REVIEWER #1

Specific comments

P7369 L10: Here and elsewhere: I think you have to make perfectly clear to the reader that part of your data set deals with solute distribution within the sediment, while another part deals with total solute fluxes between sediment and water. Your microsensor profiles, for instance, only represent oxygen distribution across the sediment-water interface and within the sediment. Nevertheless, the larvae may not only affect DOU (diffusive oxygen uptake) that you calculated from the concentration profiles, but also TOU (total oxygen uptake) that includes the oxygen exchange inside the irrigated burrows, which you didn't measure. Please, mention this discrepancy here and in the Discussion.

Effectively, we only measured DOU that corresponds to the oxygen diffusion across the sediment-water interface. The advective uptake of oxygen via burrow walls driven by bioirrigation was not calculated (irregular profiles were rejected), as well as respiration rate, so TOU was not estimated.
By comparing DOU in defaunated and bioturbated cores, our aim was to put in evidence that organic matter mineralization increases with bioturbation.
Although we paid attention to avoid this kind of confusion on the first draft, several modifications has been made throughout the manuscript for clarity.

Other examples: The nutrient (or metal) concentrations presented in Figure 2 are the result of total fluxes of these solutes between the sediment including animal burrows and the water column, whereas the ferrous/ferric iron concentrations presented in Figure 4 represent the solute distribution within the sediment only. Of course, you can calculate local rates and then depth-integrated rates from such solute distributions in the sediment (if in steady state), but the obtained rates might considerably differ from total fluxes between sediment including animal burrows and the water column. You correctly call C. crassimanus a typical bioirrigator and therefore you should - whenever necessary - discuss your findings (the total sediment-water fluxes vs. the depth-integrated rates) in exactly this context.

We perfectly agree this comment. Fig 2 gives total fluxes between sediment and water while the Profile calculations on Fig 4 give only diffusive fluxes. Obviously, diffusive fluxes are a lower estimate of real fluxes. Our data, however, show a zero iron flux in both Fig 2 and Fig 4 (despite a slight trend for a higher iron concentration in the water with chironomids in the sediment, Fig 4).
Thus, both the diffusive and the total iron fluxes were zero. In conclusion, the bioturbation (irrigation + particle advection) by chironomids did not result in a net transport of iron from the sediment into the water.

A last comment on this issue: The microsensor profiles and the DET profiles may also represent something slightly different: In the ideal case, a microsensor profile does not intersect a burrow and does not even come close to a burrow, whereas a DET profile may well integrate information from far away and close to several animal burrows due to the larger "diameter" of the probe. In the worst case, there might even be preferential burrowing directly adjacent to the DET probe, a phenomenon often observed at the wall of sediment microcosms. I think that this difference between microsensor and DET probes should be mentioned in your manuscript.

Of course, microsensor profiles correspond to one-dimensional measurements (and we did not use profiles crossing burrows) whereas DET profiles integrate horizontal heterogeneities.
For oxygen, the microsensor profiles were repeated until we get at least 3 regular profiles per sediment core with 4 replicates by treatment, i.e. we had 12 profiles for each treatment.
For iron, DET profiles correspond to the mean profiles of four replicates.
In both cases, we had few variations and we considered our measurements quite representative of the vertical distribution of oxygen and dissolved iron in the sediment.
These considerations have been highlighted again in the revised manuscript.

P7365 L8: What was the diameter of the luminophores?

We used green 63-mm luminophores ($\lambda_{excitation}$=450 nm, $\lambda_{emission}$=520 nm) from the "Geologishpaleontologisches Institute and Museum of Kiel University" in Germany. This information has been added into the text.

P7366 L10: When exactly were the DET probes inserted and what was their total exposure time in the sediment?

The DET probes were added during the installation of microcosms, i.e. 10 days before the beginning of the experiment. In C-cores, they were retrieved the first day. In D- and Chir-cores, they were retrieved at the end (day 16). This information is already mentioned in the paragraph "2.2 Microcosm set-up", but it has been repeated in the paragraph 2.6 for clarity.

P7369 L10: You don't explicitly mention that burrows were avoided during microsensor profiling. Did you never intersect irrigated burrows during the microsensor measurements? This would surprise me.

