Facies sequence of Triassic–Jurassic red beds in the Sierra Madre Oriental (NE Mexico) and its relation to the early opening of the Gulf of Mexico

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ABSTRACT


The configuration of Upper Triassic grabens in the Gulf of Mexico rift system is pointed out by the suture zones of late Palaeozoic plate convergence. Rifting particularly started on both sides of the ancient magmatic arc. The taphrogenic red beds of the Huizachal Formation in the Sierra Madre Oriental represent the western parts of this system.

The early syn-rift sediments are characterized by fining upward cycles of a fluvial environment with a low-sinuosity channel pattern. Later on, decreasing of relief intensity caused the change to a rather meandering system. Climate was evidently semiarid during that time. The petrographic composition of the clastic rocks suggests a nearby sedimentary–metamorphic basement.

The transition to early post-rift sediments is marked by an angular unconformity. Its formation approximately coincides with the first emplacement of oceanic crust in the central parts of the Gulf basin. The early post-rift sediments of the La Joya Formation show, within a single fining upward megacycle, the transition from terrestrial to marine conditions that persisted up to the beginning of Cenozoic time.

Introduction

Rift-related Triassic–Jurassic red beds, unconformably overlying Palaeozoic or older basement, are known from a number of regions surrounding the Gulf of Mexico. Since the presence of oceanic crust underlying the central Gulf of Mexico basin seems to be confirmed by geophysical data (Ladd et al., 1976; Watkins et al., 1978; Buffler et al., 1980, 1981), these sediments commonly are related to the initial breakup of Pangea and to the early fracturing of the Gulf region.

However, since all pertinent geological information from the northern and southern Gulf rim is based on subsurface data, the Sierra Madre Oriental surface outcrops (Fig. 1) provide a significant tool for palaeoenvironmental and palaeotectonic interpretation.

The presence of red beds in northeastern Mexico is known since the beginning of this century, but it was not until much later (Heim, 1940; Imlay et al., 1948; Mixon et al., 1959; Carrillo-Bravo, 1961) that first published information was available and that the main stratigraphic features were established. More detailed environmental interpretation was contributed by Belcher (1979) and Bracken (1982, 1984). However, all these works were mainly based on observations in the Huizachal–Peregrina anticlinorium, including the type locality in the Huizachal Valley SW of Ciudad Victoria (State of Tamaulipas). The northernmost outcrops in the State of Nuevo Leon were mentioned only incidentally; some of them remained almost unknown because of difficult access. A part of this important area was mapped in detail by Götte (1986), whereas Michalzik (1986) contributed some petrologic data.

In this paper, the main types of lithofacies observed in several stratigraphic sections are discussed. A generally valid facies model is presented.