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***Interactive comment on* “Seasonal dynamics of carbon recycling in coastal sediments influenced by rivers: assessing the impact of flood inputs in the Rhône River prodelta” by C. Cathalot et al.**

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The paper aims to determine the temporal and spatial evolution of benthic remineralization in the bed sediments of Rhone River prodelta. This is done by intensive sampling in the prodelta area over almost 2 years. The benthic remineralization fluxes has been determined in three different ways: from in situ oxygen profiles, ex situ profiles and sediment core incubation in the laboratory. The different approaches provide consistent results evidencing the role of diffusive exchange at the sediment water interface. The main conclusion are: - a clear pattern of decreasing oxygen consumption fluxes with distance from the river mouth that is present during time when “normal” river discharge

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conditions occurs. - in June 2008, after a period high river discharge, the deposition of a “flood layer” happened and the oxygen demand in the area in front of the main Rhone River mouth decreases decisively. - After six months the initial conditions were reestablished and some speculations on the involved processes are given. In general I found the paper to be well organized and the method and the conclusion to be sound. The figures are well done and add significantly to the paper. However, I have some specific comments that might help to improve the final quality of the paper.

Specific comments: The authors should be clearer in some parts of the section 4.2 Spatial and temporal distribution. of the discussion part..

The data presented in Fig. 11 are very important and add a lot to the discussion. However, the data presented are not mentioned in Material and methods (i.e. coring during September and October 2008, OC profiles, the sediment core description method and the station at 45 m is not included in the list of table 1). Also referring to fig 11. data interpretation, the evolution of the June 2008 flood deposit could be compared respect to river discharge and wave heights time evolution to better validate the deposition/resuspension processes. Beside that, other chemical tracers (e.g.. ^{7}Be) could better explain new sedimentation processes. The 2 –4 cm ochre mud layer observed in June and September 2008 core (fig . 11) seems unrealistic to me: too thick given the oxygen penetration < 5 mm measured at the station B. Another issue is that looking at fig. 11 the Dec 2008 cruise do not seems to represent a “normal discharge period” because a new 19 cm thick layer (see also P15 L 13) has been deposited after October 16 (probably due to the water discharge peak of almost $5000 \text{ m}^3 \text{ sec}^{-1}$ occurred in mid November 2008 (I extrapolate these numbers from figure 2 and probably are not so exact). I brief, please clarify what is the meaning of “normal discharge conditions” respect to “major flood conditions”. Taking in consideration the data presented in fig. 2 and fig. 11 (integrated SPM amount and new deposit due to Nov 2008 discharge peak) the Apr 07 and Sept 07 cruises discharge conditions seems different from Dec 2008 ones. On P16 L18-19 (in the conclusion part) the sentence “. . .which create a

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rapid relaxation of the oxygen distribution towards its initial state (<6 months)” it is not clear to me . Please clarify. From the discussion part I understood the relaxation of mineralization occurred immediately after the deposition of the June 2008 flood layer. From the cited sentence I can understand the rapid (?) relaxation occurring in the six months from June 2008 to Dec 2008.

Minor comments:

I have found some minor typing errors, but since English is not my first language I do not assure the quality of my check for English grammar.

P4, L 17 please check “extending then the shoreline” probably replace “then” with “from”

Fig. 1 caption. Replace: “sampled the four cruises” with “sampled during the four cruises”

P9 L19 Replace: “enriched:” with “enriched.”

P9 L27 Replace: “ighest” with “highest”

P13 L28 “discharge was similar (4 Mt)”. It is better to use the same unit for sediment load. (i.e. Exponential notation as in line P13L19). Probably a reference is needed.

P13 L18. “This annual flood delivered up to 3.5 10⁶ tons of sediment in a 10 days period”. Please consider to insert a reference to the figure 2.

P14L16 “bio-available compounds (4 vs. 7 mg g⁻¹ d.w.)” these kind of date is not mentioned in Material and methods.

The following references are missing in the references list:

Eyre et al., 2006 Rees et al., 2005 Ulses et al, 2008 Cathalot et al, In prep

Table 3 : The date relative to station K present a (*) that is not explained. The numbers of digits is not homogeneous.

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Table 4 : The date relative to station N present a (*) that is not explained. The numbers of digits is not homogeneous

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