We effectively intersect burrows during the measurements but we did not keep these irregular profiles for further analysis.
This information has been added in the text.

Technical comments

Title: Can the title be shortened a bit? E.g., "biogeochemistry of littoral sediments of an acidic mine pit lake".

The title has been shortened as "Influence of bioturbation on the biogeochemistry of littoral sediments of an acidic mine pit lake"

Page 7361, Line 19: "extent"

The text has been corrected.

P7361 L21: "development of such lakes" is a bit vague. Development in what respect and towards which final state?

The sentence has been reworked.

P7361 L22: "among by other parameters" might be correct, but still sounds awkward to me.

"Among other parameters" sounds more correct. The text has been corrected.

P7362 L28: "Rodriguez"

The text has been corrected (in the references as well).

P7363 L9: Is Lusatia really in South-Eastern Germany? I would say that Bavaria is located in South-Eastern Germany and Lusatia in Eastern Germany.

The text has been corrected (in the abstract as well).

P7363 L25: "3rd and 4th instar larvae" or "individuals in the 3rd and 4th larval stage"

The text has been corrected.

P7370 L8: I think the term "suboxic" is reserved for the zone between the bottom end of the oxic zone and the upper end of the sulfidic zone.

We agree with this definition and we think it was correctly used in the sentence. Microbial reduction of iron occurs in this zone.

P7372 L15: In this sentence you specifically refer to your acidic lake; please, include this information in the sentence.

This remark is partially true. The paragraph has been reworked for clarity.

P7372 L25: the larvae "stayed" in their tubes

The text has been corrected.

P7373 L4: “Stief et al.”
The text has been corrected.

P7373 L15: What do mean by writing “reliable”?
It is a language mistake. The word has been replaced by “linked”.

P7374 L16: “magnetite”
The text has been corrected.

P7374 L20: Maybe turn around this sentence by writing “Mn-oxides can oxidize Fe2+”?
The text has been corrected.

P7376 L16: The water was well oxygenated in your experiments, but maybe not in the littoral zone of your study lake. Earlier you wrote that the larvae constructed chimneys in the lake in response to oxygen shortage. Can you please comment on this?
It is true that we observed occasionally chimneys during the sampling of sediment cores, but it includes all the samplings we made to check the distribution of chironomids in the lake (5 transects from lake shore to 4m of water depth). The cores we kept for the experiment came from a location corresponding to the highest densities of chironomids we found, it was at a water depth of 1.5-2m. These cores had some very small chimneys (as observed afterwards at the lab) indicating that the study zone was quite well oxygenated.
This information has been added to the text for clarity.

P7377 L8: The old discussion “bioturbation vs. bioirrigation” may have to be revived here. You relate the release of nutrients from the sediment into the water column to the bioturbation activity of the larvae, but isn’t it much more related to the bioirrigation activity of the larvae?
During the last Nereis Park conference (August 2008), where a large part of the community of scientists working on bioturbation was represented, there was a debate to discuss this point. It was decided to define bioturbation as a general term referring to all activities of benthic organisms. Then, bioirrigation (flux of solutes) is opposed to particle mixing (movement of solids), and both are components of bioturbation.
We tried to follow this guideline throughout the manuscript. In the paragraph 4.3, we distinguish 3 processes to explain the release of nutrients. For clarity, the term “bioirrigation” has been added into brackets after “pumping water in and out of burrows”.

P7377 L19: “mobilization of adsorbed phosphorus”
The text has been corrected.

P7377 L20: “the phosphorus flux remains a matter of controversy”
The text has been corrected.

Table 1: It is more common to write NH4-N instead of N-NH4 (and NO3-N instead of N-NO3).
The text has been corrected.

Figure 2: Color code: Intuitively, I would expect an open symbol for the sediment cores without larvae, a shaded symbol for cores with intermediate larval abundance, and a filled symbol for cores with high larval abundance.
Sorry for this inconvenience but the same code is used for all figures. We can change it depending on the recommendation of the editor.

Figure 2: Some of the axes are dotted, while others are not. Meaning?
It is probably a problem of file compatibility or resolution (??). There are no dotted axes on the original figure. Only the “control” C plot is dotted.

Figure 3: You don’t mention PROFILE 1.0 in the legend of Figure 3 (see Figure 4).
The text has been corrected.