DEPOSITIONAL ENVIRONMENTS OF THE TYPE TEMBLOR FORMATION,
CHICO MARTINEZ CREEK, KERN COUNTY, CALIFORNIA

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ABSTRACT

The eight members of the type Temblor Formation record a complex middle Tertiary tectonic and sedimentary history, which includes four partial and complete depositional cycles. The early Zemorrian depositional cycle is represented by the lower bathyal Cymric Shale. Tectonic uplift and erosion preceded the second depositional cycle which includes the Zemorrian Wygal Sandstone and lower Santos Shale. The Wygal comprises a relatively high-energy inner-neritic basal sandstone, a fossiliferous shelfal siltstone, and a condensed outer shelf facies. The superjacent lower Santos Shale records an abrupt return to middle bathyal depths. The next cycle of uplift occurred in latest Zemorrian time and was centered to the northwest of the study area. The basal transgressive sand in this sequence is the upper Zemorrian Agua Sandstone, which comprises a shallow inner-neritic sandstone in the northern part of the study area and a condensed, outer shelf-upper slope phosphatic facies in the south. The remainder of the Saucesian depositional sequence includes the bathyal upper Santos Shale, the inner to middle submarine fan facies of the Carneros Sandstone, and the mid-bathyal Meda Shale. Deposition of the shallow-marine Relizian Buttonbed Sandstone followed a major tectonic uplift accompanied by locally intense structural deformation. The Buttonbed is the basal transgressive sand of the Monterey depositional sequence and includes a variety of high-energy shelfal facies.

INTRODUCTION

The type area of the Temblor Formation is located in the eastern foothills of the central Temblor Range between Carneros and Zemorra Creeks, where it consists of eight mappable members ranging in age from early Oligocene through late early Miocene. The stratigraphy of the type Temblor has been reviewed by Foss and Blaisdell (1968) and Dibblee (1973), and is summarized in Figure 1. The type Temblor is significantly older, generally thicker, and represents a greater diversity of marine environments than does the Temblor Formation to the north on Reef Ridge, in the Coalinga area, and in the Kettleman Hills oil fields. Stratigraphically, the type Temblor is quite complex; it includes three significant unconformities and parts of four depositional sequences. Unfortunately, the stratigraphic expedient of including all these sequences in the Temblor Formation has obscured a complex middle Tertiary tectonic and sedimentary record, which includes four partial and complete cycles of deposition. These are the lower Zemorrian Cymric Shale sequence; the lower and upper Zemorrian Wygal Sandstone and lower Santos Shale sequence; the Saucesian sequence, including the Agua Sandstone (actually reported to be late Zemorrian), the upper Santos Shale, Carneros Sandstone, and Meda Shale; and finally, the basal part of the Monterey depositional sequence, represented by the Relizian Buttonbed Sandstone. All of these, with the probable exception of the Cymric sequence, were preceded by major tectonic uplifts and at least local emergence, followed by abrupt subsidence and a return to bathyal depths. Figure 1 diagrammatically illustrates these sharp oscillations in paleobathymetry. This pattern is typical of many Tertiary basins in California and reflects the rapidly changing dynamics of a convergent, and later a transform, continental margin. Proximity to the San Andreas fault, a major basement boundary even before the onset of wrench tectonism, makes the type Temblor a particularly sensitive record of active margin tectonics. The fault was a locus of uplift three and possibly four times in the course of Temblor deposition.

THE LOWER ZEMORRIAN CYMRIC SHALE SEQUENCE

In outcrop, the Cymric Shale is poorly exposed and very thin, averaging only 12-18 m in thickness. It is a silty mudstone with rare fish scales and scattered, mostly arenaceous foraminifera. In all localities studied the unit is so pervasively fractured and badly weathered that very few small-scale bedding features are discernible. Rare horizons of thin, concretionary limestone and thin beds of very fine grained sandstone serve to define the overall bedding attitude. The very rare sandstones are thin (<12 cm), silty, very fine grained, and massive. Obcure silt filled tube shaped burrows are present in some of the better preserved intervals. No lamination was observed, and it is presumed that the Cymric is massive throughout. Two specimens of the gastropod Brucikria columniana are the only megafauna reported from the Cymric Shale (Addicott, 1973). Aside from fish scales and rare pteropods, the remainder of the Cymric fauna consists of a meager foraminiferal assemblage (Carter, 1985). Ten of the 17 taxa reported from the Cymric Shale are