

## ***Interactive comment on “Heterogeneity of soil carbon pools and fluxes in a channelized and a restored floodplain section (Thur River, Switzerland)” by E. Samaritani et al.***

**E. Samaritani et al.**

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These are the same answers as in the combined Final Author Comments, but only considering comments by anonymous reviewer 1:

Comment: I would have liked to see some hypotheses underpinning the paper – although there is not a great deal of research in the area, the development of broad hypotheses to be tested using the empirical data collected would have helped to direct the discussion. However, the paper works well without these so this is not an essential modification.

Reply: Since this is also a request by Referee 2, we agree on adding the following broad hypotheses in the last paragraph of the introduction: (i) In dynamic FPZs, frequent disturbance by flood pulses affects C pools and fluxes temporary and locally. (ii) Such effects are an essential precondition to achieve a broad spectrum of conditions and processes supporting a large variety of organisms and, thus, biodiversity. In the conclusions this can be taken up as follows: Irrespective of the FPZ, the input of non-structured allochthonous soil material and possibly the destruction of local aggregates during flood pulses appears to be the driver for a temporary and - in dynamic FPZs – local increase of microbial activity. The related variability in available carbon or soil respiration cannot be explained by the spatial heterogeneity of bulk soil properties or the variability of environmental conditions. Our results thus confirm the first hypothesis put forward in the introduction. However they also show, that the temporal effects are not restricted to dynamic FPZs. The strong increase in plant biodiversity brought about by the recurrent rejuvenation of the habitats seems to support our second hypothesis, that frequent disturbance – defined as temporary and strong changes in environmental conditions and substrate availability – creates a large functional diversity.

Comment: The discussion is good and covers all the major topics – however, given that the aim of the paper as stated (p. 1064) is within the context of ecosystem services, I would have expected some discussion of the significance of the findings for key services in the discussion.

Reply: we agree that this is an important aspect and will add at the end of the conclusions chapter some implications regarding the ecosystem services habitat provision and carbon storage as follows: In particular, this (creation of near-natural floodplains comprising both dynamic gravel bars and stable alluvial systems) ensures the provision of a large diversity of habitats. On the other hand, the complex interplay of organic matter input and hot spots of both mineralisation and incomplete degradation very likely strongly affects the potential of floodplains to store carbon, an ecosystem service of great current interest (Cierjacks et al., J. Plant Nutr. Soil Sci. 173:644-653).

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Comment: It would have been interesting to see the PCA demonstrating ‘completely different characteristics’ of plant species composition in the ‘dynamic’ FPZs compared to the ‘stable’ ones. Was this left out only to save space? I think it would be a useful addition, with some brief discussion.

Reply: We did not include such a figure because vegetation is not a major focus of this paper as well as to save space. Including this aspect in a sound way would indeed require not only to include a figure but also to explain how the characteristics were selected, measured etc.

Comment: For Table 2, is it possible to statistically test whether the coefficients of variation differ significantly between the FPZs?

Reply: It would be possible to calculate ANOVA for the CVs of soil environmental conditions, carbon pools and soil respiration. However, the CVs are for different samplings and doing simple one way ANOVA of these temporal replicates to look at significant spatial differences between FPZs might provide misleading results. Furthermore, the CVs are not normally distributed.

Comment: Page 1062, lines 6-10: This opening paragraph needs some references. They are general statements but still require some acknowledgement of the literature.

Reply: We can add the following references to this paragraph: (i) Ward et al. 1999, as already in the reference list. (ii) Pinay, G., Clement, J. C., and Naiman, R. J.: Basic principles and ecological consequences of changing water regimes on nitrogen cycling in fluvial systems, *Environmental Management*, 30, 481-491, 10.1007/s00267-002-2736-1, 2002.

Comment: Page 1063 line 1: insert ‘consequent’ in front of ‘rehabilitation’.

Reply: will be done

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Comment: Page 1063 line 6: remove 'the' before 'embankments' and before 'flood levees'

Reply: will be done

Comment: Page 1063 line 10: 'tightly linked to organic C dynamics in riparian soils' – this statement needs a reference.

Reply: We will add here the following references: (i) Hill and Cardaci, 2004 as already in the reference list (ii) Wilson et al. 2010, as already in the reference list

Comment Page 1066 line 15: 'the growing season 2008' should be 'the 2008 growing season'

Reply: will be done

Comment: Page 1066 line 18: 'topsoil samplings were' should be 'topsoil sampling was'

Reply: will be done

Comment: Page 1071 line 5: insert 'and' before 'those'

Reply: will be done

Comment: Page 1073: insert 'us' after 'allow'

Reply: will be done

Comment: Page 1074 line 29: competitive species tend not to dominate in high degrees of disturbance, rather ruderals do, so this line should be clarified.

Reply: This sentence was indeed unclear. It will be modified as follows: This hypothesis predicts highest species richness in habitats characterised by intermediate inundation frequency (i.e. WILLOW BUSH), and lower diversity under high or low degrees of disturbance (i.e., GRASS and the two forested FPZs, respectively) where ruderal or competitive species dominate, respectively (in particular *Phalaris arundinacea* as flood

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tolerant species in GRASS, Foster and Wetzel, 2005).

Comment: Page 1076 (actually 1075) line 24: change 'samplings' to 'samples'

Reply: we do not agree; here we relate to the overall differences between the four samplings in October, January, April, and August.

Comment: Page 1076 line 9: 'content of fine soil' would be better as 'fine soil content'

Reply: will be done

Comment Page 1076 line 22: change 'evidences' to 'observations'

Reply: will be done

Comment Table 1: can you check the superscript letters, they don't quite seem right to my viewing.

Reply: The respective calculations were checked, and indeed some of the superscripts for "Sand", "Organic C" and "Total N" need to be changed; see the corrected table in the supplement.

Comment: Table 3 caption: 'samplings were' should be 'sampling was' – 'all samplings' should also be 'all sampling'

Reply: We will replace "Samplings were" by "Sampling was" and "all samplings" by "all sampling periods".

Comment: Fig 3 caption: 'each are represented' should be 'each represented'

Reply: will be done

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/8/C1026/2011/hessd-8-C1026-2011-supplement.pdf>

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