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Hydrology and Earth System Sciences Discussions



# *Interactive comment on* "Spatial variability in floodplain sedimentation: the use of generalized linear mixed-effects models" *by* A. Cabezas et al.

**Anonymous Referee #1**

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This manuscript describes spatial variation in the deposition of sediment and associated carbon and nitrogen on floodplains of the Middle Ebro River that occurred during a single overbank inundation event. Sediment collection mats were installed at a variety of spatial scales in order to identify the factors controlling floodplain deposition rates using mixed-effects general linear statistical models. Plot ($\sim$ 1m2) scale variability in deposition was large, as high as the variability within individual floodplain reaches. The amount, size distribution, and nutrient content of sediment deposited differed among the four floodplain reaches, associated with hydrologic connectivity, and with distance from the main channel (lateral) and from the entry point of overbank water into the floodplain reach (longitudinal). Mixed-effects general linear models were proposed as an effective model for statistically evaluation of deposition at multiple spatial scales.

There are several, but not a lot, of published manuscripts that quantify sediment deposition rates on floodplains. The state of the science is at the stage that more data is needed, but novel and creative interpretation should be present. The study design is competent but limited in that it sampled only a single flood along a short section of a single river. Therefore, substantial interpretation and synthesis is expected to reach the threshold of publication. The application of mixed-effects general linear models seems new to this discipline. It has the benefit of better apportioning error terms to better account for the effects of controlling factors at different spatial scales – a problem that vexes this type of research. However, the synthesis of the study findings was limited. In addition, discussion of the relationship between sediment size distribution and TC and TN was difficult to follow and unfulfilling.

In general, there were many spelling or stylistic problems with the writing that need to be improved, including citing incorrect Figures. More details on the flood characteristics, reach characteristics, and processing of the sediment traps are needed to sufficiently evaluate the manuscript.

Technical corrections:

Abstract, L2: specify that 1.15 yr refers to the return interval. P1591, L24: Please add citation of either Hupp et al. 2009, or Ross et al. 2004, both of which offer detailed analysis of spatial variation in sedimentation or sediment delivery within floodplains. P1593, L21: Specify that 27 days was duration of the flood. P1593, L22: Specify that years are the return interval of a flood of this magnitude. P1593/1594: Was the entire floodplain surface inundated at each reach during the flood? What was the depth of water? Since the threshold for surface water connectivity at each reach is provided in Table 1, addition of a graph showing the flood hydrograph would be useful. Please provide more details on the flood. P1594: Please add the dates of trap installation, flood start, flood end, and trap retrieval. P1549, L14: This zone of water input is depicted to cross the floodplain, instead of a point of entry. Did water enter through a levee crevasse or channel at a point, or as sheetflow from the adjacent upstream



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floodplain reach? If it was a point, then longitudinal distance should be calculated to that point, not to the zone depicted. P1594, L19: Air drying does not remove all moisture from sediments, instead, oven drying is needed. P1594: Was coarse (>2 mm) particulate organic matter present in the captured sediment? Was it removed? How was the sediment on the bottom of the mat removed to not bias the measurements of mass deposited? P1595, L1: Was the sample acidified prior to TC analysis? If not, then TOC was not measured. P1595, L11-17: This section is a repeat of the paragraph. P1599, L13: the <500-um size class was not similar (Table 2). P1599, L28: From Figure 3, these distances appear to be 94, 130, and 132 m. P1600, L2: This should be Figure 3, not Figure 2. P1600, L7: This should be Figure 4, not Figure 3. P1601, L11: Specify that it is the deposition rate of TOC and TN. P1602, L10: Replace "released" with "retained". P1603, L1: It was not composed of coarser particles (Table 2). P1603, L11: So far as I can tell, these results are in agreement with the findings of Steiger and Gurnell 2003. P1603, L17-20: Water velocity also decreases. P1603, L20: I don't understand "what increased also sediment qualities". P1603, L11-23: I generally do not understand this paragraph. P1604, L13-18: I suggest citing Ross et al. 2004 or Hupp et al. 2009. Figure 1: The scale on the river drawing is not legible. Table 3: The headers need to be changed to make it easier to understand this correlation table. I suggest adding each reach label to both the column and row headers (top or bottom) to clearly label the appropriate correlation coefficients for each reach.

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 7, 1589, 2010.