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Earth Surface Dynamics Discussions

Interactive comment on "River profile response to normal fault growth and linkage: An example from the Hellenic forearc of south-central Crete, Greece" *by* Sean F. Gallen and Karl W. Wegmann

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This paper investigates river response to uplift along the southern margin of Crete, using well known fluvial geomorphic metrics and previously published data on the rate of uplift and behaviour of recently linked normal faults. The paper draws some interesting conclusions on the role of river capture on river profile evolution and the potential pitfalls of this technique in some areas. The background to river analysis and the geology/geomorphology of the study area are very well presented and described as are the results. The discussion is well structured and outlines the authors arguments well. There are only minor comments that need to be addressed prior to publication.

Page 3, lines 10-15. This paragraph sets up an argument based upon the work of Attal

et al., (2015) and Shobe et al., (2016). Shobe et al., is described but the work of Attal is not elaborated upon and instead Brocard et al., (2016) is introduced. I find that this is rather unsatisfactory as Attal et al.'s contribution is unclear in this review. Page 7, line 6. Missing parenthesis after (Fig. 2. Page 7, Lines 10 and 11. See also Kent et al., (2016). Kent, E., Boulton, S. J., Whittaker, A.C., Stewart, I.S., & Alçiçek, M.C. 2016. River profiles as recorders of fault linkage and slip rate increases in the Gediz (Alaşehir) Graben, Turkey. Earth Surface Process and Landforms. Doi: 10.1002/esp.4049 Page 9, line 19. Headward Section 3.1/4.1. These sections incorporate a monte carlo approach to calculate the uplift rate along the coast and at individual sites, a nice idea but the results leave me with a number of questions/comments. An average uplift rate is determined, shown in figure 3a (I think the figure caption should state the uplift rate or it should be shown on the figure). However, it needs to be made clearer that these are post-linkage uplift rates. Also I would have liked to see the authors try to narrow down the timing of linkage, as currently they simply use the previous estimate of < 1 Myrs ago. Also have you any constraints on pre-linkage uplift rates? Although the mouth of the rivers on the Dikti block enter the sea on the hangingwall block, knickpoints in these rivers are still going to be formed by the initiation of faulting or change in footwall uplift rates on the SSCF. How do the rates of hangingwall and footwall uplift compare? Many studies of the hangingwall to footwall motion cite ratios of $\frac{1}{4}$ to 1/3 partitioning. Page 12 section 3.3 I am interested that you have defined knickpoints as a 25% difference between Ksn upstream and downstream, what is your rationale for this number? Is that consistent with where known active faults cross channels? Section 4.3 Although I agree that the two sets of knickpoints represent two phases of development it would be nice if there was some test of this hypothesis. How about presenting distance migrated upstream vs catchment drainage area. Faults of the same generation should exhibit a power law relationship. Section 5.1 lines 18-21. Ah – I think that this information on the timing of fault linkage should be presented earlier. Page 15, Line 31 – . . .in uplift rate determinations. . .? Page 16, line 21 (also page 17, line) What mechanism caused the first increase in uplift rate, if there is no linkage? What evidence is there for previous

slow uplift? Why does a shallow river indicate slow uplift? Why could not the upper knickpoint represent the initiation of faulting? Page 18, lines 29-32. I might have misunderstood but this sentence appears to contradict the discussion two pages earlier, as you are now saying the upland areas are 'relict' topography from prior to fault initiation. Page 19, lines 23. I know that assumptions need to be made, but having been to gorges in southern Crete, channel narrowing seems to be important and should not be discounted so easily. Perhaps saying that this variable is beyond the scope of the paper would be better than saying it is not important. This change might also explain some of the variability you observe in your data. Page 20, line 24. Whittaker and Boulton also (2011) demonstrated that knickpoint migration is a function of uplift rate, with higher uplift rates resulting in more rapid migration of knickpoints through the landscape.

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