

## ***Interactive comment on “Morphodynamic regime change induced by riparian vegetation in a restored lowland stream” by J. P. C. Eekhout and A. J. F. Hoitink***

### **Anonymous Referee #2**

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#### General comments:

This paper describes an in-depth monitoring project on a lowland stream restoration project. Monitoring consisted primarily of repeat RTK-GPS surveys coupled with hydrologic monitoring, one aerial photograph, and repeat photos from the ground level. The authors use DoDs to determine morphologic change, separated into geomorphic regime, and relate the overall change by regime to hydrologic drivers. This is a nice, detailed monitoring project of a remeandered site.

Like other reviewers, however, I have problems with premise that vegetation is the primary driver for the change in stream behavior over the 1.5 years following project com-

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pletion. The authors see a lot of change initially and decreasing amounts of change through time, with more muted response to high flow events in year 2 as compared to year 1. This decrease in change and muted response to floods in year 2 is attributed to vegetation growth. You would expect the same kind of signal even without vegetation growth, due to the disequilibrium associated with the remeander project. Deposition in the channel followed by a bend cutoff indicates that perhaps the designed channel was unable to transport its imposed sediment load and thus adjusted. To me, this attribution of change to vegetation is the biggest short-coming of the paper. Fundamentally, although it may still be the case that some of the stability attained in the system is driven by vegetation, the authors need to address the possibility that the systems is simply adjusting over time to the impulsive nature of the restoration project including the cut-off that occurred shortly after the project was completed.

In addition, given that the premise of the paper is that riparian vegetation growth is altering channel behavior, the density, type, and changes in riparian vegetation are not addressed well. In fact, I see no mention at all as to what kinds of vegetation were established at the site. The color-shaded “vegetation density” data in Figure 10 is qualitative and comes from photos shown in Figure 9. There is no mention of the species that are present, whether or not they were planted, how they vary across the reach, how they change seasonally, etc. In addition, there is no quantitative “vegetation density” metric that can be compared with geomorphic change. There is only a general sense that vegetation was not present and then it slowly grew back. The NDVI would have been helpful here, but there is only one photo that was analyzed, which gives only two points in time ( $t=0$  with no vegetation and  $t=289$  days).

#### Additional comments:

1. This is a very rich dataset in terms of morphologic change.
2. I like Figure 11 and think it shows good evidence for a change in behavior between times 1-5 and 5-13.

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3. In terms of shear stress, the authors use a time-averaged, reach-averaged shear stress based on one cross-sectional survey (for A and P) and the reach-average slope. Yet most sediment transport occurs during peak events in isolated locations. Given that they have detailed gaging records and detailed DEMs across the reach, I think a better treatment of shear stress could be done.

4. I have trouble with the idea of bank erosion calculated in terms of channel widths/year over time scales much shorter than that. I realize the idea is to standardize between measurements taken over different time intervals, but using a temporal ruler that is longer than the sampling period is misleading. Perhaps channel widths/day is a more defensible rate. Likewise, this rate is being applied to bank erosion in meters, but aren't you calculating bank changes in m<sup>3</sup>? How did you get back to change in meters?

5. Bounding boxes were set up to define channel bank, bed, floodplain, and cutoff channel (Fig. 3). Were those bounding boxes adjusted through time as the channel shifted?

6. p. 725, line 8-10 implies that the observations made in the two stages of behavior indicates that riparian vegetation can have a substantial influence on time that elapses before an equilibrium is reached. Given the difficulties in attributing the two-stage behavior to vegetation growth alone, I don't think this statement holds.

Other minor comments:

1. P. 712, line 8: add in the word "through" as in "maximum coverage halfway through the survey period"

2. P. 713, line 20 should include Tal and Paola (2007)

3. P. 719: Was the RMSD and volumetric change calculated only on areas that were above the LoD? How was the uncertainty propagated through to the volumetric change measurements?

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4. P. 720, line 11 should reference equation 3

5. P. 721, line 12: specify "survey #5-13", not just 5-13.

6. P. 724, line 1-2: "riparian cover started to decrease". Was this because it was winter? It would be nice to include actual dates on figures and in the text so that the seasonality of flows with respect to the seasonality of vegetation can be seen.

7. P. 724, last line: "accidental peaks in discharge" This is an odd term, and I'm not sure what it means. High-intensity precipitation events lead to peak discharges in unregulated catchments, too. Could you make this more clear?

8. P. 725 – I think it needs to be clear in the paper that the regression lines presented in Figure 11 are for the time periods 5-13 only. It is in the caption, but should be in the text, too.

9. P. 726, middle paragraph, I agree with another reviewer that this comparison between the field site and experiments by Gran and Paola, Tal and Paola, and Braudrick et al. is not warranted as those systems achieved equilibrium before vegetation was established and the energy of the system did not change. I think to make that comparison, you would need to watch the field site for several years with no vegetation while it attained equilibrium, and then add vegetation.

10. Minor comment on figures – can you add an arrow showing direction of flow? It is on Figure 1, but not the others, and I think it would help.

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Interactive comment on Earth Surf. Dynam. Discuss., 1, 711, 2013.

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