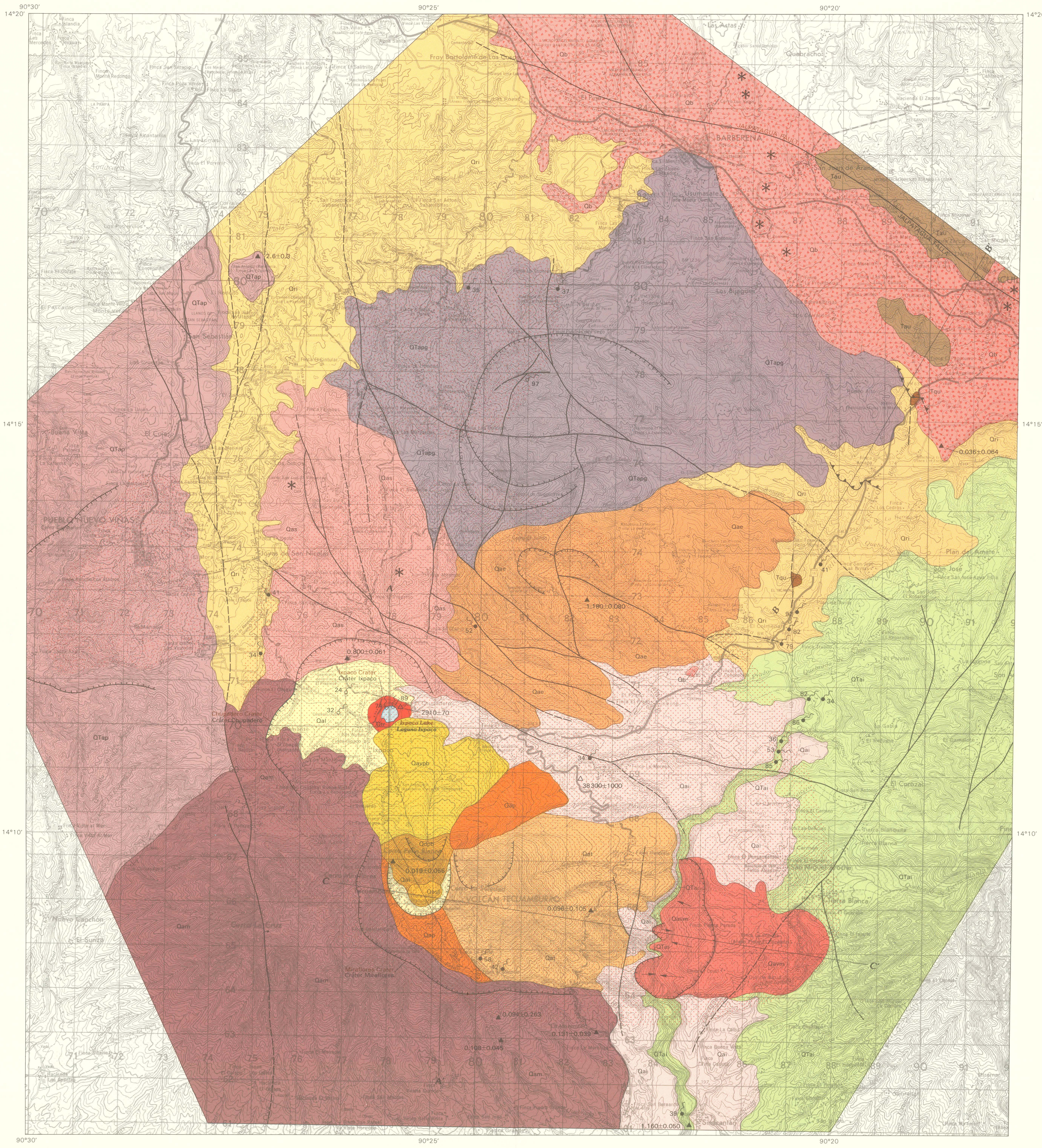

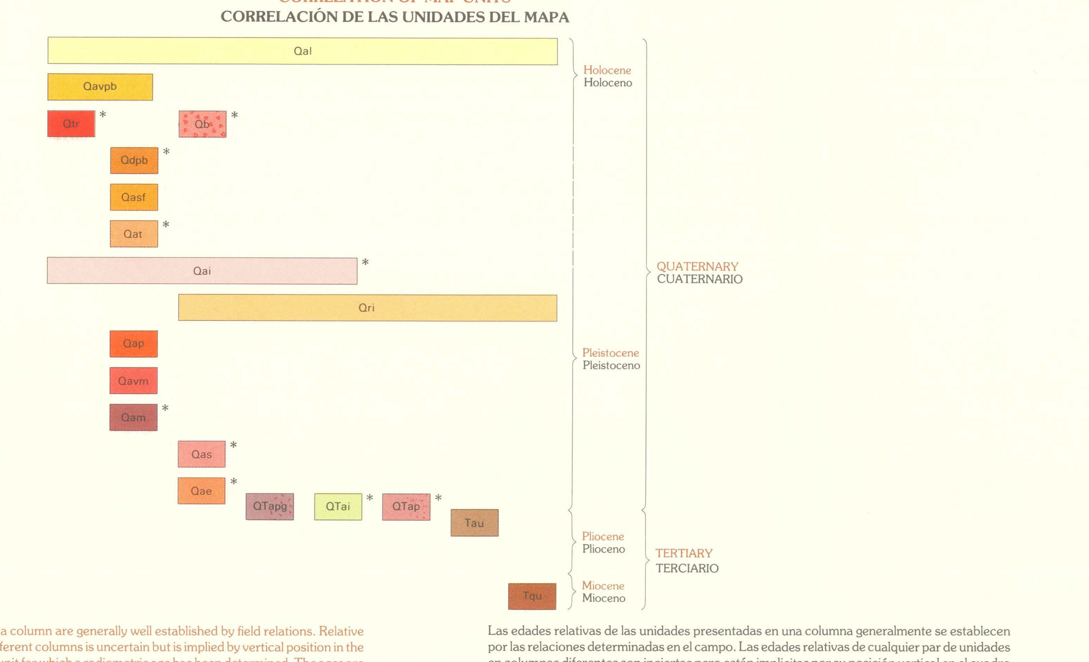

GENERAL GEOLOGY

Tecuamburro Volcano is within the west-tapering tail of the Caribbean lithospheric plate (fig. 1). The south boundary of the plate in this area is defined by the Middle America Trench and related northeast-dipping subduction zone, above which is a chain of volcanoes that includes Tecuamburro. The north boundary is defined by the Polochic and Motagua system of left-lateral transform faults. This fault system and the trench apparently intersect offshore about 300 km west of the Mexico-Guatemala border.

A system of roughly north-trending grabens is actively deforming the west-tapering tail of the Caribbean Plate (fig. 1; Burkhart and Self, 1985). Such structures are readily identifiable at least as far east as the Honduran depression, which is a series of en echelon grabens that essentially bisects that country. The westernmost examples of the system of grabens probably are buried beneath volcanic rocks accumulating rapidly along the active volcanic chain in Guatemala. Graben formation, which reflects east-west crustal extension, presumably is a result of plate interactions, as the Caribbean plate moves east-northeast relative to adjacent parts of the North American and Cocos plates (Burkhart and Self, 1985). Alternatively, Carr and others (1982) proposed that graben formation, expressed as segmentation of the volcanic chain along north-trending normal faults, is controlled by mirror-image segmentation of the underlying subducting Pacific-plate slab, above which the grabens and volcanoes are growing; boundaries between the inferred subduction-slab segments are thought to propagate upward and form faults in the overlying lithosphere.

