EVAPORITE FACIES OF THE TRIASSIC-LIASSIC BOUNDARY IN NE SPAIN: SEDIMENTOLOGICAL SIGNIFICANCE

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1. INTRODUCTION

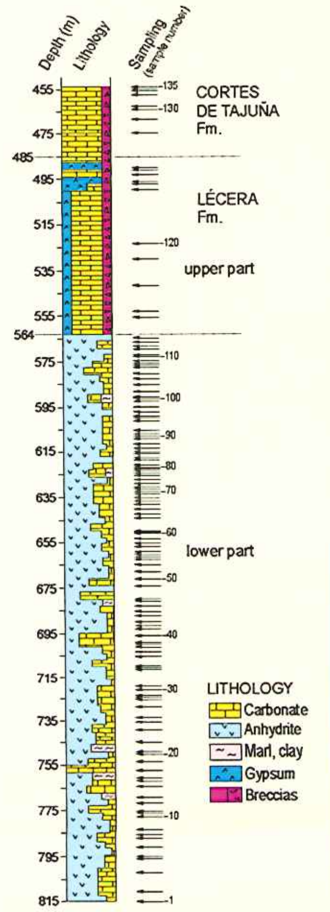


Fig.3-Simplified lithologic log of the Lécera Formation at the Alacón borehole, and sampling carried out for this work.

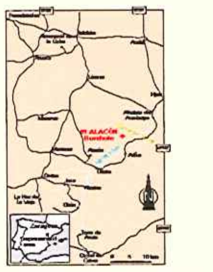


Fig.1- Location map of the study area and the Alacón borehole.

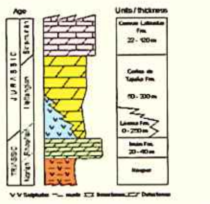


Fig.2- Lithostratigraphic units of the Triassic-Liassic boundary in the Sierra de Arcos area.

Evaporite deposits are common at the Triassic-Liassic boundary in the Iberian Peninsula. These deposits overlie the carbonates of the Imón Formation (of Rhaetian age) and underlie the carbonates of the Cortes de Tajuña Formation (of Hettangian age).

The study of some outcrops in the Sierra de Arcos, in the Iberian Chain, led Gómez and Goy (1998) to propose the name "Lécera Carbonate, Anhydrite and Gypsum Formation" for this unit.

This poster offers new insights into the Ca-sulphate lithofacies at one of the boreholes recently drilled in the Sierra de Arcos in order to better understand the sedimentary environments in the northeastern Iberia during the Triassic-Liassic boundary.

At the Alacón borehole, the Lécera Formation can be subdivided into a lower and an upper part. About 250 m of predominant anhydrite rock with subordinate carbonate is present in the lower part. In contrast, the upper part is composed of predominant carbonate rock and interlayered gypsum beds.

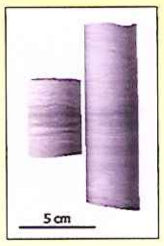
For this study, 135 samples of sulphate and carbonate rock of the Alacón borehole succession were selected.

2. FACIES ANALYSIS

The facies of the samples present at the Alacón borehole can be classified in two groups: carbonate and anhydrite lithofacies.

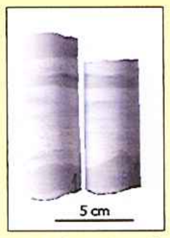
Carbonate lithofacies

C1-Massive to banded carbonate mudstone



C2-Alternation of carbonate and anhydrite laminae

Anhydrite lithofacies

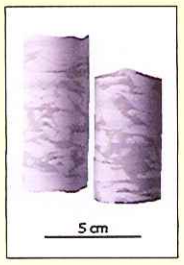


A1-Alternation of anhydrite and carbonate bands

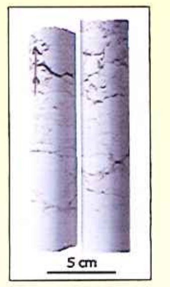
A2-Clastic (anhydritic) intercalations within the alternation of anhydrite and carbonate bands

A3-Laminated to banded anhydrite

A4-Bedded pseudomorphs



A5-Interstitial pseudomorphs



A6-Massive to nodular anhydrite

3. EVAPORITE CYCLICITY

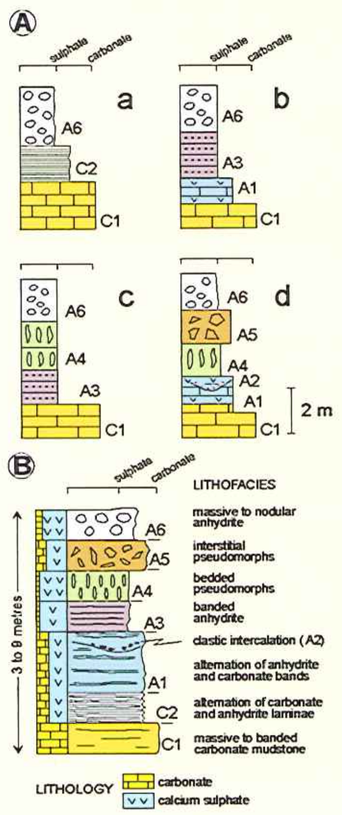


Fig.4. Evaporitic cycles at the Alacón borehole. A) Individual cycles: a) sabkha cycle; b) fine-grained gypsum (laminated to banded anhydrite lithofacies) grading to nodular anhydrite; c) bedded selenites (bedded pseudomorphic lithofacies) grading to nodular anhydrite; d) interstitial selenites (interstitial pseudomorphic lithofacies) grading to nodular anhydrite. B) Evaporitic succession of an ideal, shallowing upward, complete cycle.

