bg-2016-49 review

"Variations in triple isotope composition of dissolved oxygen and primary production in a subtropical reservoir" by:
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The authors report measurements of O_2/Ar, $^{17}O/^{16}O$ and $^{18}O/^{16}O$ ratios of dissolved gases in a fresh water reservoir. They sampled the water column for more than a year. In addition to dissolved gases, they also measured $^{18}O/^{16}O$, D/H and ^{17}O excess of water. Using these measurements they estimated gross and net primary production and their ratios (GP, NP and NP/GP respectively). In their estimates they applied the method introduced by Luz and Barkan in 2000 (LB00). LB00 demonstrated the potential of the method for both marine and fresh water studies. Since then the method has been used a number of times in marine systems but not in fresh water ones, so the data set collected is valuable in that it adds information on triple oxygen isotope variations in a freshwater system. This information has potential to help understanding the metabolic balance in lakes and fresh water reservoirs. Yet, there are a number of issues that need to be addressed before the material in the manuscript is suitable for publication.

In order to meaningfully interpret the results in quantitative terms of GP and NP, the authors need to realize that the LB00 method is applicable to mixed layer which is at steady state with respect to fluxes of photosynthesis, respiration and gas exchange with negligible effects of vertical and horizontal advection. While these conditions may be assumed for a number of marine situations, the reservoir in this manuscript may be more dynamic. If that's the case, to obtain meaningful quantitative estimates of GP and NP, the authors will need to include at least some of such dynamics in their calculations and apply a non-steady state model. While this may be a tall order, at the least, such approach should considered and discussed and the present estimates should be qualified and treated in a qualitative way. The data base of the study should be made available for future studies (see below) when a non-steady state model becomes available.

The authors are aware that a portion of the reservoir's photosynthesis takes place in the photic zone beneath the mixed layer. They have to give an estimate of how much is missing in their estimates for the mixed layer.

As well, in order to apply the LB00 method, it is necessary to know the ^{17}O excess of photosynthetic oxygen. While the latter depends on the ^{17}O excess of water, the two are not identical and the difference may be significant (see Luz and Barkan, 2011, GRL).

Even if the difference between ^{17}O excess of photosynthetic and water oxygens is known, I expect the value for water in the reservoir to be variable and to be dependent on fluctuations in the isotopic composition of meteoric water and evaporation from the reservoir. So more measurements of ^{17}O excess of water

are needed. The authors give one value for ^{17}O excess of water (246 per meg with respect to air). What are its $\delta^{17}O$ and $\delta^{18}O$ values?

Importantly, all raw data for $\delta^{17}O$ and $\delta^{18}O$ of dissolved and water oxygen should be given in tables suitable for web appendix if the paper is published.