Whatever the cause of graben formation, Tecuamburro Volcano lies within a north-trending graben (fig. 1*B*) that is about 20 km wide. This graben terminates to the north against the west-northwest-trending strike-slip Jalpatagua fault. Lateral faults defining the graben are buried by Quaternary sediments to the south, where evidence of graben structure disappears beneath the Pacific coastal plain. Faults along the north and central parts of the west side of the graben separate the andesite of Pueblo Nuevo Vinas (QTap) from a fault-zone valley partly filled with a younger silicic ignimbrite (Qri). Further south these faults offset part of the stratovolcano complex of Miraflores (Qam), which is ancestral to Tecuamburro Volcano on the basis of near colocation of vents. Thus, at least some activity on these graben faults has occurred since about 0.1 Ma, the approximate age of Miraflores (table 1); the relatively younger silicic ignimbrite (Qri) also appears to be faulted, as determined from study of aerial photographs, although we found no direct evidence of such offset in the field.

The east boundary of Tecuamburro graben is expressed as a north-trending zone of faults [illegible]

Some of the youngest craters are associated with lava domes that grew within the collapse crater (Miraflores) of unit Qam. These include a constructional closed depression that marks the vent of Tecuamburro Volcano, as well as features that apparently formed by local collapses originating from the onlapping domes.

Tecuamburro Volcano, which has no record of historic activity, rises about 800 m above its surroundings and may be considered a relatively small stratovolcano or a large dome of mixed endogenous and exogenous origin. Its upper flanks are mostly lava flows and its lower flanks mostly laharic breccias. The nearly uneroded constructional form of Tecuamburro Volcano suggested a Pleistocene age to geologists who studied the area (for example, Williams and others, 1964; Carr, 1984; Reynolds, 1987). Radiometric ages completed as part of our study indicate that Tecuamburro and onlapping domes are no older than late Pleistocene and may be as young as Holocene.

RADIOMETRIC AGES

Stratigraphic succession indicated by field relations is summarized in the accompanying correlation chart. Some age assignments are equivocal, and some adjacent vent areas may have had overlapping periods of activity; but broadly speaking, vents and associated eruptive products within the graben are progressively younger toward the south. The volcanic complexes that flank and partly occupy the graben to the east (unit QTai) and west (unit QTap) are interpreted to predate most if not all of the rocks that vented within the graben, although some overlap in ages is likely.

Radiometric ages (table 1) are generally consistent with field-defined stratigraphy. The oldest ages, 2.6±0.3 Ma, 1.16±0.048 Ma, 1.18±0.080 Ma, 0.821±0.118 and 0.800±0.[illegible] were determined for rocks from the flanking unit QTai and unit QTap volcanic complexes [illegible] the part of the graben north of Tecuamburro Volcano. In the south-central part of the graben, the age of the stratovolcano (unit Qam) that is ancestral to Tecuamburro is about 0.1 Ma. [illegible] volcano subsequently was modified by sector collapse mentioned above, which was followed by the emplacement of two-pyroxene pyroclastic deposits (unit Qai) at 38.3±1.0 ka, [illegible] followed by the growth of Tecuamburro Volcano and onlapping domes within the crater formed by sector collapse. Tecuamburro Volcano and onlapping domes are too young to yield [illegible] K-Ar ages, but their calculated ages (table 1) are consistent (within associated uncertainties) with a less-than-38.3-ka constraint provided by the ^{14}C age of a log in the underlying unit [illegible]. Conservative interpretation suggests that all of the rocks less than or equal to 0.1 Ma [illegible]

GEOTHERMAL FEATURES

Ixpaco crater contains a lake with a pH of about 3. Fumaroles and boiling mud pots are present locally around the shore of the crater lake, and foci of vigorous upwelling of thermal fluids are visible on the lake surface. Many hot springs and fumaroles are located within a few kilometers of Ixpaco, especially on the floor of Chupadero crater, on the flanks of Tecuamburro Volcano, and along Rio Los Esclavos.

Gas and hot-water geothermometry reported by Goff and others (1989) suggests that subsurface temperatures range from about 150°C to 300°C, presumably within about 2 to 3 km of the surface. These chemical-geothermometer temperatures generally increase toward the Ixpaco-Tecuamburro Volcano area, which is evidence that an upper-crustal heat source is centered there.

