Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2017-240-AC1, 2017

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Stable isotopes of nitrate reveal different nitrogen processing mechanisms in streams across a land use gradient during wet and dry periods" *by* Wei Wen Wong et al.

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Received and published: 13 November 2017

We thank the reviewer for the constructive comments.

Major comments:

(1) There was no correlation between the isotope values (both δ15N and δ18O) and the total amount of rainfall for 10 days before each sampling event as shown in Fig. 1. This kind of relationship might be expected for pristine environment, however for heavy anthropogenic-affected environment like the WP catchment; it is impossible to observe such correlation because of the dominance of other sources of nitrate. In this study,

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the condition of the soil (i.e. wet versus dry) in the catchment and the residence time of the rivers were affecting the occurrence and the extent of certain biological processes in the catchment and thus the isotope values of the residual nitrate rather than rainfall. We believe this has been shown nicely in the manuscript. The amount of rainfall in this study was used as a direct indicator of soil condition and residence time of the rivers, hence why the isotope data was grouped into wet and dry periods instead of the actual amount of rainfall. Fig. 1, however; is a strong evidence to show that the amount of rainfall had minimal effect on the isotope values in this study; supporting our contention on the insignificant direct contribution of rainfall amount to the overall nitrate dynamic in the catchment. Fig. 1 will be included in the supplementary information in the revised manuscript.

(2) Apportioning the contribution of multiple sources of nitrate using the suggested models requires a well-defined isotope values of the end members, accurate fractionation factors of the possible processes (i.e. denitrification and mineralisation) as well as the loads and rates of each possible source and process particularly for an emission model. Unfortunately, determining the fractionation factors of the processes was beyond the scope of this study. These models were not suitable in this study because there was significant overlapping of the end member nitrate isotope values as well as the lack of information on the rates of different types of fertiliser applications. Hence, only a qualitative assessment of the sources was presented in this study.

(3) We agree with the reviewer and will include more detailed comparisons to studies with similar findings in the revised manuscript.

(4) Individual samplings within the same stream did not provide sufficient data points for the interpretation on the processes governing the isotope values of the residual nitrate in the streams. For example, at Watson creek only three samples were obtained during each sampling trip. We are not confident to deduce any findings based on that even though the isotope biplot or the keeling plots for some of the sampling events showed significant correlations.

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All the minor comments will be addressed in the revised manuscript.

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2017-240, 2017.

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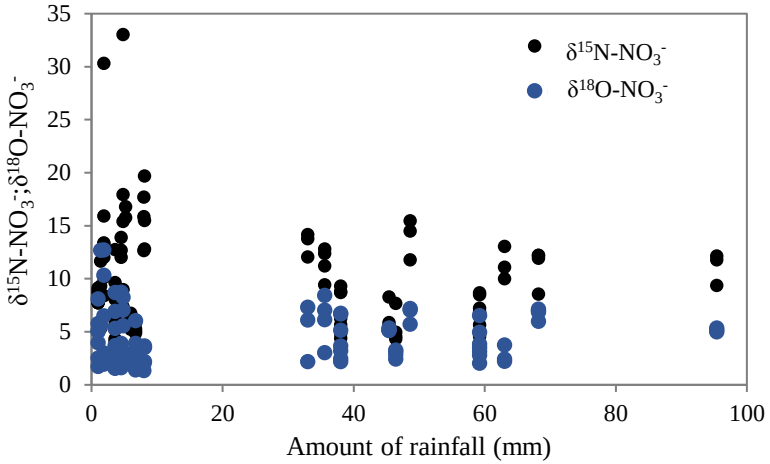
Figure 1: Relationship between (a) δ^{15}N-NO_3-; (b) δ^{18}O-NO_3^- of the streams and the total amount of rainfall for 10 days before the sampling event.



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