

Interactive comment on “Carbon and nitrogen isotope variations in the water column of Lake Bled (NW Slovenia)” by A. Bratkič et al.

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Responses to the anonymous referee #1

We appreciate and accept the criticism of the referee and have revised the manuscript accordingly.

Major Comments: 1. Page 8526, line 18-21: Atmospheric CO₂ invasion is only possible when pCO₂ in water is lower than pCO₂ in the air. The authors have not demonstrated why this is possible by providing data for pH, CO₂, pCO₂, Chl a and primary productivity. Since the lake was significantly influenced by anthropogenic inputs and might have been a net sink for organic matter, this lake is not likely a sink for atm CO₂. It might be a sink for CO₂ during the summer algal bloom but in the remaining months

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with low temperature are expected to be a source of CO₂.

Many thanks for this remark – indeed by calculating the pCO₂ using pH, T and alkalinity data it was found that the lake is the net source of CO₂ during our sampling period. The following text was added on Page 8526 L 17 -: “In the epilimnium, isotopic composition of DIC was changed mainly due to photosynthetic removal of CO₂ and due to the temperature-dependent fractionation between HCO₃⁻ and dissolved CO₂ (Mook et al., 1974). Based on pH, T and total alkalinity data it was estimated that Lake Bled was supersaturated with CO₂ relative to the atmosphere and thus representing a source of CO₂.”

2. The authors did not provide an explanation on the lower C-13POC and higher DIC-13 at the bottom water in September than other months especially in December.

The text was modified on page 8526 L 24-30 as follows: “The decomposition of organic matter was more pronounced in September comparing to other months and was reflected in the highest DIC concentrations and the lowest δ¹³CDIC values. Bernasconi et al. (1997) and Lehmann et al. (2004) observed a similar decrease in δ¹³CDIC values, ranging from -4 to -6‰. Low δ¹³CPOC values between -33‰ and -36‰ determined at the bottom of water column in September and October and at the depth of 24 m in October, could also reflect the contribution of methanotrophs.”

3. Page 8530: line 15 to 19: The authors should explain why they expected the N-15 of NH₄ is lower than that of NO₃. If NO₃ is derived from NH₄, then the substrate (NH₄) should have the higher values. Unless NO₃ is used intensively as the substrate for denitrification.

The explanation is described by the following text on Page 8530 L 15-: “In addition, the isotope composition of ammonium should have lower δ¹⁵N values than nitrate, since ammonium in lakes is mainly derived from organic matter decomposition and it is thus expected that organisms using ammonia as a nitrogen source will have lower δ¹⁵N values than those using nitrate as a source (Teranes and Bernasconi, 2000).”

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Minor comments:

1. Please give the latitude and longitude of the location

The latitude and longitude are included in Table 1 with basic limnological features of the Lake Bled.

2. I suggest a table with major limnological variables be added to the MS. Such a table will give the readers a better understanding of the biogeochemical features of the study lake.

Table was added (included at the end of the comment).

3. Page 8517: line 22: "import" should be "important". Corrected.

4. Page 8518: line 20: spell out "OECD" "OECD" is spelt out in the following sentence Page 8518 L19-20: "According to Organization for Economic Cooperation (OECD) criteria it is classified as a mesotrophic lake (OECD, 1982)."

5. Page 8523: line 14: Figure 2 showed the lowest C-13POC in September but here it was said in August. The data from August were not presented in Figure 2, which is now marked in the sentence Page 8523 L 13-14: "The lowest values of $\delta^{13}\text{CPOC}$ and $\delta^{15}\text{NPN}$ (-35.7‰ and +0.8‰ were observed at 28 m in August (data not shown in Fig. 2)."

6. Page 8526: "utilized" should be "utilize" Corrected.

7. Page 8532: line 1: change "weather" to "whether" Corrected.

8. Page 8534: line 19: This reference should be Gu, B., and V. Alexander. 1993. Estimation of N₂ fixation based on differences in the natural abundance of ¹⁵N among freshwater N₂-fixing and non-N₂-fixing algae. *Oecologia* 96: 43-48.

The reference was added.

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Table 1. Basic limnological features of the Lake Bled in 2008 (Remec-Rekar and Bat, 2009).

Location		46° 23' N; 14° 07' E
Altitude	m	475
Area	km ²	1.438
Maximum depth	m	30.1
Average depth	m	17.9
Volume	Mio m ³	25.69 Mio
Retention time – natural	years	3.6
Retention time – after sanitation	years	-1.5
pH		7.09 (bottom) – 8.91 (surface)
Average phosphorous content	µg/l	11.0
Average inorganic nitrogen content	µg/l	350
Average Chlorophyll- <i>a</i> content	µg/l	3.9
Average transparency	m	6.6

Fig. 1.

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