

PRELIMINARY SUMMARY OF FIELD OBSERVATIONS (6 FEB--12 FEB, 1976) FOR EERI:

SURFACE FAULTING

GUATEMALA EARTHQUAKE

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Sequence of Reconnaissance

The ground cracks were located during the initial aerial reconnaissance flight. The flight included Schwartz (EERI), Plafker (USGS), and Bonis (Instituto Geografico Nacional of Guatemala). Previous knowledge of the location of the active fault trace in the Motagua fault zone (Schwartz, in preparation) made it possible to immediately locate the surface rupture. The ground cracks were traced for 140Km but could not be traced west of the town of Churrancho or east as far as Los Amates during that flight. On Monday, 9 February, a helicopter flight that included Schwartz (EERI), Plafker (USGS), and Bonis (IGN) was taken in order to measure fault displacement at 10 localities between El Progreso and Los Amates. The length of surface cracking was extended to Los Amates but could not be traced, at that time, east into the active floodplain of the Motagua River. On Wednesday, 11 February, a reconnaissance flight containing Schwartz, Rice, and Wosser (all EERI) located the ground cracks near the hamlet of La Colcha, 35Km east of Los Amates. On the same day Plafker was able to extend the cracks west from Churrancho to the town of Mixco Viejo.

LOCATION AND MAGNITUDE

On Wednesday, 4 February 1976, the National Earthquake Information Service (NEIS), at Boulder, Colorado, located the epicenter at 15.1°N, 89.3°W, placing it near the town of Gualan, in the Motagua valley, 140Km northeast of Guatemala City. On 5 February 1976 the location was given as 15.3°N, 89.1°W, thereby shifting the epicenter 30Km east to the town of Los Amates. The location is now given as 15.27°N, 89.25°W, halfway between Gualan and Los Amates, 160Km northeast of Guatemala City. The NEIS has determined a Richter magnitude of 7.5 for the earthquake, and Bruce Bolt of U.C. Berkeley has estimated a magnitude of 8.0. The focal depth of the earthquake is shallow and the NEIS used a depth of 5Km to calculate the epicentral location.

TECTONIC SETTING

The earthquake and associated surface faulting occurred along the Motagua fault zone. The Motagua fault zone is an old structural feature that may have formed originally by plate collision in the lower Cretaceous period (110 million years). Transcurrent movement appears to have been initiated in the Tertiary (Eocene--55 million years) along with the opening of the Cayman trough. Both the Motagua fault zone and the Chixoy-Polochic fault zone to the north represent the landward extension of the Cayman trough, and they comprise the active plate boundary between the North American and Caribbean plates.

Surface Fault Characteristics--Motagua Fault Zone

Observations on surface faulting are preliminary. The surface faulting associated with the earthquake is characterized by an almost continuous 240Km long zone of right-stepping en echelon cracks. The faulting extends in a gentle arc from the vicinity of Mixco Viejo, located northwest of Guatemala City, to the hamlet of Los Animas, some 220Km northeast of Guatemala City.

The closest approach of the fault to Guatemala City is 23km to the north. The main crack zone is generally uniform in width, varying from 2m to 5m, although at some localities the zone may be as narrow as 1.5m or as wide as 9m. An apparent minimum displacement of 40cm of left slip was measured in the town of Gulluser near the epicentral area, and Plafker reports 1.4m of left slip in the town of Churranchito north of Guatemala City. Measurements of 70cm to 1m of left slip are common, and there appears to be a general increase in the amount of displacement westward from the epicentral toward Guatemala City. Displacements were measured on offset center lines of roads, fence lines, plow furrows, and railroad tracks. Mole tracks and compressional ramps characterize the fault throughout most of its length. A vertical component of slip is absent although Plafker reported a 20cm scarp on the eastern extension of the fault.

A second fault trace was located near El Progreso, .5km south of the main surface rupture. This break has a minimum length of 3km and appears as a 3.5m-wide zone of right-stepping en echelon cracks. It also exhibits mole tracks and compressional ramps. Twenty centimeters of left slip were measured along this trace, and the fault flexes the railroad tracks east of El Progreso.

Other Surface Faults

The U.S. Geological Survey has also reported surface faulting along the Mixco fault, a N to NE trending structure west of Guatemala City. This fault was not observed by EERI team members but was reported to have 10cm to 16cm vertical displacement down to the east and 4cm of right lateral slip.

GROUND FAILURE PHENOMENA

Landsliding was the major type of ground failure observed. The sliding was very prominent to the north, northeast, and northwest of Guatemala City. Slides occurred mainly in pumice deposits of Pleistocene age. Ground reconnaissance in Guatemala City indicated that many, but not all, slides resulted from failure along previously existing sets of joints and fractures. This produced sliding into the steep-sided gullies known as barrancas.

Ground cracks with no apparent relationship to faulting or sliding were observed at some localities in the northwestern part of Guatemala City. These may have resulted from settlement or extension. Good roadcuts clearly demonstrated that many old fractures and joints had re-opened and then closed as a result of the shaking.

No direct evidence of liquefaction was observed in Guatemala City. However, sand boils were reported in the vicinity of Quirigua where the surface cracks are projected into the broad alluvial floodplain of the Motagua River.