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Hydrology and Earth System Sciences Discussions

Interactive comment on "Modern comprehensive approach to monitor the morphodynamic evolution of restored river corridors" *by* N. Pasquale et al.

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General comments:

We thank this Reviewer for his observations and comments, which have as much as possible been taken into account in revising the manuscript. Both major and minor changes are hereafter discussed.

1) This Reviewer correctly observed that the proposed methodologies are not novel. This discussion article, indeed, aims at explaining how our approach integrates all the described techniques together, in order to propose a framework methodology aimed

at quantifying the role of below-ground biomass to sediment stabilization, which is indeed the scientific novelty of our research. We now better specified this point in the introduction also with respect to ecological resilience and the role of vegetation in controlling geomorphic dynamic (see later). Specifically, among others, in Section 3 we added the sentence: "Poorly vegetated sediment would in principle indicate a slow regeneration capacity as far as the creation of new terrestrial habitat is concerned. Indeed the absence of vegetation cover limits fine sediment trapping, which represents a fundamental component of the hydrogeomorphic resilience and adjustment dynamics."

2) The reviewer is correct when he says that sediment trapping by pioneer vegetation is a major process for such environments. We are not going to under estimate this effect resulting from canopy-flow interaction. To the purpose, our comprehensive approach allows to monitor the transplanted cuttings, their growth and their effects on erosion deposition processes in the vicinity and within the plot. This is accomplished (not shown in this work, but see Figure 1 here included) by comparing the high resolution DEM between subsequent years and by correlating the resulting patterns to the flow characteristics, and to both the above and the below ground amount of biomass. In particular, this explains the need of understanding how roots develop in time according to river stage fluctuations, and to quantify the canopy biomass by periodic monitoring and the use of terrestrial photography and computed NDVI (Section 4.4).

Specific comments:

- P.7, R.20: As far as the question about seasonal vegetation is concerned, we agree that the text was not clearly written. With seasonal vegetation we intended grass and shrubs growing once per year until a large flood (returning period one or two years) occurs and potentially either removes it by scouring and uprooting, or covers it by sediment deposition. A comment to this regard has been added in the text.

- P.9, L.15: The reviewer is correct when he says that dense ligneous vegetation patches trap sediment on the bedform surface. However, as mentioned in Section

3 bedforms in the restored reach are only poorly vegetated. Soil samples refer to bare soil and the vertical sediment sorting we measured is in accordance with several field and laboratory experiments (e.g., Lanzoni 2000). We agree that the presence of vegetation on bedform surface locally modifies erosion and aggradation. This data is not shown in this paper because the experimental campaign is not completed yet. However, we actually detected a much larger percent of fine sediment trapped within plots and just behind them whereas scour of material is mainly found upstream the plot (in accordance with e.g., Gurnell & Petts, 2006).

- P.10, L.26: "morphodinamic" has been replaced by "morphodynamic".

- P.11, L.25: We are using data from both aerial survey and DEM obtained by LIDAR (described in chapter 4.4). However the cost of such surveys makes them too expensive to be repeated more than once per year (P.25, L.22). Vegetation monitoring requires high frequency images (e.g., once a day) "Thus we are currently exploring the possibility to obtain such an information from terrestrial pictures". We aim to show the potential of using both, in respect to different field of application.

- P.18, L.25: This comment is pertinent. This work describes the methodologies that we adopted in order to collect data for further analysis on the interaction among river hydrology, above and below ground plant system and soil.

- P.37, Figure 8: The figure has now been changed also in accordance with the comments by Reviewer #1. The new figure shows both actual and potential growth of four plots taken as examples in 2009. The figure does not aim to show statistical information, but it is rather useful to explain the observed trend of cutting growth and death in relation to topography and river hydrology. This is fundamental in order to show that there is an active interaction between the hydrologic and the biologic time scales. In turn, this is the base to understand the colonization by vegetation time scales in this restored riverine environment. To this regard, a more specific comment has now been added in Section 5.3: “We define potential growth as the average cutting length of

each plot computed by excluding the death ones and effective growth as the average cutting length of the whole including damaged, removed or died plants). This different definition of growth average allows considering that a damaged biomass may indeed have single branches (i.e. cuttings in this case) growing at the effective rate despite the biomass has decreased.”

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 8873, 2010.

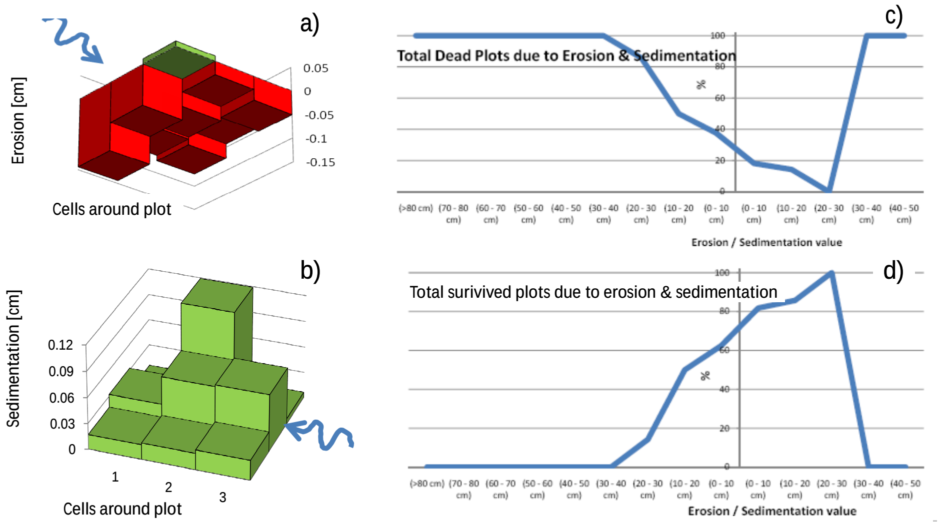

Fig. 1. By comparing the high resolution DEM between subsequent years and by correlating the resulting patterns to the flow characteristics we obtain erosion and deposition patterns around each plot (Fig. 1a