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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.

Anonymous Referee #3

Received and published: 17 January 2010

In this paper the authors study the seasonal variability of organic matter mineralization in sediments from the prodelta of the Rhône River and nearby continental shelf during normal and flood regimes of the river. For this they carried out 4 samplings during the years 2007 and 2008, in one of which (June 2008) the Rhône River was experiencing an annual flood. The sediment oxygen demand is studied with three different methodologies: ex situ oxygen profiles, in situ oxygen profiles, and core incubations. The concentration of oxygen is measured with electrodes that have previously been calibrated with measurements of oxygen made using the Winkler method. From the results obtained it can be seen that oxygen demand decreases with the distance from the river mouth, during seasons when discharge conditions are normal. However the oxy-

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gen demand in the prodelta decreases during flood discharge conditions, in response to the deposition near the river outlet of low reactivity organic matter associated with the fine material. The initial spatial distribution was found again six months after this event.

The work is of considerable interest for publication and would be of great value for the scientific community, but several aspects would need to be revised:

The English should be revised since in some places it is not easy to understand what the authors want to say. This can lead to confusion.

The methodology utilized is adequate. However, certain doubts occur to me: In the cores in which the ex situ measurements were made, the conservation of overlying water oxygenation was achieved by a soft bubbling system. How was this bubbling performed? Which gas was used? Was any kind of estimation made prior to the sampling to confirm that the bubbling does not alter the oxygen content of the overlying water? Did they check that the bubbling does not alter the most superficial layer of the sediment? Equally, during the incubation of cores (part 2.8 of the text, pg. 8), overlying water was kept homogenised by a rotating floating magnet fixed to the upper core cap. Was any kind of measurement done to check that the agitation in the core did not alter the most superficial layer of the sediment and therefore the DBL?

When they estimate the Diffusive Oxygen Uptake (DOU) using the 1-D Fick's first law of diffusion, what expression of D_{O_2} have they utilized? It would be appropriate to include the name of the author who proposed the expression utilized. Is it that of Broecker and Peng (1974)? Should D_s be put in the equation presented, instead of D_{O_2} ? Where D_s is the molecular diffusion coefficient and D_{O_2} is the coefficient of diffusion at infinite dilution. Given this, what expression that relates D_s and D_{O_2} has been considered?

More could be commented in the paper from the TOU/DOU ratio, and the data obtained should be compared with those from other systems. Equally, the plotting of

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DOU against OPD could give some interesting results.

When they speak in the text of figure 9, it would be convenient to state there that, in this figure, the stations close to the river outlet have been separated from the offshore station. They should also give the reason for this separation.

Figure 11 shows the evolution of the flood deposit in September and October 2008 (as well as in June and December) at a depth of 45 m, 2.7 km of the river mouth. These two samplings should be included in Material and methods.

Since the study is based on diffusive fluxes, in which the processes of bioturbation are very important, the text would be improved if some references were included in Material and Methods to the species of macrofauna that are most abundant in the zone.

Minor comments:

In all the bibliographical citations the proper names (Rhône, Mediterranean. . . .) and those of geographical features (River, Sea. . .) appear without a capital letter. These must be corrected.

Sometimes abbreviations appear in the text that are only explained later. For example in the Abstract on line 6, DOU appears and it is on line 7 that it is explained as referring to Diffusive Oxygen Uptake. Similarly TOU appears on line 10 but there is no explanation of what the initials mean. In part 2.9. of the text (Pg. 8 Ln. 24) the authors speak of OPD but it is only in part 3.4 (Pg. 10, Ln 11) where it is explained that these initials correspond to Oxygen Penetration Depth.

Some bibliographical citations are missing, such as: Cachalot et al., In Prep.; Ulses et al., 2008; Eyre et al., 2006, and Rees et al., 2005.

In table 1 μM and not μM appear as units of $[\text{O}_2]$.

In table 3 an asterisk appears and it is not specified to what this refers. Also in this table the number of digits for the same variable is not homogeneous.

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6, C4017–C4020, 2010

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