EARTHQUAKE-INDUCED LANDSLIDES FROM THE FEBRUARY 4, 1976 GUATEMALA EARTHQUAKE AND THEIR IMPLICATIONS FOR LANDSLIDE HAZARD REDUCTION

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INTRODUCTION

The M. 7.5 Guatemala earthquake of February 4, 1976, generated at least 10,000 landslides. These landslides caused hundreds of fatalities as well as extensive property damage. This investigation was undertaken to map the earthquake-induced landslides, to classify the different types of landslides that occurred, to attempt to determine the mechanisms involved in their formation, and to lend technical assistance to the Guatemalan government in areas where landslide hazards remained. Another objective was to attempt to correlate the landslide distribution with geologic and geophysical parameters in order to help delineate areas of high susceptibility to earthquake-induced landslides in the future.

The epicenter of the main event was located on the Motagua fault zone near Los Amates (fig. 1), about 157 km northeast of Guatemala City (Person and others, 1976). This earthquake triggered landslides over an area of approximately 16,000 km^2 extending from near Quebradas on the east to Quezaltenango on the west and from near Lake Amatitlan on the south to near Sacapulas on the north (fig. 1). This zone is only a few kilometers wide in the epicentral area, but expands to the southwest, reaching a width of about 80 km in the highlands. There were relatively few landslides near the epicenter and along the Motagua valley northeast of Guatemala City. The greatest concentration of landslides was in several parts of the western highlands, principally along the Rios Pixcaya, Motagua, Las Vacas, and Los Chocoyos (figs. 1 and 2). The shape of the zone of earthquake-triggered landslides is similar in form to the pattern of isoseismals of shaking intensity prepared by Espinosa and others (1976).

The predominant types of landslides occurring in this earthquake were rockfalls and debris slides of less than 15,000 m^3 in volume. In some areas, however, individual landslides coalesced so extensively that there was almost continuous failure, with as much as 80 percent of the slopes denuded (figs. 3 and 4). There were also 11 large landslides with volumes of over 100,000 m^3 (fig. 2, table 1). Several of these large landslides blocked stream drainages, and posed an additional hazard from flooding.

The landslides were almost exclusively located on steep canyon slopes that are pervasive throughout the Guatemalan highlands. Therefore, the

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