

## Comment on bg-2022-30

Anonymous Referee #1

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Referee comment on "Tracing the source of nitrate in a forested stream showing elevated concentrations during storm events" by Weitian Ding et al., Biogeosciences Discuss., <https://doi.org/10.5194/bg-2022-30-RC1>, 2022

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This manuscript investigated the source of nitrate exported from a forested watershed in Japan during 3 summer storm events using hydrologic, nitrate concentration, and nitrate isotope data. The results indicate that nitrate concentrations increase during storm events as the result of the flushing of soil nitrate that accumulates in soils near the stream between storm events. The manuscript is solid; the writing is generally clear and the interpretations are generally supported by the data. My main suggestion for improvement is for the authors to do a more thorough job of putting their results in the context of prior studies on this topic. For example, Sebestyen et al. 2019 (ES&T) and the references it contains address a similar issue as this manuscript (e.g. Buda et al. 2009 and Sabo et al. 2016 both sampled storm events), and this manuscript could do a more throughout job of using those studies to help justify this study (in the Introduction) and then comparing/contrasting the results of this study to those studies in the Discussion. Similarly, oher studies (Burns et al. 2009; Barnes et al. 2010; Bostic et al. 2021) have addressed similar questions in non-forested systems and could be useful for helping to provide a broader context for the results that are presented in this manuscript.

### Specific comments

Title: "Enriched" is a word that is often used incorrectly in the isotope literature to refer to increased values of the heavier isotope. Here I believe the authors use "enriched" to mean increased nitrate concentrations, which is might cause confusion given that this paper also talks about isotopic enrichment (e.g lines 66 and 303). One solution might be to simply delete "enriched" from the title and another solution might be replace "nitrate enriched" in the title with something like "elevated nitrate concentrations".

Lines 2-3: This sentence implies that nitrate concentrations always increase in temperate forest streams everywhere. Is that true? If not, perhaps slightly adjust this sentence. For example, do some severely nitrogen saturated forests that show higher NO<sub>3</sub> concentrations in baseflow than stormflow?

Line 5: Please tell the reader what time of year (winter, spring, summer, autumn) these storm events occurred.

Line 6: It might be helpful to insert "increasing" before "from" to help the reader understand that the "variation" nitrate concentration that was observed was primarily an increase in concentrations.

Line 14: I believe "(d<sup>15</sup>N, d<sup>18</sup>O, and C<sup>17</sup>O)" can be deleted without sacrificing meaning.

Line 26-27: Could the authors support this claim by calculating annual export of NO<sub>3</sub>-atm (and NO<sub>3</sub>-terr) using their concentration and flow data?

Lines 26-30: Is this conclusion specific to the author's study site (or certain types of forests) or are they suggesting that is a more broad/general conclusion that applies to forested catchments everywhere?

Line 33: "representative" of what? Please clarify.

Line 50: First, how are the authors using "overland flow" here and elsewhere (e.g. line 463) in the manuscript? My understanding is that overland flow is unlikely in areas that are not near channels or stream/riparian areas in forests except for unique situations, such as intense rain events or rain that occurs on frozen soils. Second, I don't believe either of the cited studies suggest that overland flow is a mechanism for direct supplier of atmospheric nitrate to stream water. As far as I recall, Kaushal et al. didn't show overland flow for their forested site and Sebestyen et al. talked about routing of NO<sub>3</sub>-atm along flow paths that allowed NO<sub>3</sub>-atm to bypass uptake/processing (but not specifically about overland flow).

Line 72: Is beta completely constant or can it exhibit some variation around 0.5279? If so, does the variation affect the authors data analyses or interpretations?

Lines 162-164: It seems like there would be potential for microbial alteration of the samples during the 1-2 weeks that they stayed in the field before being returned to the

lab. Did the authors assess this?

Lines 184-185: How many "local laboratory nitrate standards" were used and what are their isotope values?

Lines 205-206: What data were used to calculate the reported standard error of the mean for each isotope? For example, was precision determined from the lab standards, replicate samples, or something else?

Line 226: How was the error range "allowed"?

Line 279: I believe "events" should be singular.

Line 353: I suggest inserting "primarily" or "likely" before "responsible" here and elsewhere that this conclusion is presented. The soil and stream data the authors are using come from different years as they describe on lines 318-342, so I think the conclusion on lines 351-354 should be considered tentative.

Lines 389-390: Please indicate which symbols indicate upland samples and which indicate riparian samples.