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Interactive comment on "Density structure and geometry of the Costa Rican subduction zone from 3-D gravity modeling and local earthquake data" *by* O. H. Lücke and I. G. Arroyo

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The manuscript is well written, well organized and the scientific discussion is well developed. The figures are of great quality and all are necessary. The integration of seismicity with gravity analysis to study the complex geometry of the Costa Rica slab will help to improve the interpretation of a complex convergent margin large studied that still arouses much controversy. I recommend the acceptance of the manuscript after authors have answered some issues. Specific comments In my opinion authors have to answer four main questions that in fact are interrelated 1. The slab geometry proposed in southeastern Costa Rica. It is surprising that after the Cocos Ridge

subducts causing the uplift of the upper plate, then the slab sharply steepens towards the mantle. Considering that have subducted at least 250 km of the Cocos Ridge, it is difficult to explain the steepening of the slab just 50 km from the trench. 2. The gravity model. The change in slab density shown in Figure 4 is not well justified. I strong recommend comparing the results obtained by the authors with that obtained from the wide-angle seismic data in the region (e.g. Sallarès, Stavenhagen, ...). These data can help set the gravity model and therefore to improve the slab geometry proposal. 3. Shallow seismicity under the Talamanca Range. According to the slab geometry and gravity model proposed by the authors, How can you explain the shallow seismicity nucleated under the Talamanca Range? 4. Normal faulting along Cocos Ridge. The lack of bend faulting across the Cocos Ridge does not mean that the ridge is not affected by faulting. According to Ranero and von Huene (2000), once the Cocos Ridge "pass" the trench, it breaks into major normal faults parallel to the ridge axis. How this fits with the explanation given by the authors in reference to the lack of mantle serpentinization through faults and the smallest depth of the 3.15 Mgm-3 zone?

Technical corrections: -pag.1943, line 13: "the" is repeated, delete it. -pag.1944, line 1: The East Pacific Rise (EPR) does not appear in the map of the tectonic setting of the Central American Isthmus (Figure 1). I think that it is an important tectonic element in the region and the authors refer to it several times in the text, so I recommend that it appears on the map. -pag.1944, line 10: Sallarès et al. (2003) proposes a maximum Moho depth of 18.5 km for the Northern Cocos Ridge. Please, change the 21 km. -e.g. pag. 1958 lines 18 and 23. All geographical locations mentioned in the text must be represented. In this case, Uvita and Dulce Gulf should be located in Figure 5 -Figure 1: I recommend that the EPR appears on the map -Figures 4 and 6: In the figure caption must appear the meaning of "C" and "T". It is impossible to read "3.15" in 4b-4d. -Figure 5: I recommend locating the different geographical elements cited in the text, as well as the RSB. It would be helpful to the reader if the authors also located in this figure the profiles presented in Figure 4. It is difficult to read the contours values as well as "Osa P.", and "Coronado Bay" represented in the middle of the seismicity. I recommend

using white instead of black, and localizing the contours values in the seismicity gap

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