

The diversity of the N2O reducers matters for the relative proportion of N2O emitted across cropping systems by denitrification

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Diversity of N₂O reducers matters for the relative proportion of N₂O emitted across cropping systems by denitrification

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Agriculture is the main source of terrestrial emissions of N_2O_1 , a potent greenhouse gas and the main cause of ozone layer depletion. The reduction of N₂O into N₂ by microorganisms carrying the nitrous oxide reductase gene (nosZ) is the only biological process known to eliminate this greenhouse gas. Recent studies showed that a previously unknown clade of N₂O-reducers was related to the capacity of the soil to act as an N₂O sink, opening the way for new strategies to mitigate emissions. Here, we investigated whether the agricultural practices could differently influence the two N2O reducer clades with consequences for denitrification end-products. The abundance of N₂O-reducers and producers was quantified by real-time PCR, and the diversity of both nosZ clades was determined by 454 pyrosequencing. Potential N₂O emissions and potential denitrification activity were used to calculate the N₂O emission ratio. Overall, the results showed limited differences between management practices but there were significant differences between cropping systems in both the abundance and structure of the *nosZll* community, as well as in the N₂O emission ratio. More limited differences were observed in the nosZI community, suggesting that the newly identified nosZII clade is more sensitive than nosZI to environmental changes. Potential denitrification activity and potential N₂O emissions were explained mainly by the soil properties while the diversity of the nosZII clade on its own explained 26 percent of the proportion of N2O emitted, which highlights the importance of understanding the ecology of this newly identified clade of N₂O reducers for mitigation strategies.