

Interactive comment on “Denitrification in soil as a function of oxygen supply and demand at the microscale” by Lena Rohe et al.

Anonymous Referee #2

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Denitrification process is of critical importance because it is closely related with agricultural sustainability, environmental quality, and human health. However, the denitrification process in particular N₂O/N₂ generation and emission is poorly understood at microscopic scales. This study provides very useful information towards understanding the complete denitrification process with X-ray CT imaging analysis, and gives new insights how the N₂O and N₂O+N₂ are formed in soils at microscopic scales.

Major issues/concerns

The authors selected two different land use types of soils when investigating soil organic matter contents. The grassland soil has a SOM up to 4.5%, much higher than that of arable soil. I feel that it is difficult to compare the denitrification process between soils with different land use types. The authors had better use arable soils with differ-

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ent gradients of SOM to investigate the effects of SOM on the complete denitrification process.

It is unclear why the authors set up these three different water saturation (70, 83 and 95%). The 60% water saturation is widely used when setting up the soil microcosm experiments. I feel that 60% water saturation is needed as the control when setting up the gradients of water saturation experiment in this study. Moreover, the flooded paddy soils are widely distributed all over the world, in particular Asian areas. The authors had better include such kind of soil in their experiments to gain a full picture of water saturation effects on the complete denitrification process. The flooded paddy soil usually has a low N₂O emission but a high N₂ emission. It may be an excellent material when investigating the effects of water saturation on the complete denitrification.

The authors have shown very detailed information in Results section. However, it is difficult for reader to follow in this section. So the authors need to improve this section and lead the readers to pay attention to their important findings.

The authors showed their results based on different gradients of distance, water saturation and so on. I feel that they need to show their results with incubation time, at least in supplementary files. They should clarify why they show the results of a specific incubation time in the main body of this manuscript.

Minor issues/concerns

P4 L119: delete the comma after N₂O.

P5 L150-151: is added nitrate amounts equal for each treatment?

P24 L630-633: please clarify this sentence.

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