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# *Interactive comment on* "Organic carbon mass accumulation rate regulates the flux of reduced substances from the sediments of deep lakes" *by* Thomas Steinsberger et al.

**Anonymous Referee #2**

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The paper by Steinsberger et al presents interresting results on the role of dissolved fluxes from sediment in the oxygen consumption in lakes with oxic hypolimnion. It fits perfectly one of the scopes of the journal, linking mainly chemical and physical aspects of the cycle of chemical substances, organic matter, and sedimentation rates. The paper presents new data from fives Swiss lakes with different trophic status. Results, interpretation and conclusion seem coherent, however my main comment concerns i) the lack of clarity in the presentation of the results, and their use in figures. For instance 8 cores were collected in Lake Geneva with corresponding Fred, but only one point plotted (and discussed?) on figure 2 and 3 (average value, deepest point?). I have the general feeling that a large set of data has been produced, but partly dis-



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Discussion paper

cussed; and ii) how the variability in the observed fluxes is taken into consideration in the final assessement. On page 5 line 14 and following, the authors correctly indicate that fluxes, at the same location, show variations due to local sediment heterogeneity and/or seasonal effect. Depending on the substances, values varies between 23% to 67%. However, only one value per lake /depth is given in table 2, without any uncertainty, either from the measurements themselves (including uncertainty in sediment accumulation rates) or from the replicates. Then how the values in table 2 are computed (simple average, time weighted)? What could have these uncertainties on the interpretation and conclusion? From a quick evaluation it seems that the main trends are still significant, but this should be discusssed in the manuscript to improve the strength of the conclusion. More detailed comments: Page 2 line 31. From the classical reference (Wetzel 2001), Lake Geneva is meso-eutrophe (10-30 mg/m3) based on phosphorus content (20 mg/m3), but also on chlorophyll (.

P4 line 23. I don't understand why the sedimentation rate (SR) is calculated based on a depth scale, and then at each layer a TOC-MAR (mass accumulation rate) is calculated, including porosity and dry density. This way is correct if the porosity is relatively constant downcore. But in general in recent sediment porosity vary strongly with depth, and this variation should be taken into account before the computation of the sediment rate. For instance a SR of 2 mm/y correspond to 0.05g cm/2/y with 90%porosity, but 0.1 g/cm2/y with 80% porosity.

P4 line 24. It is not clearly explain here (but discussed later) why the surface sediments are excluded from the computation.

P6 line 28. Not clear here the difference between TOC-MAR and OC (or TOC?) gross sedimentation rate.

P9 line 22. Not clear what is meant by "accessibility of hypolimnetic O2 to the sediment surface".

Table 1. Units of Hypolimnetic volume is (Mm3) and not (m3). Sampling depth in lake

Baldegg 40m but 38m on table 2, Lake Geneva 40m but 45 on table 2.

Table 2. see above comment on uncertainties.

Fig S2. Concentrations in Lake Geneva at 310m are much lower throughout the year, varying between 2 and 5 mg/L (Barbier and Quetin 2016). To what year do these profiles correspond?

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