Paleoenvironmental, Paleoecological and Tectonic Considerations about Onshore Mucuri Member, Neo-Aptian, Espirito Santo Basin, Brazil*

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Introduction

The neo-Aptian Mucuri Member of Mariricu Formation, in Espirito Santo Basin, SE Brazilian continental margin (Figure 1) has been an exploratory target since the1960’s. It is located between parallel 18°20’ and 21°00’ (França and Tokutake, 2002). The studied section is the Mariricu Formation, divided into Itaunas Member. (evaporites) and Mucuri Member (Figure 2). In this article we refer only the member names.

Structural Aspects

Structural aspects make the main well remarkably different from the others. It is placed on the border of the basin, with a relatively high basement plateau, showing a hinge line to the east. This hinge line is locally parallel to the Cedro Paleocanyon edge and shows fractures such as positive flower and pinnacles due to meso-tectonic reactivation. The main well is in a very proximal area in neo-Aptian morphology (Figure 3).

The main well geologically is on São Mateus Platform, on the W edge of Fazenda Cedro Paleocanyon (Figures 4 and 5).

Core Analysis

This well was continuously cored in the section of interest; this made it possible to carry out many accurate analysis (Figure 6). Sandstones are predominant in the Mucuri Member in these cores, which are divided into two depositional sequences: basal fluvial facies and the other characterized by alluvial facies.

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Petrographic Analysis

Petrographic analysis shows very immature facies (textural and mineralogical) in both sections, with grains just a little better sorted in the fluvial section (Figure 7).

Palynology Analysis

The palynologic assemblages are marked by continental elements, with a considerable amount of opaque and non-opaque phytoclasts and rare cuticles. Pollen grains of Classopolis (Cheiropidiaceae) constitute the predominant group, commonly recorded in the form of tetrads, as well as Gnetales.

The predominance of Cheirolepideaceae and Gnetales suggests a hot and dry paleoclimate, possibly in salty soils (Lima, 1978). The good preservation and the high frequency of tetrads (mainly Classopolis classoides) indicate a very short transport. Pollen grains of Araucariacites australis are less abundant; during the Aptian preference was the highlands near salty seaside (Dutra, 2003).

No cores were taken in the other wells (Figure 5) that were drilled in a less proximal area. The palynological content shows Classopolis classoides predominance again, but tetrads are less common, with Gnetales, spores and rare, but consistently present, Araucariacites australis.

Paleoenvironmental Reconstruction

The massive presence of hot and dry climate proxies and a constant occurrence of a colder climate proxy show a predominant hot and dry climate, with adjacent highlands very close to depositional site.

Structural analysis shows the main well is near the edge of the basin, on a relative high basement plateau.

Integration of the available data sets allows us to make an interpretation of a depositional site in a low area, with non-perennial rivers under hot and arid climate providing influx from the nearby rise to form an alluvial fan complex (Figure 8).

Conclusion

- A geomorphologic analogue is The Death Valley in California, USA: a very flat hot and dry basin near highlands, with associated colder climate and alluvial fans.

- The integration of different data sets and knowledge allowed for a more accurate interpretation of the paleoenvironmental setting.
References


Figure 1. Location map and structural context (lineaments) in the area.
Figure 2- Stratigraphic chart (Aptian-Albian) of Espirito Santo Basin (from França et al., 2007).
Figure 3. Geological cross-section (in time—ms) of study area.
Figure 4. Geological cross-section, onshore Espirito Santo Basin (from Vieira and Tschidel, 2001)
Figure 5. Location map with blocks ("ring-fences" in green), main geological features, and studied wells
Figure 6. Core/log/petrophys analysis of the main well, with photomicrographs of *Classopolis* tetrads + *Arucariacites australis* above *Classopolis* spp. (scarce tetrads) + *Arucariacites australis* (less frequent in alluvial fans).
Figure 7. A – Photomicrograph of alluvial-fan section sample. B – Photomicrograph of fluvial section sample.
Figure 8. Schematic paleoenvironmental reconstruction.