

Interactive comment on “Are flood-driven turbidity currents hot-spots for priming effect in lakes?” by D. Bouffard et al.

Anonymous Referee #1

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The MS bg-2015-645 deals with the impact of flood-driven turbidity currents on the availability of oxygen in the hypolimnion of stratified lakes. As underlined by the authors, the hypothesis of oxygen replenishments in these zones of lakes have been pointed out a long time ago but direct evidences are rare. The present study focuses on the effects of river floods on the oxygen profiles in Lake Geneva. Contrary to expectations, results presented in this study do not reveal this oxygen replenishment. On the contrary, authors observed either redistribution of oxygen into the water column without changes in mean O₂ concentrations or decrease in oxygen availability in the upper part of the hypolimnion. These results are then corroborated by an experimental test (dark bioassays) showing that small river water inputs in deep lake water tend to disproportionately increase respiration, suggesting a stimulation of carbon use following river water inputs. These results are then discussed in the light of microbial co-metabolism

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and priming effect mechanisms. The MS is well written, most experimental aspects are clearly described, well justified, and results are discussed in depth. I have no major comment on the MS, only questions and minor comments aimed at improving the understanding of the results.

- My first question deals with contradictory results between old observations of Meybeck et al. (1991) and those presented in the MS. Since in the present study measurements were made on a single date, could we expect that oxygen replenishment could be a transitory phenomenon? If oxygen profiles were measured throughout time, could we expect first an oxygen replenishment (in accordance with old observations) then followed by a decrease in O₂ below initial values due to a stimulation of microbial respiration. For me, both results are not necessarily contradictory and this aspect could be discussed in the MS - A second question related to the first one: Even if I believe that co-metabolism and/or priming effects arise, could O₂ transported in river water be a primer of lake C mineralization? This question could perhaps be partly solved - and discussed- if initial O₂ levels during dark bioassays were given. - I am not specialist at all of this question but would it be interesting to discuss of O₂ concentrations both in terms of saturation levels and mg L⁻¹? The related questions are : could higher river temperature lead to saturated but “low” O₂ concentrations (in mg L⁻¹) inputs in lake water, partly explaining O₂ depletions in lake water measurements? Could observations differ if river floods come from ice melt or from (warmer) spring rainfalls?

And more minor questions/comments: - P8, L5: is it really 0.22mg L⁻¹ m⁻¹? I am probably wrong but this value seems huge since graphically, we can see variations between ca. 10-11mg L⁻¹ and 5-6mg L⁻¹ between 20 m and 200m deep. Such a decrease of 0.22mg O₂ L⁻¹ would lead to O₂ levels of 0 mg L⁻¹ on a 50m deep water column. - I find the results of the dark bioassays very interesting, especially when discussed in the light of priming effect and co-metabolism. It would certainly require further testing to understand in more depth the underlying mechanisms. However, as written, I find it might be a bit confusing for readers since both mechanisms are discussed in two

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distinct paragraphs. I suggest merging paragraphs 4.4 and 4.5 in a more integrated discussion. - Why the 50% treatment was not tested with lake water coming from 200m deep? - Try to justify the selected % of river water introduced in the microcosms. Is 1% still high considering the size of Lake Geneva? Or is it what could be expected during the highest floods? Obviously this might differ as a function of the position in the Lake, but such calculation could render the bioassay more convincing for explaining results observed in May. - Changes that could have occurred between Dranse water entering Lake Geneva in May and Dranse water collected for the bioassays are well discussed in the MS. However, what could have occurred to lake water during the same period? Do we expect huge changes in lake water physico-chemistry between May and bioassays especially after the important spring river floods of 2015? And really minor things. . . - P3, L1: what kind of anomalies? Positive, negative, idiosyncratic? - Why not introducing co-metabolism and priming effect concepts in the introduction? It is fundamentally not a problem, but since priming effect is used in the title of the MS, reader could expect to see this concept discussed earlier than in the last paragraph of the discussion. - P7, L26: "suspended" instead of "susepended" - P11, L21: suppress the "," after Dranse - P11, L25: Turbidity -

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