[illegible]

DESCRIPTION OF MAP UNITS

[illegible]

DESCRIPCION DE LAS UNIDADES DEL MAPA

[illegible]

GEOLOGIA GENERAL

[illegible]

EDADES RADIOMÉTRICAS

[illegible]

PETROLOGY AND CHEMISTRY

[illegible]

PETROLOGÍA Y QUÍMICA

[illegible]

ACKNOWLEDGMENTS

[illegible]

RECONOCIMIENTOS

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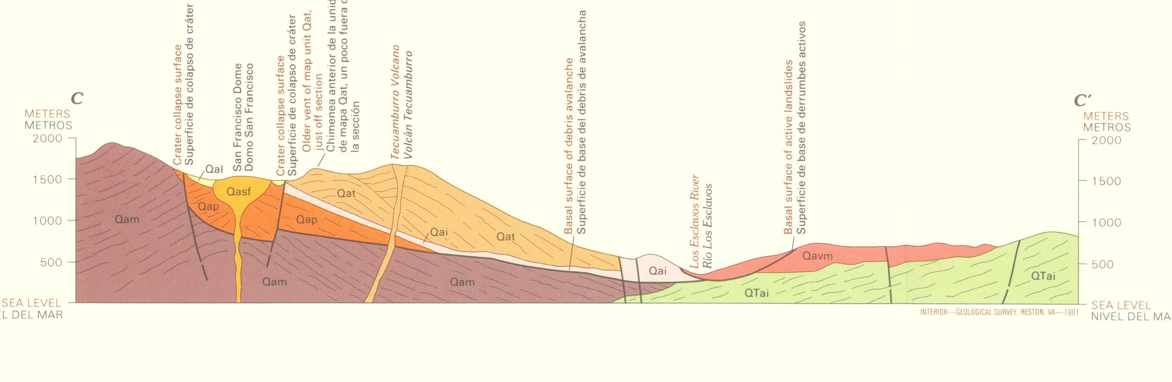

