

bg-2020-285

### Comments by Reviewer 3

Dear Editor,

the named study is a valuable contribution. I support publication. Please find my review below:

The study by Rohe et al. is well written and sheds light on a timely topic, namely the role of fungal denitrification in N<sub>2</sub>O production. Though the results are limited to arable soils, the study has been devised wisely and brings together state-of-the-art methods. It is a valuable contribution to the scientific community and well suited for a journal like BG.

I support publication and have only minor comments, which are given below.

Title

ok

Abstract

L41: the term in brackets doesn't add additional information on the mapping approach. I suggest deleting the brackets.

L45: units unclear. I guess this is the fraction, but for clarity I suggest converting in % at this point.

Introduction

L62: describes is inappropriate. I suggest: Denitrification is the stepwise reduction of nitrate to ...

L70: sentence is incomplete: I guess it was ...performing respiratory denitrification produce substantial amounts of N<sub>2</sub>O.

L118: I don't agree that the interpretation is more complex. In situations in which oxygen exchange with water is complete, this stabilizes δ<sup>18</sup>O-NO<sub>3</sub>, since the <sup>18</sup>O in water is more stable than in a nitrate pool that is replenished and consumed through nitrification and denitrification. Thus, an assumption of a constant endmember value becomes possible, which has helped immensely with regard to SP <sup>18</sup>O-mapping. Please work out that exchange may stabilize <sup>18</sup>O-NO<sub>3</sub>.

Materials and Methods

L191: the term "substrate induced growth inhibition" is confusing. Please clarify in how far substrate and not inhibitor is responsible for limiting growth.

L282-291: How FFD<sub>mi</sub> is calculated depends on how well the calculated D of eq 1 and the measured D agree. In other words, at this point of the manuscript, one cannot assess if eq. 3 makes sense because D could be the sum of remaining N<sub>2</sub>O due to nitrification, uninhibited fungal denitrification, uninhibited bacterial denitrification and abiotic processes. Due to the experimental setup, nitrificatory contributions and abiotic processes are likely to have little relevance, which is in agreement with the author's notion. But that's also why I don't understand why the denominator is A-D and not A. Why is it more sensible to calculate fungal contribution to denitrification with microbial inhibition compared to inhibitable fungal denitrification ((A-C)/A)?

L306: Please also give the mean SP<sub>BD</sub> value, why is only the range given in contrast to SP<sub>FD</sub>?

L318-324: section is unclear what values were fitted? Please clarify

Results

Section 3.1: Based on Eq. 1 and 2, the production rate in  $A = B+C-D$ . This should be used as a quality criterion for the assumptions met. From table 2, it seems that the assumptions made in deriving Eq 1 and 2 were not valid for N<sub>2</sub>O production rates. I suggest including the term B+C-D in table 2 and present this as result as well.

Discussion

L632: distribution or community? Please clarify.

L780: please define ap.

L821: larger instead of “smaller than the SPn2o range ...