QUATERNARY FAULTING ALONG THE CARIBBEAN-NORTH AMERICAN PLATE BOUNDARY IN CENTRAL AMERICA[1]

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INTRODUCTION

The transcurrent fault zones that cross Guatemala are generally regarded as the landward extensions of the Cayman Trough (Hess and Maxwell, 1953; Donnelly et al., 1968) (see inset, Figure 1). Infrequent, moderate, shallow focus earthquakes that range in magnitude from approximately 4.0 to 6.0 occur along the Cayman Trough. These earthquakes have focal plane solutions that indicate left-slip motion (Molnar and Sykes, 1969). Holcombe et al. (1973) show that earthquake epicenters located between the mid-Cayman spreading center and the Central American mainland are restricted to the south wall of the Cayman Trough. A bathymetric survey along the western end of the Cayman Trough (Banks and Richards, 1969) indicates that both the Motagua and Chixoy-Polochic fault zones represent the landward continuation of the southern escarpment (wall) of the trough (Figure 1). The relationship between the Jocotan-Chamelecon fault zone and the Cayman Trough is less clear.

Detailed geologic mapping along the Motagua fault zone prior to (Schwartz, 1976a) and after the 4 February 1976 Guatemala earthquake (Richter magnitude 7.5), plus aerial and surface reconnaissance and photointerpretation along the Chixoy-Polochic and Jocotan-Chamelecon fault zones provide new data on Quaternary faulting along these transcurrent fault zones. This paper presents the preliminary results of an ongoing investigation of these faults and discusses their implications regarding the distribution of strain, slip rates, and earthquake recurrence intervals along this portion of the Caribbean-North American plate boundary.

MOTAGUA FAULT ZONE

Previous Work

The Motagua fault zone extends at least 300 km from Chichicastenango to the Caribbean coast (Figure 1). This fault zone is a suture between small crustal plates (Schwartz and Newcomb, 1973) that formed as a result of plate convergence and closure of a small ocean basin in the late Cretaceous (Lawrence, 1976; Donnelly, 1977). The time of the onset of subsequent strike-slip faulting along the Motagua fault zone is not well-constrained, but appears to be between Eocene and Miocene time (Schwartz, 1976a). Faulting on the north side of the fault zone is characterized by south-dipping thrust and high-angle reverse faults, and possible strike-slip faults, which separate generally continuous and linear belts of cataclastic gneiss, serpentinite, and Tertiary continental clastic rocks (Schwartz, 1976b). Quaternary displacements have been looked for along the faults on the north side of the zone; however, none have been observed.

Quaternary Faulting

The southern boundary of the Motagua fault zone is defined by an active left-slip fault, the Motagua fault[a], that ruptured and produced the

[a] The fault that ruptured on 4 February 1976 has been referred to by two names. It was named the "Cabanas fault" by Eric Bosc on a preliminary geologic map of the San Augustin Acasaquastlan quadrangle