March 25, 2007

534 Deike Building
Penn State University
University Park, PA 16802

Kip Hodges, Editor
Tectonics

SUBJECT: REVISIONS #2006TC001949

Dear Dr. Hodges:

Attached is a revised version of the manuscript, " Constraints on Inner Forearc Deformation From Balanced Cross Sections, Fila Costeña Thrust Belt, Costa Rica," authored by Jason Sitchler, Donald Fisher, Thomas Gardner, and Marino Protti.

The study describes the inner forearc response to subduction of the Cocos Ridge in southern Costa Rica, with the overall outcome that 1) an inner forearc thrust belt is accommodating nearly 50% of the total plate convergence rate, 2) deformation in the inner forearc is concentrated inboard of the Cocos Ridge crest where a culmination is reached by an imbricate stack, 3) the thrust belt is actively propagating to the southeast in coincidence with the stable Panama triple junction, and 4) much of the estimated trench retreat from previous studies can be accounted for by increased plate boundary coupling. Again, this manuscript has not been published previously or submitted elsewhere and there are no related papers currently pending.

The additional comments of the associate editor were helpful. We believe that we have addressed all the comments and that this has resulted in a stronger paper. The following pages include the associate editor evaluations in bold with a subsequent explanation for how each comment was addressed.

We have made all the changes while keeping the length relatively constant. Please let me know if there is anything else I can do.

Sincerely,

Jason Sitchler

Changes to figure order:

Original	This draft
Fig. 1, inset	Fig. 1
Fig. 1	Fig. 2
Fig. 2	Fig. 5 (unmodified)
Fig. 3	Fig. 3
Figs. 4a, 4b	removed
Fig. 5	Fig. 4
Fig. 6	Fig. 6 (unmodified)

Evaluations in bold:

Fig. 4a. Why is this figure necessary? It shows nothing more than Figure 3 except the shaded relief.
Fig. 4b. Is this file necessary or another repeat of the map? It is not referred to much in the text. Please justify it.
Figures 4a and 4b have been removed.

You should include some kind of map or figure inset that shows the many geographic features discussed in the text (such as the Cordillera Talamanca, Sandino Basin of Nicaragua), which do not appear on any of the figures. The Cordillera and the basin are especially important to your arguments (including interpretations of Holocene deformation) and should be adequately described/shown. Many units (Brujo) also are not shown anywhere. Reviewer #1 had requested previously that you show the dual plunge of the Terraba units (the arch). Please comply with these requests.
The inset from the original Figure 1 was removed. A figure of the Central American isthmus including plate boundaries, and the Sandino Basin has been added (new Fig. 1).

Old Fig. 1 (now Fig. 2) has been annotated to include the Cordillera Talamanca.

The Brujo Formation was not mapped in our area and, therefore, does not appear on the map or stratigraphic column. It is discussed in the context of measurements made by Richard Kesel in the 1970's on lines 272-283.

We discuss the dual plunge of the Terraba units and basement arching in the discussion on lines 458-463.

Pages 16-17 (lines 345-354). I do not follow the methods you used to reconstruct the decollement depth and I suspect others won't either. It is crucial to your argument that your method is explained as clearly as possible. You need a sketch showing your method. Reviewer #2 had requested this previously.
We clarified the method for determining the depth to detachment for the thrust belt on lines 356-366. To illustrate this we have included an inset on the cross section (new figure 4, B-B').

Line 378. This cutoff should be clearly marked. I could not find it.
This particular cutoff has been clearly marked "HW cutoff" on the map (Fig. 3) and is referenced on lines 390-391.

Lines 427-437. This should be better emphasized in the data presentation sections.
This information was moved to the data presentation section, "Geologic and Structural Mapping of the Fila Costeña," on lines (330-338).

Lines 438-440 of the discussion: Your interpretation of a steady-state topography is unconvincing and based on no measurements. I recommend removing this aspect of the discussion.
We removed the steady-state topography interpretation from the discussion.

Please plot all fold trends and lineation (slickenline) data mentioned in the text on your map so readers will know where your controls are (requested previously by reviewer #1).
The data collected in our map area were added to figure 3 where possible. We are only able to fit six of the seven slickenline data points and three of the five fold data points on the map in order to prevent overlap. The data points that are not plotted lie at the same location as the slickenline data point near "B" on section line B-B' (Trending NNE, plunging 38º on Fig. 3). These unplotted data are included on lines 373-378 in the text and have similar values as the plotted points.

Please confirm that you have adequately cited the mapping of the Costa Ricans (requested by reviewer #1).
We feel we have adequately cited the mapping of the Costa Ricans. We cite the early work done by *Mora*, (1979), in the introduction and background ("Térraba Trough") on lines 88, 228, 229, and 236. Additionally, we modified lines 86-92 to properly cite previous work and state that we are interested in lateral variations in deformation using balanced cross sections.

Fig. 1. No reference is provided for the plate motions used. Is this DeMets et al.? The GEOMAR data should be referenced here and in the text (line 171) just as you do for the SRTM-3 data.
DeMets, et al., (1990), *Silver, et al.,* (1990), and *Shuanggen, et al.,* (2004) references were added to Fig. 1 (now Fig. 2) caption and to lines 168 and 174 in the text. The last line of the figure caption originally included "Bathymetric data courtesy of GEOMAR," which we feel is a sufficient citation for the offshore dataset.

Fig. 3. The strike-and dip symbols need to be cleaned up. The very thin lines used won't reproduce well and the overlap of text and lines should be eliminated. The unconformities should be clearly marked.
We thickened the strike and dip symbols and added white boxes to prevent text and line overlap. The regional unconformity between the Curré and Paso Real Fms. has been clearly labeled.

Fig. 6. This figure is not used very effectively in the text. Can you improve this?
Figure 6 is now cited on lines 289, 331-338, and 449 in the context of landsliding, maximum shortening, and the number of thrust faults.

Abstract
Line 32. Add "The" before "absence."
Added.

Introduction/discussion
Yáñez & Cembrano (2004, JGR v. 109, B02497) should be referenced in the context of interplate coupling at trenches. This is a landmark paper on the effects of coupling on deformation in forearc regions.
We modified the sentence on lines 42 and 43, "[Erosive margins] are found in conjunction with **<recently>** subducted seamounts and ridges…," and cite *Yáñez and Cembrano*, (2004). We also added a sentence to the discussion on lines 408-411, clearly stating the relevance of this paper on our project.

You should refer to Figure 2 before Figs. 3, 5, or else re-order the figures.
{See "**changes to figure order**" at top.}

Line 157. Delete "dramatic"
Deleted.

Lines 152/205. Spaces after period/between words.
Added.

Line 327. If this is a duplex, where is the roof thrust? Prior to this you describe the belt as a series of imbricate thrusts. Be clear on this point.
We state arguments for an imbricate fan versus a duplex on lines 322-330