The Guayape-Papalutla fault system: A continuous Cretaceous structure from southern Mexico to the Chortís block? Tectonic implications: COMMENT and REPLY

COMMENT: doi: 10.1130/G24949C.1

J. Duncan Keppie
Departamento de Geología Regional, Instituto de Geología, Universidad Nacional Autónoma de México, 04510 Mexico D.F., Mexico

The use of piercing points in making paleogeographic reconstructions greatly adds to their accuracy beyond that available using other techniques. Thus, Silva-Romo’s (2008) proposal that the Papalutla fault in southern Mexico and the Guayape fault in Honduras provide piercing points to constrain a Late Cretaceous reconstruction (Fig. 1) of the allochthonous Chortís block is a worthwhile objective. However, such a correlation raises more questions than it solves.

QUESTIONS
1. What Euler pole was used? Silva-Romo (2008, p. 75) states that it is a “nonrotational hypothesis” and that the Chortís block was merely moved westwards. This implies that the Euler pole lay 90° away to the south, near the coast of Antarctica. This contradicts the Cenozoic Euler pole for the Caribbean plate derived by both Pindell et al. (1988) and Ross and Scocese (1988), which lies near Santiago (Chile), i.e. ~50° to the SSE of the Cayman Trough. This Euler pole is consistent with the southward concavity of the Cayman Trough transform faults.
2. How is the Chortís block transported through the Gulf of Tehuantepec, which contains an undeformed Late Cretaceous–Holocene sedimentary sequence that straddles the Motagua fault zone, generally considered to be the boundary between the Chortís and Maya blocks (Keppie and Morán-Zenteno, 2005)?
3. Where is the Nicaragua Rise in the Late Cretaceous reconstruction? It is generally considered to be part of the Chortís block (Rogers et al., 2007, and references therein), which poses a geometric problem because it would overlap southern Mexico in Silva-Romo’s (2008) reconstruction.
4. Why does Silva-Romo use a WNW-trending boundary for the northern margin of the Chortís block, when no such feature has been identified? The northern boundary of the Chortís block, which presently lies on the Caribbean plate, is generally located along the ENEnorthwestwards, would intersect the Cayman Trough at 80°W, not 85°W as shown by Silva-Romo.

PROBLEMATIC STATEMENTS
Silva-Romo makes the following problematic statements:
1. “The Papalutla fault represents the eastern limit of the Guerrero-Morelos Platform” (p. 76). This contradicts the Cenozoic Euler pole derived by both Pindell et al. (1988) and Ross and Scocese (1988), which lies near Santiago (Chile), i.e. ~50° to the SSE of the Cayman Trough. At this location, the Papalutla fault deviates from its sinistral strike slip” (p. 76). This Euler pole is consistent with the southward concavity of the Cayman Trough transform faults.
2. “Basement rocks of the Central Chortís terrane are similar to those of the Acatlán Complex” (p. 76). This contradicts Rogers et al. (2007) who state that the Central Chortís terrane represents the core of the Chortís superterrace (including the Northern, Central and Eastern Chortís terranes), which is underlain by ~1 Ga basement.
3. “Northeast of Papalutla town, the Papalutla fault displays left lateral slip” (p. 76). This contradicts Rogers et al. (2007) who state that the Central Chortís terrane represents the core of the Chortís superterrace (including the Northern, Central and Eastern Chortís terranes), which is underlain by ~1 Ga basement.

FUTURE RECONSTRUCTIONS
Any future reconstructions must take into account the following:
1. The Euler pole and displacement across the Cayman Trough since 49 Ma (Leroy et al., 2000).
2. The undeformed, untruncated nature of the latest Cretaceous sediments in the Gulf of Tehuantepec that straddle the Motagua Fault Zone (Keppie and Morán-Zenteno, 2005).
3. Removal of an ~210-km-wide Eocene-Oligocene forearc from the southern coast of Mexico during the Upper Oligocene and Lower Miocene (Keppie et al., 2007).

