EGUsphere, referee comment RC1
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Comment on egusphere-2022-717

Anonymous Referee #1

Referee comment on "Stable isotopic evidence for the excess leaching of unprocessed atmospheric nitrate from forested catchments under high nitrogen saturation" by Weitian Ding et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-717-RC1, 2022

The submitted manuscript by Ding et al. reports nitrogen and oxygen isotopes of nitrate from two forested catchments with elevated stream nitrate concentration over two years. The authors combined their results with the 17O excess of nitrate in precipitation from one site to calculate the proportion of unprocessed atmospheric nitrate into streams, i.e., Matm/Datm ratio, and used this ratio to assess N status for forest ecosystem by comparing with one nearby forested catechment but with low stream water nitrate concentration, and other 8 forests where Matm/Datm ratio in the world can be calculated. The authors proposed that Matm/Datm ratio can be more robust index for assessing N status compared to stream nitrate concentration. This is because stream water nitrate concentration can be diluted by high precipitation and groundwater recharge. Their results show that the study forested catchment had highest nitrate concentration in stream water among the 11 sites, and highest Matm/Datm, as well. In addition, the authors found that there were good relationships among stream water nitrate concentration, Matm/Datm ratio, nitrate deposition. The authors concluded that Matm/Datm should be used as a more reliable index for evaluating the progress of nitrogen saturation because the Matm/Datm ratio is independent from the amount of precipitation. This conclusion can be well supported. The manuscript was clearly written.

I have one major concern about Matm/Datm ratio as an index for evaluating N saturation. We definitely can observed low Matm/Datm ratio if a forest is N limited and almost all precipitation nitrate is biologically processed. However, there are two exceptions. One is high precipitation may cause high Matm/Datm ratio due to limited contact time of precipitation nitrate with soil microbes and roots. The other is high soil nitrate production (gross nitrification rate), which can dilute of 17O of precipitation nitrate that reachs the soil. It will be wonderful if the authors have more discussion on these two factors.

Another concern is about 17O of precipitation nitrate used in the calculation of Matm/Datm ratio in the study. The streamwater samples for the three forested catchments were collected in 2019 to 2021, while 17O of precipitation nitrate used in the calculation was

from the site Sado island in central Japan during 2009 to 2012. So the space and time both were mismatched between stream water sampling sites and precipitation sites. So it is better that authors justified the mismatch. In addition, the average of 17O in precipitation nitrate were used. However, there are a number of studies reporting highly seasonal variation of 17O in precipitation nitrate. I would like to see some discussion on the uncertainties involved with the sampling.