

Interactive comment on “Nitrate retention and removal in Mediterranean streams with contrasting land uses: a ^{15}N tracer study” by D. von Schiller et al.

D. von Schiller et al.

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We would like to express our gratitude to the referee for providing helpful comments and suggestions that we think have clearly improved the manuscript. The referee8217;s comments are repeated here and our responses are inserted after each comment.

General comments:

pg 3309: lines 5 to7: These are good lines and have been used often to argue for importance of local uptake. line19: is the 1996 date for Newbold correct?

Answer: Yes, it is correct.

pg 3310: lines 2 to 3: These lines are redundant with pg 3309, lines 5 to 7

Answer: The sentence has been removed.

pg 3311: lines 4 to 5: I can't stand these we are the first lines. That's not what's important. How would it read if you just deleted it?

Answer: The sentence has been removed.

line 24: Table 1 reference. Table 1 is packed full of results and the reader just isn't ready to see them yet. I suggest you make an independent table for the study sites (else a figure).

Answer: We have included a new figure (Fig. 1) in the revised version of the manuscript with the location and land use characteristics of the study sites. This figure clearly highlights the fact that the streams were closely located, and that the study reaches were bordered by contrasting land uses, although the catchments were mostly forested. Table 1 now includes only physical, chemical and metabolism characteristics of the study streams. Some variables (altitude, reach length, pool/riffle and dominant substrate type) have been removed from table 1, and results have been included as text in the study sites section of the revised manuscript.

pg 3312: line 16: replaced injected with released

Answer: Done.

pg 3317: line 21: Here you describe the KL values. These could be addressed statisti-

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cally in the among land use categories the same way you test day vs night differences. If you are concerned about the influence of velocity, you could normalize or compare proportional differences in KI with those suggested by velocity.

Answer: We have compared kW among streams the same way we did for day vs. night differences using the comparison of slopes method (Fowler and Cohen, 1990) and applying a Bonferroni correction. Results from all the comparisons are shown in the new Fig. 1 of the revised manuscript.

pg 3318: line 2: replace the final mean with average to avoid using the same word twice in a sentence

Answer: Done.

line 24: Thus the measure does not account for turnover.

Answer: Yes, correct.

pg 3319: lines 1 to2: probably need to clarify that this is done within a given stream (else you would have to do it with U instead of parsing k values).

Answer: We have changed the sentence to clarify this aspect.

line 17 8211; This line is misleading. It should say that we used the biomass 15N (B) as the source of labeled N that can contribute to regeneration (kREG). You can then model the amount of 15N in B using a longitudinal exponential decline.

Answer: We have changed the sentence following the referee8217;s suggestion.

line 21 8211; I m not following the restriction that the fractional uptake rate for am-

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monium ($k_w \text{NH}_4^+$) has to be less than or equal to $k_w \text{NO}_3$ because ammonium is a preferred substrate. Did you get the comparative operator backward? If ammonium is preferred, then uptake for ammonium should be larger, right? i.e., $k_w \text{NH}_4^+$ greater than or equal to $k_w \text{NO}_3$.

Answer: We checked the model used and confirmed that it was correct. However, as noticed by the referee we made a typo in the text. The sentence should read: uptake for ammonium (i.e., $k_w \text{NH}_4^+$) was greater than or equal to uptake for nitrate (i.e., $k_w \text{NO}_3^-$). This has been corrected in the revised version of the manuscript.

pg 3320: lines 3 to6: Consider the units for the slope of the regression line relating flux vs time. It certainly is not a velocity term. If you log transformed, did you use a natural log (i.e., \ln) in order to evoke a 1st order decay with time? If so, then you are looking at the proportional decline in the amount of 15N that fluxes out of the reach. The metric allows you to compare among streams, how rapidly a proportional change in tracer abundance occurs.

Answer: Following comments by this and previous referees we have changed the way we present the N export results in the revised version of the manuscript (see new Fig. 6).

lines 910: As a rule, I tell my students not to construct sentences that say a table or figure exists. Similarly, no sentence should simply describe the result of a statistical test. Instead, imbed those bits of information in lines that tell us something about the data.

Answer: The first sentence has been removed. Following the referee8217;s suggestion, this paragraph and other parts of the results section have been rewritten to be more concise and informative.

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lines 8 8211; 25: Consider the following trend. In this paragraph the following occurs: lowest, low, higher, higher, lower, low, moderately low, highest, highest. These are all comparative modifiers and require objects higher than what? There is a more accurate and informative way to describe these data.

Answer: Done (see previous comment).

pg 3321: line 9: standing stocks can't agree with metabolism. You're putting in data interpretation that requires a link between the nature of standing stocks and their assumed contribution to metabolic fluxes. Pull this part of the line.

