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# Early Mesozoic Southern Mexico–Amazonian connection based on U–Pb ages from detrital zircons: The La Mora Paleo-River in the Mixteca Terrane and its paleogeographic and tectonic implications

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ABSTRACT

The La Mora Formation is the oldest Mesozoic floodplain succession in the Mixteca Terrane of Southern Mexico. The presence of Amazonian detrital zircons in the La Mora Formation and in the overlying volcanic Diquiyú Unit indicates a major fluvial system that drained the Mixteca Terrane. The La Mora Paleo-River crossed the Oaxaquia microcontinent and the Mixteca Terrane prior to the breakup of Pangea, during Late Triassic–Early Jurassic time, when the Acatlán–Oaxaquia block was part of the northwestern portion of the Amazonian craton. Detrital zircons in the La Mora Formation have ages between 3307 ± 31 and 210 ± 12 Ma, which suggest that they originated in Amazonia and Southern Mexico: 33.2% of the detrital zircons have ages that are found only in Amazonian sources; whereas 66.7% of the zircons may be associated with either the Amazonian craton, the Andean Basement, or Southern Mexico. We propose that the La Mora fluvial system drained the Amazon basin in a westward direction, with its mouth in central Pangea, and that it most likely fed the Tolimán submarine fan. The inferred location of the Acatlán–Oaxaquia tectonic block at the time of the La Mora fluvial system implies that the basement of Southern Mexico experienced a right lateral displacement of at least 2300 km with respect to South America during the Mesozoic.



## 1. Introduction

The Mixteca Terrane of Southern Mexico had an enigmatic history in the Early Mesozoic. The earliest Mesozoic geological record previously reported refers to a clastic continental succession of the Middle Jurassic (Morán-Zenteno et al., 1993; Campos-Madrigal et al., 2013). The content of the Triassic detrital zircons in the La Mora Formation exposed in the Ayuquila Basin located northwest of Huajuapan allows two inferences to be made (Silva-Romo et al., 2011): A) the continental record in the Mixteca Terrane extends back in time prior to the breakup of Pangea; B) the Mixteca Terrane was probably drained by the La Mora Paleo-River, whose floodplain facies are described in Section 2.1. During the Late Triassic, the northwestern sector of Pangea was drained by large fluvial systems, such as the Lena Paleo-River, the Taymir Paleo-River, and the Trans-Laurentian Paleo-River, that have been identified on the basis of detrital zircon analyses (Miller et al., 2013) (Fig. 1). The largest fluvial systems of the Late Triassic, with drainage towards the Paleo-Pacific, have been identified in the central sector of the western margin of Pangea (Fig. 2). For example, a river–estuarine system represented by the Barranca and Antimonio formations flowed in the region of Sonora (González-León et al., 2009), and probably drained the Laurentian lands. The Alamar fluvial system identified in central Mexico (Dickinson and Gehrels, 2009; Barboza-Gudiño et al., 2010) likely fed the Potosí submarine fan (Silva-Romo, 1993; Centeno-García and Silva Romo, 1997; Silva-Romo et al., 2000; Centeno-García, 2005). According to Barboza-Gudiño et al. (2010), the Alamar fluvial system drained landmasses such as the Grenvillian Oaxaquia microcontinent, and Pan-African landmasses such as the Yucatán block and southeastern Texas. The Alamar Paleo-River formed within the framework of the crustal extension that resulted from the fragmentation of Pangea and the formation of the Gulf of Mexico (Barboza-Gudiño et al., 2010).

Based on the analysis of detrital zircons contained in siliciclastic units, the stratigraphic knowledge and paleogeographic affinity for Central and Southern Mexico have been refined. For example, in the Chilar Complex exposed in Central Mexico, an age associated with the Late Triassic has been recognized (Dávila-Alcocer et al., 2009), and Proterozoic detrital zircons that likely originated from the Río Negro-Juruena

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