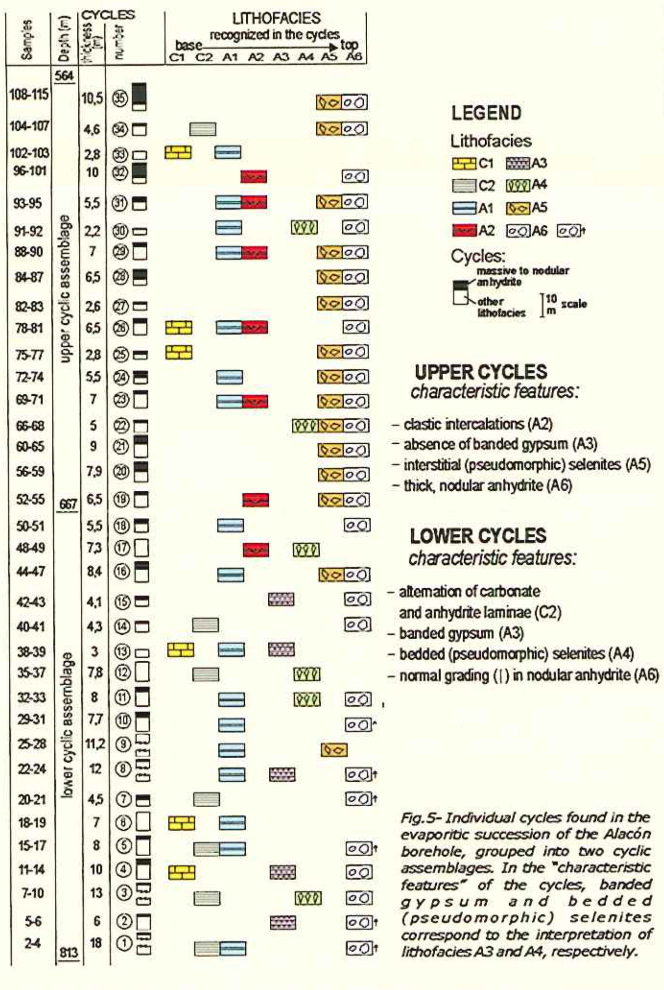


Fig.5- Individual cycles found in the evaporitic succession of the Alacón borehole, grouped into two cyclic assemblages. In the "characteristic features" of the cycles, banded gypsum and bedded (pseudomorphic) selenites correspond to the interpretation of lithofacies A3 and A4, respectively.

In the interval studied at the Alacón borehole, a number of lithofacies arrangements were observed. These patterns cleary reflect the existence of cycles. Only one type of these cycles seems to represent a sabkha succession in a carbonate-sulphate tidal complex. The rest exhibit shallowing upward successions originally involving gypsum precipitated subaqueously: fine-grained gypsum (banded anhydrite) grading to nodular anhydrite; bedded selenites (bedded pseudomorphs) grading to nodular anhydrite; and interstitial selenites (interstitial pseudomorphs) grading to nodular anhydrite.

Taking these cycles together, an "ideal" cycle for the Lécera Formation at the Alacón borehole can be proposed, which would comprise up to eight lithofacies. We assume that this is a shallowing upward cycle. Along the lithologic log, the presence of 35 individual cycles was deduced.

A distinction between a lower cyclic assemblage and an upper cyclic assemblage can be made. The lower assemblage is charcterized by cycles beginning with carbonate lithofacies, followed by fine-grained gypsum and bedded selenites, and ending with massive to nodular anhydrite at the top. The upper cycle assemblage is characterized by cycles with few carbonate lithofacies, an absence of laminated to banded fine-grained gypsum, and by predominance of interstitial selenites.

4. THE EVAPORITIC MODEL OF THE LÉCERA FORMATION

At the Alacón borehole, the most outstanding evaporite lithofacies which were interpreted as subaqueous deposits -laminated to banded fine grained gypsum and bedded selenite- bear a strong resemblance to the gypsum facies currently characterizing the precipitation in the evaporative salinas of the Mediterranean coast in Spain.

The evaporitic basin of the Lécera Formation in the Sierra de Arcos can be interpreted as a subsiding coastal basin of the salina-lagoon type, where the relatively small size of the selenites suggests a shallow setting.

The cyclic evolution from a salina (subaqueous) to a sabkha (subaerial) setting was probably controlled by relative sea level fluctuations.

5. CONCLUSIONS

1) The evaporitic succession of the Lécera Formation at the Alacón borehole, up to 250 m thick, exhibits a number of individual cycles. An "ideal" cycle of this succession is made up of massive to banded carbonate lithofacies at the base; fine-grained gypsum and selenite lithofacies (the two currently preserved as anhydrite) in the central part; and nodular anhydrite at the top. This is a shallowing upward cycle that starts with subaqueous precipitation of carbonate and gypsum and ends with the subaerial growth of anhydrite.

2) The existence of a number of depositional cycles was deduced. In this cyclic succession, a lower assembalge can be differentiated from an upper one. As a whole, this cyclic succession records an infilling process.

3) The sedimentary environment where these cycles were accumulated corresponds to a subsiding coastal salina or lagoon with a continuous supply of a sea water. In this environment the water depth was progressively reduced.

6. REFERENCES

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