic to the lower Cretaceous, two basins (Iberian-levantine and Maestrat) were formed in the South-eastern sector of the Iberian plate. Up to 760 meters of continental and deltaic materials were deposited in them. Independently from the role played by the tectonic forces, which was different in each one of these basins, the sedimentary record is very similar. Within them, fourth or fifth order trangresive-regressive sequences are recognized. These sequences range from deposits with marine tropical carbonates at their bases to calcareous paleosoils at the top. The nature of these sequences is compatible with climatic changes from tropical humid to mediterranean semi-arid type. This cyclic pattern of the sedimentary record, with an apparent eustatic control, is a general feature of the deposits formed in the north margin of the western sector of Tethys. Bearing this in mind, the analysis of the facies distribution and the geometry of the sedimentary bodies leads to changes in the stratigraphic and sedimentary models. Therefore, the faunal distribution patterns established up to date in the area must be reconsidered. As a result of the present analysis, it can be stated that the sedimentary record shows important discontinuities. Their generation imply an important loss of previously deposited materials, due to eustatic sea-level downs , thus making possible to know the rhythm and the magnitude of the eustatic changes. Such rhythm, controlled only by climatic factors, determines the type of the preserved depositional architecture.

Stratigraphy

All the transgressive-regressive sequences of the continental and transition materials of the two studied basins are limited in the base by means of an erosion surface, often showing a marked paleorelief. The complete sequence is formed, from the base to top, by: marine marls and platform bioclastic carbonates, beach sandstones, red floodplain clays and a calcareous paleosoil. Locally, attenuating the paleorelieves in the basal erosion surface can show up a polygenic breccia including fragments of marine carbonates, beach sandstones and/or paleosoils. These sequences are the result of the sedimentation in a wave-dominated delta subjected to eustatic changes. The deposits of marine marls and carbonates, and some of the beach sandstones they constitute a transgressive system tract, while part of beach sandstones, and the red clays and the paleosoils, represent a regressive one.

Some of the sequences change laterally to incised valleys. These are channelled structures having up to 1 km of width and 15 of depth. They are usually filled with beach sandstone bodies in an offlap disposal, or with non-bioturbated thin-bedded estuarine sandstones and mudstones. Alternatively the large incised valleys can be infilled with more than a complete depositional sequence.

Control on stratigraphic architecture

The stratigraphic record of the eustatic sea-level lowering is indirectly implied in the formation of the erosive base of the incised valleys. However, this record is directly fossilized, with much more detail, in the beach

sandstone bodies of most of the sequences. In them, it takes two different aspects: 1) Beaches in onlap disposal, and 2) Systems of stepwise erosive terraces and taluses. Both structures respond to different magnitudes and rhythms of absolute eustatic descents.

The onlaping beach bodies show continuous sea-level downs of a magnitude of less than 5 metres. The systems of erosive terraces and taluses respond to a discontinuous sea-level fall, sometimes interrupted by minor transgressive events, with magnitudes of a total eustatic falls between 0'5 and 30 meters. The larger incised valleys usually show a complex system of terraces and taluses in one of their margins, especially the eastern margin for channels with paleocurrents from NNW and NNE towards SSE and SSW. The development of important eustatic sea-level drops is usually preceded by several sea-level lows and ups of minor order. During the falls down, part of the previous marine and continental sedimentary record is eroded, thus leaving only mutilated sequences formed by cycles of red clays and marine marls which can be confused with continental floodplain deposits.

Conclusions

The sedimentary record of the upper Jurassic and lower Cretaceous of the Iberian-levantine and Maestrat basins (eastern Spain), shows a cyclical character of climatically controlled transgressive-regressive sequences. Within them, it has been possible to model and quantify the eustatic sea-level falls, which can take place in a continuous or in a discontinuous manner. The type of sedimentary record preserved depends more in the rhythm than in the magnitude of the eustatic sea-level falls.

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