

Latest Cretaceous to Miocene deformation events in the eastern Sierra Madre del Sur, Mexico, inferred from the geometry and age of major structures

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ABSTRACT

The Cretaceous-Cenozoic major lithologic units and structures of the Sierra Madre del Sur are well known. The Laramide orogeny is generally considered as the cause of the contractile structures, but the details about the migration, kinematics, and intensity of deformation are poorly known. Furthermore, the deformation events responsible for the post-Laramide strike-slip and normal faults have not been identified. In this paper, we document the migration of the deformation events that occurred in southern Mexico from Maastrichtian to Miocene time. We identify different groups of structures representing three successive deformation events, based on the geometry, age, and kinematics of tectonic structures. Deformation migrated from west to east. The first event, corresponding to the Laramide orogeny, occurred during Late Cretaceous time in the Guerrero-Morelos Platform and ended in the middle Eocene in the east within the Veracruz basin. The Oaxacan fault system, which bounds the Acatlan-Oaxacan block to the east, records

Laramide shortening. From six structural sections, we interpret the juxtaposition of the Oaxacan complex against the mylonite belt of the Sierra de Juárez, with subsequent uplift of the eastern border of the Oaxacan complex and, finally, the gravitational over-riding of the sedimentary cover in a radial centripetal arrangement. The second event produced strike-slip faulting during NE-SW horizontal shortening from Eocene to Oligocene time. The third event produced normal and strike-slip faults, indicating NE-SW horizontal extension during Oligocene-Miocene time. Major structures produced during these three deformation events are roughly distributed in an arcuate pattern bounding the block formed by the Acatlan and Oaxacan complexes. Based on this pattern and the relatively less deformed Mesozoic rocks within the Acatlan-Oaxacan block, we interpret that most of the deformation resulted from the impingement of this block on thinner crustal domains adjoining the block.

Keywords: southern Mexico, Laramide orogeny, Oaxacan shear zone, strike-slip faulting.

INTRODUCTION

The Cenozoic evolution of southern Mexico involves the movement of the Farallon, North America, and Cocos plates (Engebretson et al.,

1985). Although the relative motion of the tectonic plates is well known (e.g., DeMets and Stein, 1990; DeMets et al., 1990), their associated deformation within the continent has not been well understood. Only the Laramide orogeny has been recognized as the cause of the contractile structures (De Cerna et al., 1980). The deformation events responsible for post-Laramide strike-slip and normal faults have not been inferred. The details about the migration, kinematics, and intensity of deformation of these events remain unknown.

This paper describes the structural features located in the eastern part of the Sierra Madre del Sur, grouped by ages. The knowledge of the geometry and kinematics of the groups of structures is necessary to enhance the understanding of the relationship between the subduction and the continental deformation in southern Mexico.

The basement of southern Mexico consists of metamorphic complexes with ages spanning from Proterozoic to Cretaceous that form a mosaic of blocks bounded by large faults. Those blocks contain a wide diversity of rocks and structures. The younger structures form a group with folds of reverse transport direction or refolded, strike-slip faults, which are left lateral regardless of their orientation, groups of structures with incompatible kinematics superposed in the same zone, and reactivated structures.

Knowledge of the distribution and characteristics of Cenozoic rocks and tectonic struc-

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