Author replies are indented and italicized.

Reviewer 2:
General comments

The manuscript “Downpour Dynamics: Outsized impacts of storm events on unprocessed atmospheric nitrate export in an urban watershed” by Bostic et al. expands on the existing literature using triple isotopes of nitrate to partition storm event loads into atmospheric and terrestrial fractions. The main finding is that stormflow exports more atmospheric nitrate and baseflow exports more terrestrial nitrate in an urban watershed and there is not much difference in a non-urban watershed. This is not necessarily a surprising finding, but the results are described well and presented with interesting and unique figures with the data to support them. I think the strength of the paper is in its comparative nature. While a few others have used D17O to partition loads into terrestrial and atmospheric fractions, it is exciting to see how these relative partitions vary between comparable urban and non-urban watersheds. I think this paper would benefit from a few more citations particularly in the methods section to further differentiate it from other work in the field.

Specific Comments

Lines 39-42: I don’t know if it is still correct to say that export is rarely partitioned into atmospheric and terrestrial sources. It is an important part of the literature, and this study adds to the cumulative knowledge in this area, but I wouldn’t frame it as something no one else has done.

> *We agree that many prior studies have partitioned nitrate into atmospheric and terrestrial sources. Our intention was to highlight that such partitioning is less commonly done during storm events. We have revised the sentence as follows:*
>
> > *“Exported loads of individual NO3 sources (e.g., atmospheric NO3-) are less often quantified during storm events than routine baseflow samples, however (Divers et al., 2014; Sabo et al., 2016).”*

Lines 59-60: I would caution against referring to D17O as triple oxygen isotopes. While three isotopes are relevant to the measurement of D17O so the method is sometimes known as triple oxygen isotope analysis of nitrate (Kaiser 2007), but the resulting value for D17O itself is not triple. D17O values could also be called the 17O anomaly (Michalski 2003). To add to the confusion, the way you are using these isotopes for quantifying loads is often referred to as triple nitrate isotopes, where D17O is one of the three isotopes along with d15N and d18O (Liu et al 2013, Hale et al 2014, Rose et al 2015). To minimize

confusion here and throughout the paper, I would keep it as either “D17O values” or “triple oxygen isotope analysis.”

Thank you for this suggestion. To reduce potential confusion, we will replace the two instances of “triple oxygen isotopes” in the manuscript with “oxygen isotopes” and then use the abbreviation of “D17O” in the remainder of the manuscript.

Line 79: What are "moderate frequency samples"? There is no reference point for the time interval.

Thanks for this comment. The sentence has been changed to:

> *“To address these research questions, we collected moderate-frequency (45 minute – 12 hour) streamwater samples before, during, and after eight rainfall events, bulk rainfall samples corresponding to these events, as well as monthly baseflow samples, in two catchments within the broader Chesapeake Bay watershed.”*

Line 101: 45 minutes to 12 hours is a very wide range of sampling intervals. Is this the average among events with widely different sampling intervals, or does this change within a given event?

The sampling frequency did sometimes change within a given event. For clarification, we will add a supplementary table that includes relevant information (sample date, time, discharge, nitrate concentrations and isotopes, water isotopes) to your question. Sampling intervals were generally shorter during the beginning of an event (i.e., the rising limb) and the interval was longer later in the event (i.e., the falling limb). The longest sampling interval (12 hours) was associated with the slowly falling limb of a large event.

Lines 166 – 170: I am not sure what traditional methods you are referring to. Maybe a citation or two would help. The other papers I have seen that quantify NO3 loads use the discharge that corresponds with each individual grab sample (ie Hale 2014).

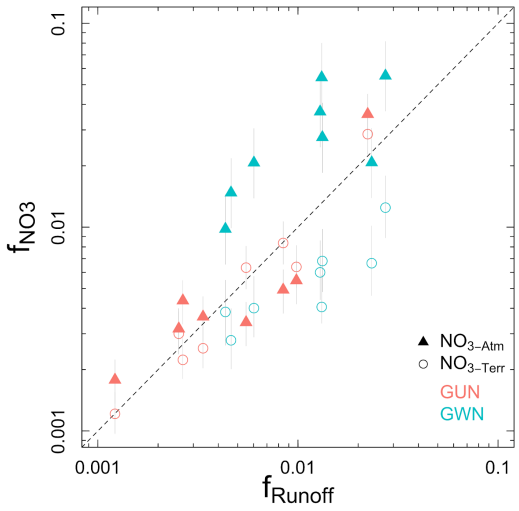
Thanks for your suggestion to clarify the methods we are referring to. We have changed the sentence to:

Line from our paper to edit: To assess potential bias in $NO_3^-{}_{Atm}$ load quantification between our method (i.e., multiple samples collected during a storm event; eq. 5) and methods in which a single sample is collected, we used the mean daily discharge multiplied by $NO_3^-{}_{Atm}$ concentrations of each individual grab sample collected during a particular event.

Lines 222-223: The fractional export plot seem like a very interesting method. Could you add a few citations for other that have used this, unless you are the first?

After a literature search, we are unaware of others who have used a scatter plot in this same method. Just because we are unaware we do not claim to be the first, however.

Figure 2: I would recommend using open and filled circles/triangle for your two sites. With the colors as they are, they will both print grey in black and white. Also, is each point a single storm event? It is a bit confusing to have both NO3 atm and NO3 terrestrial plotted as they are directly inverse of each other.



Thanks for your suggestion. We have changed this figure so that circles are filled and triangles are open. Each point is a single storm event. We included both NO3-Atm and NO3-Terr to show the differences in export behavior.

Figure 3: Event mean does gloss over the changes in source load within a given event. Though I suppose it is necessary for the 1:1 comparison with baseflow for this plot. Might be worth discussing in the body of the text though.

Figure 3 was produced to demonstrate the changes between baseflow and event mean concentrations/event mean values. This manuscript focused on event mean

concentrations/values and loads relative to baseflow as opposed to intra-storm variation.

Line 16: Spell out 8

"8" is now spelled out as "eight"