Answer: The final part of the sentence referring to metabolism has been removed.

line 23: don't do this

Answer: The first sentence of the paragraph has been removed.

line 24 to 26: Here's where you could show the results from statistical assessment of KI across streams with a Bonferroni correction

Answer: Done.

pg 3322: line 3: Fig 1 8211; this isn't the way to show these results. This is what we do with raw data. Get a KI and a SE. Plot the day and night KI values and their errors as grouped bars. Use letters and superscripts to show difference with time within a stream or for across stream comparisons.

Answer: We have changed Fig. 1 in the revised version of the manuscript as suggested by the referee. Parts of the results section have been modified accordingly.

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line 4: Fig 2 8211; What about showing the forested stream results?

Answer: In our opinion, it makes no sense to show the results from the forested stream because there was no ^{15}N labeling in this stream. The tracer $^{15}\text{N}_2$ and $^{15}\text{N}_2\text{O}$ fluxes were below the detection limit, so the graph would appear as an empty space.

line 7: This is the sort of data analysis that the reader is looking for compared to higher or lower .

Answer: We have modified parts of the text in the revised version of the manuscript according to these comments.

line 18: By varied don t you really mean differed ?

Answer: We have changed 8220;varied8221; to 8220;differed8221;.

line 22: What does CBOM was relatively unimportant with respect to FBOM mean?

Answer: We have changed the sentence to clarify it.

line 26: produce data analysis more like that on line 7.

Answer: We have changed many parts of the results according to this suggestion.

pg 3323: lines 1 to5: I m not sure about the usefulness of the snail (limpet) data. The use of delta ^{15}N ratios with producers is not explained in the methods and really seems like a tangential assessment of food web relationships that is clearly not the focus of this work.

Answer: We included the snail data to show that the N was incorporated into the food

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web. However, we agree with the referee's comment that it is not the central focus of this manuscript. Therefore, we have decided to remove the snail data (methods, results, discussion and figure) from the manuscript. This has shortened the length of the revised manuscript without altering the main message of this study.

line 25: I Look at the slopes of these lines. They are the same! Doesn't that mean that stream uptake compartments are really similar in their N turnover even across these stream types. Accordingly, differences are related to abundance.

Answer: We have removed this sentence. In the new version of the manuscript the N export data have been reexamined and are presented in a more concise way.

pg 3324: line 6: Use of the term demand is confusing. Demand is defined as an urgent requirement. Which of the three metrics best describes this? I'm not sure. V_f is clearly not a good measure of demand. Instead, it represents mass uptake normalized to supply (i.e., U/C). It is really the best measure of efficiency. Newbold first referred to S_w as a measure of efficiency, but he was thinking of that in terms of space (i.e., efficiency of uptake with distance). I suggest that you replace nutrient demand with uptake efficiency here.

Answer: We may note that the interpretation of the metric V_f has changed much during the last years. We interpreted V_f as demand sensu Hall et al. (2002). However, following the referee's suggestion, in the revised version of the manuscript we have replaced nutrient demand for uptake efficiency (sensu Davis and Minshall, 1999) when we refer to the mass-transfer coefficient (V_f). This seems to be the preferred interpretation of this metric in recent studies (e.g., Mulholland et al. 2008). Although some attempts have been made to review the meaning of each of the uptake metrics (e.g., Webster and Valett, 2006), it would be interesting and necessary to retake this issue in order to unify the use of these terms in future studies,

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lines 10 to11: above and below are locations. Use greater than and less than .

Answer: We have substituted 8220;above8221; by 8220;greater than8221; and 8220;below8221; by 8220;lower than8221;.

pg 3325: line 1: Earl et al. 2006 is an excellent ref for this.

Answer: We agree with the referee. The reference 8220;O8217;Brien et al., 20078221; has been changed by 8220;Earl et al., 20068221;, because it is more appropriate for the content of this sentence.

lines 21 to22: Consider the U/C perspective. Greater (not higher) vf for NH4 results from a given uptake and a small C compared to NO3. Comparison of U gives the actual amount used. This may be closest to demand .

Answer: This is a good point. The exposed ideas seem reasonable and interesting; however, U has never been interpreted as nutrient demand in previous studies. We could add too much confusion if we interpreted it that way in this manuscript.

lines 13 to24: This isn t a very strong paragraph. Christensen et al. 1990 didn t work on your streams. Decide what points are being made a rewrite this.

Answer: The paragraph has been rephrased in the new version of the manuscript.

pg 3329: lines 1 to10: These lines should be pulled (see earlier comment regarding limpet results)

Answer: The lines have been removed. No limpet data appear in the new version of the manuscript.

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pg 3330: lines 16 to18: This really is an awkward way to describe these trends. Percent decline in labeled N export over a 72hr period was virtually identical among streams...etc.

Answer: The N export data are represented differently in the new version of the manuscript (see new Fig. 6).

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