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Biogeosciences Discussions

Interactive comment on "Assessment of the importance of dissimilatory nitrate reduction to ammonium for the terrestrial nitrogen cycle" *by* T. Rütting et al.

N. Wrage (Referee)

nwrage@gwdg.de

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The manuscript 'Assessment of the importance of dissimilatory nitrate reduction to ammonium for the terrestrial nitrogen cycle' by Rütting et al. nicely summarises current knowledge about dissimilatory nitrate reduction to ammonium (DNRA), which has been found to be the dominant nitrate (NO3-) consumption process in some soils, but which has largely been ignored in studies of terrestrial N cycling. That DNRA may lead to the conservation of N in the soil and reduce losses in gaseous form or as leached nitrate is another reason for keeping this important process in mind, also against the background of global changes, as the authors point out. I find the manuscript well written, concise

and very informative. The reader needs to stay focussed to grasp the contents, but is rewarded with a good overview over DNRA. My criticism focusses on two points (for more technical and editorial issues, see specific comments below): First of all, I am missing a clearer description of the two mechanisms of DNRA that are mentioned (e.g. page 1171, l. 18-22). A small figure showing the pathways and involved enzymes would help to make the subject of this review clearer. Secondly, it would be nice for the reader to get a better idea of the important influencing factors. If a meta-analysis is not possible, a table summarizing the results discussed in Part 2 and 5 could grant a better overview of conditions and fluxes. I could imagine this also to be an extension of Table 1, with additional information on conditions and identified main factors. The outcome of this should then also be included in the abstract, which so far mentions redox status and the C/NO3- ratio as important, without saying in which direction they act. To sum up, I find this an important and well-written manuscript that could be slightly improved, but that definitely merits publication.

Specific comments:

1. p. 1170, l. 20/21: suggestion: 'due to newly discovered processes and the finding that various groups of...'

2. p. 1171, l. 7: NO3-

3. p. 1171, l. 13: '...N form that...' (as it is defining information)

4. p. 1171, l. 17: Start new paragraph after 'fixation', including more information abouth the two mechanisms and sets of enzymes.

5. p. 1171, l. 23 – p. 1172, l. 1: I was at first a bit confused by this information as it seemed contradictory that the numbers for potential free energy of total denitrification are more negative than for DNRA, but you state later that the potential free energy is larger for DNRA than denitrification – per NO3-. Maybe you can add above (1171, l. 23) whether this is per mole of NO3- or N2.

6. p. 1174, l. 13: suggestion: '...DNRA or effects of soil rewetting'

7. p. 1174, l. 29: 'of DNRA exist'

8. p. 1177, l. 5: Add comma after 'batch culture'

9. p. 1177, l. 20: Add comma after 'this'

10. p. 1178, l. 6: 'genus worldwide that...'

11. p. 1178, l. 8: Remove comma after 'strains'

12. p. 1178, l. 15: 'newly'

13. p. 1178, l. 24: 'Microorganisms that'

14. p. 1178, l. 25: 'accumulators that'

15. p. 1179, l. 7: 'inoculating'

16. p. 1179, l. 15: 'denitrifiers'

17. p. 1179, l. 20: 'accumulators'

18. p. 1179, l. 24: I would find a reference to the introduction nice at this point.

19. p. 1182, l. 2: 'different soil depths'

20. p. 1184, l. 1-3: Where is this shown in Table 1, especially the link with the application of the 15N tracing model?

21. p. 1184, l. 13-14: suggestion: 'performed DNRA and heterotrophic nitrification simultaneously'

22. p. 1185, l. 4: 'alternative'

23. p. 1185, l. 15: 'global change'

24. Part 6: Maybe you could in this part also discuss aspects like the influence of global

changes on the C/NO3- ratio or drier soil conditions, and potential effects on DNRA.

25. Fig. 1: It is 'SOM' in the figure, but 'SON' in the caption. I guess it is 'SON' you want here...

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