© 2008 Geological Society of America. For permission to copy, contact Copyright Permissions, GSA, or editing@geosociety.org.
REFERENCES CITED


REPLY: doi: 10.1130/G25152Y.1

G. Silva-Romo
Departamento de Geología, Facultad de Ingeniería, Universidad Nacional Autónoma de México, 04510 México D.F., México

In Figure 1 of his Comment (Keppie, 2008), Keppie confused the Papalutla fault with the Teloloapan fault in his Comment’s Figure. Here (in my Figure 1), I correctly identify the Papalutla fault in south Mexico, which supports my original hypothesis (Silva-Romo, 2008).

ANSWERS
Keppie presented a list of questions, which I answer here.

1. My hypothesis assumes a Caribbean plate stationary relative to the mantle after Chron 18 at 38.4 Ma (Müller et al., 1999).

2. The ancestral Acapulco trench–Motagua transform fault was displaced ~70 km by the Chiapas massif southeast displacement, during Neogene convergence of the North America and South America plates after the Chortís block departure (Silva-Romo and Mendoza-Rosas, 2007). Thereafter, the sedimentary sequence of the Gulf of Tehuantepec was northward from the fault zone.

3. The structural characteristics of the Colon fold belt of Honduras (Rogers et al., 2007a) are congruent with a left strike-slip fault system, which might have displaced the Nicaraguan Rise from a southwest location during Cenozoic time.

CLARIFYING STATEMENTS
In response to Keppie’s “Problematical Statements” (1) and (3): Just as the tectonostratigraphic division does, the Papalutla fault may cut the Mixteca terrane (Campa and Coney, 1983; Keppie, 2004) or be a terrane boundary (Sedlock et al., 1993). When comparing my model with the correlation between southern Mexico and the Chortís block (Rogers et al., 2007a), I used the tectonostratigraphic map of Campa and Coney (1983).

Here, I claim that Papalutla fault (1) is a major structure that controlled Cretaceous sedimentation in the Guerreró-Morelos platform, which has a different Cretaceous stratigraphic column than the Mixteca terrane (Hernández-Romano, 1999); (2) its main Laramide kinematics were left-slip; (3) its inverse thrust segment near Papalutla town is a right bend in a left-slip fault; (4) its northeast projection is hidden by the eastern sector of the Transmexican volcanic belt (Fig. 1A)—on this sector, the Papalutla fault acted as a tectonic front because the Cenozoic complex Veracruz Basin (Jannette et al., 2003).

In response to Statement 2: Laramide reconstruction by Keppie (2004) invokes a Oaxaca terrane displaced by a major left-slip fault where the Transmexican volcanic belt is presently located (Fig. 1B). I propose the Papalutla fault is that major structure (Fig. 1A). With this tectonic array, an ~1 Gm basement may extend below Guerreró-Morelos platform and may conciliate with central Chortís terrane basement invoked in Keppie’s Comment.

FUTURE RECONSTRUCTIONS
My model allows some rotation of the Chortís block and erosion by subduction after the Chortís block departure, but southern Mexico truncation only by erosion by subduction (Keppie et al., 2007) implies a rate process yet unproven.

REFERENCES CITED


Figure 1. A: Papalutla fault as a major northeast trend structure that accommodates deformation on south Mexico during Cretaceous and Cenozoic time. B: Laramidian reconstruction for south Mexico (Keppie, 2004). GMp—Guerrero-Morelos platform. Terranes: J—Júarez; Ma—Maya; Mx—Mixteca; OX—Oaxaca; SM—Sierra Madre. Overlap volcanic provinces: SMO—Sierra Madre Occidental; TMVB—Transmexican Volcanic Belt.

Downloaded from https://pubs.geoscienceworld.org/gsa/geology/article-pdf/36/1/e172/3535446/0091-7613-36-1-e172.pdf by guest


