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# *Interactive comment on* "Chlorophyll $a$ specific $\Delta^{14}$C, $\delta^{13}$C and $\delta^{15}$N values in stream periphyton: implications for aquatic food web studies" *by* N. F. Ishikawa et al.

**N. F. Ishikawa et al.**

ishikawan@jamstec.go.jp

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Dear the editors and referees,

We are grateful to the constructive comments from three anonymous referees on our paper. We also thank the associate editor Dr. Tom J. Battin for handling the manuscript. Below we responded to each of the referees' comments and described how we revised the manuscript. The numbers of page and line (e.g., P10L23) in our response are for the revised manuscript (please see also supplement file, the revised sentences are highlighted). We believe that the revised manuscript has been greatly improved in accordance with the referees' valuable suggestions. In case we disagree with a

specific recommendation, further explanations supporting our approach were made.

Sincerely,

Naoto F. Ishikawa

Responses to the comments from Referee #1

(RC: Referee comment; AC: Author comment)

(RC) The manuscript written by Ishikawa et al. reported chlorophyll a specific $\Delta$14C, $\delta$13C and $\delta$15N values in stream periphyton. The information is new and provides valuable insights on the study of stream food web. I have only some minor comments and questions to the authors.

(AC) Thank you for your valuable comments. Please see our responses to your comments below.

(RC) P.11096 l. 17 1-sigma of the measurement was 0.9 permil, which seems high especially for bulk analysis. I consider the "ultra-small-scale" analysis is required for chlorophyll a, but the authors can provide more precise data for other samples.

(AC) We revised the sentence as "The 1$\sigma$ analytical precision for both $\delta$13C and $\delta$15N measurements was within 0.2‰ for bulk and with 0.9‰ for chlorophyll a.". Please see P7L1-3.

(RC) P.11101 ll.10-16 The authors suggested two possible mechanisms explaining the difference in $\Delta$14C values between bulk and chlorophyll in terrestrial plants. However, both explanations are difficult to understand why chlorophyll has such an "old" signal, compared to the fact that $\Delta$14C value of bulk tissue is almost identical to that of ambient CO2. Especially, the latter mechanism is difficult understand. The $\Delta$14C value of chlorophyll will be higher than that of bulk tissue if the salvage pathway occurs.

(AC) We revised this paragraph explaining the differences in $\Delta$14C between bulk and chlorophyll a in Q. glauca. To support our explanation, two references (Trumbore and



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Zheng 1996; Koarashi et al., 2009) showing that soil organic carbon does not necessarily have modern carbon were added. Furthermore, we discussed that carbon in chlorophyll a molecule may be originated from various sources because its biosynthesis has multiple channels to acquire carbon. Please see P10L23-P11L8.

(RC) Section 3.5 Implications of this study: the authors concluded that the $\delta$13C and $\Delta$14C values of bulk periphyton can be used as a surrogate of those of photosynthetic algal community in periphyton, which seems a good news to many ecologists who are difficult to access the technique. However, the authors need to stress on potential advantages of the technique in the study of stream ecosystems, where the study was conducted. The final paragraph is rather easy to understand, but the manuscript focused on stream food web. I don't think a potential application to "less productive stream" (p.11102 l.15) is an attractive example. Need more explanations.

(AC) We revised section 3.5 to stress on potential advantages of chlorophyll specific isotope analysis for not only stream ecology, but also biogeochemical science. A brief note on pitfalls in the methodology was also added. Please see section 3.5.

End of responses to the comments from Referee #1

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/12/C6278/2015/bgd-12-C6278-2015-supplement.pdf

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Interactive comment on Biogeosciences Discuss., 12, 11089, 2015.