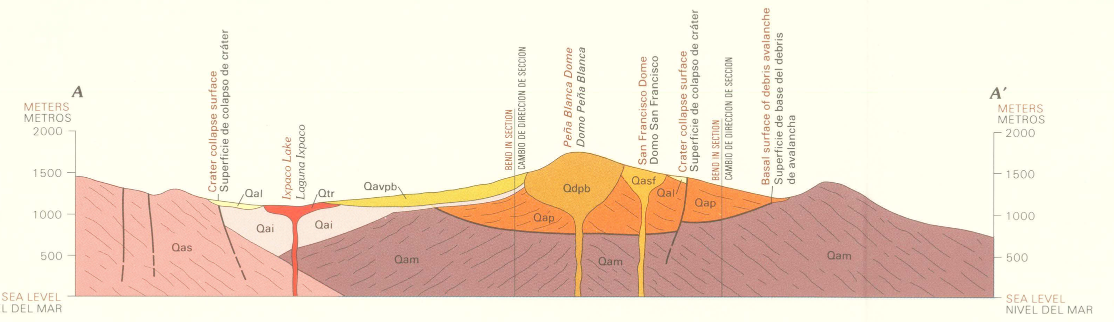

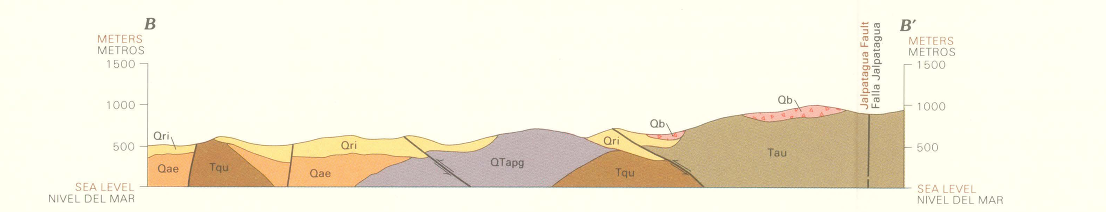

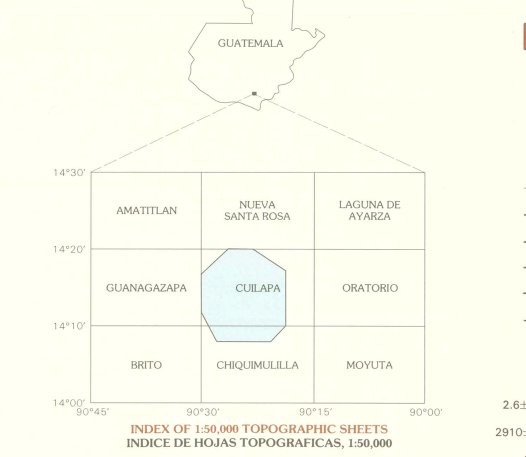

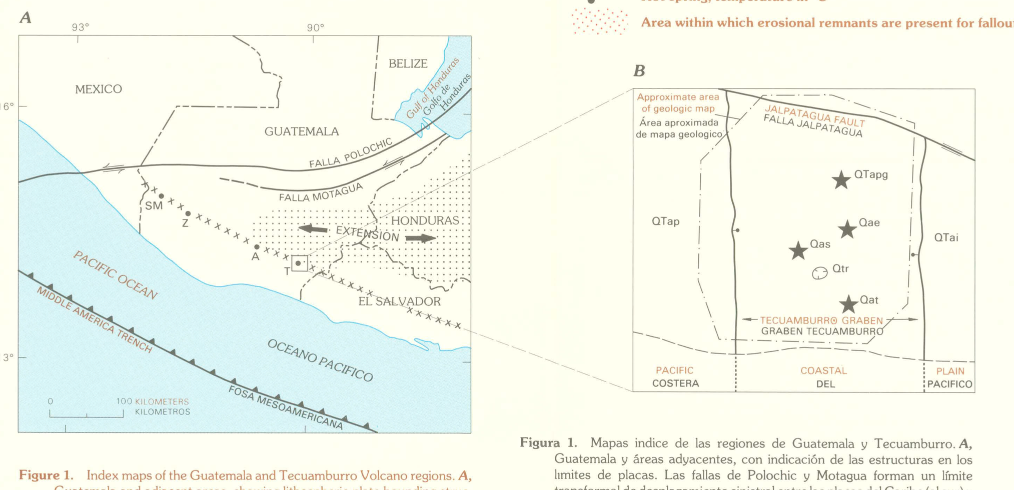

Figure 1. [illegible]

EXPLANATION

EXPLICACION

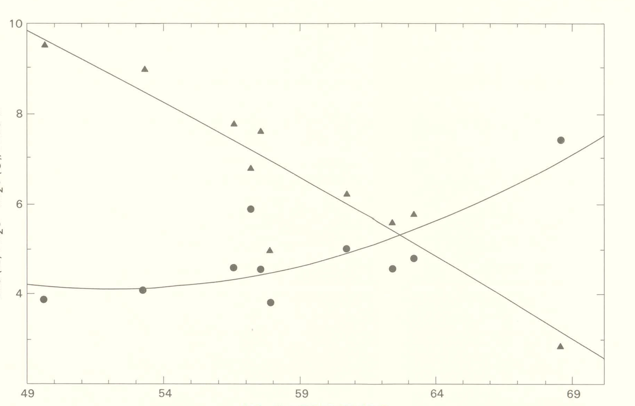

Figure 2. [illegible]

Table 1. [illegible]

Table 2. [illegible]

GEOLOGIC MAP OF TECUAMBURRO VOLCANO AND SURROUNDING AREA, GUATEMALA

By

W.A. Duffield[1], G.H. Heiken[2], K.H. Wohletz[2], L.W. Maassen[2], Gabriel Dengo[3], and Oscar Pinzón[4]

1991

MAPA GEOLÓGICO DEL VOLCÁN TECUAMBURRO Y ÁREA VECINA, GUATEMALA

Por

W.A. Duffield[1], G.H. Heiken[2], K.H. Wohletz[2], L.W. Maassen[2], Gabriel Dengo[3], y Oscar Pinzón[4]

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