



Bahía de Banderas, Mexico: Morphology, Magnetic Anomalies and Shallow Structure

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Abstract—The Bahía de Banderas lies within a tectonically complex area at the northern end of the Middle America Trench. The structure, morphology, subsurface geology and tectonic history of the bay are essential for unraveling the complex tectonic processes occurring in this area. With this focus, marine geophysical data (multi-beam bathymetry, high resolution seismic reflection and total field magnetic data) were collected within the bay and adjacent areas during four campaigns aboard the B.O. EL PUMA conducted in 2006 and 2009. These data image the detailed morphology of, and sedimentation patterns within, the Banderas Canyon (a prominent submarine canyon situated on the south side of the bay) as well as the shallow subsurface structure of the northern part of the bay and the submarine Marietas Ridge, which bounds the bay to the west. We find that the Marietas Ridge is presently a transtensional feature; the course of the Banderas Canyon is controlled by extensive turbidite fan sedimentation in its eastern extremity and by structural lineaments to the west; the canyon floor is filled by sediments and exhibits almost no evidence for recent tectonic movements; the southern canyon wall is quite steep and a few sediments are deposited as submarine fans at the base of the southern wall; and extensive turbidite fans form the lower part of the northern canyon wall, producing a gently sloping lower northern wall. We find no evidence for a regional east–west striking lineament between the bay and the Middle America Trench, which casts doubts on the previous assertion that the Banderas Canyon is unequivocally related to the presence of a regional half-graben. Finally, a N71°E oriented normal fault offsets the seafloor reflector by 15 m within the central part of the bay, suggesting that the bay is currently being subjected to NNW–SSE extension.

Key words: Bahía de Banderas, Banderas Canyon, marine geophysics, Canyon morphology, subsurface structure, multi-beam bathymetry.

1. Introduction

The Bahía de Banderas is a broad, tectonically active, coastal embayment located on the Pacific margin of Mexico offshore of Puerto Vallarta, Jalisco (Fig. 1). Geologically, the bay is important because it is the offshore extension of the tectonically active Rio Ameca Rift (e.g., Johnson and Harrison 1989, 1990; Núñez-Cornú et al. 2000, 2002; Arzate et al. 2006), which has been proposed to be the northern boundary of the Jalisco Block (e.g., Johnson and Harrison 1989); a small crustal block which may be in the process of slowly rifting away from the rest of North America (Luhr et al. 1985; Bandy and Pardo 1994; Selvans et al. 2011).

Given its tectonic importance, surprisingly few detailed marine geological and geophysical studies have been carried out within the bay and in the offshore area between the bay and the Middle America Trench (MAT). Existing studies include (1) several cursory bathymetric surveys using conventional wide-beam echo-sounders and satellite altimetry data (Fisher 1961; Dauphin and Ness 1991; Alvarez 2007) and a bathymetry map (Núñez-Cornú et al. 2016) constructed from multibeam data collected during the CORTES 96 and TsuJal projects (Dañobeitia et al. 1997; Córdoba et al. 2014), (2) geological and geochemical studies related to observations of present day submarine hydrothermal activity within the bay (Núñez-Cornú et al. 2000; Taran et al. 2002), and one cursory total field magnetic survey (Alvarez et al. 2010). In addition to these studies, several earthquake studies have been conducted in the area of the Bahía de Banderas (e.g., Núñez-Cornú et al. 2002; Rutz López 2007; Núñez-Cornú 2011; Rutz López et al. 2013) and presently the bay is covered by a local seismic network (Red Sísmica y Acelerométrica Telemétrica de Jalisco, RESAJ) (Núñez-Cornú et al. 2011) operated by the Universidad de Guadalajara,

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