Geophysical Research Abstracts
Vol. 15, EGU2013-10293, 2013
EGU General Assembly 2013

Isotope effects and O-exchange with water during N2O production by denitrifying fungi

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N_2O from soil denitrification originates from bacteria and - to an unknown extent - also from fungi. In pure culture studies, bacterial and fungal denitrification showed differences in isotopomer ratios of N_2O. Isotopomer ratios of N_2O can be expressed as ^{15}N site preference (SP), i.e. the difference between $\delta^{15}N$ of the central and terminal N-position of the asymmetric N_2O molecule and might be suitable to distinguish between bacterial and fungal N_2O under denitrifying soil conditions.

Oxygen exchange takes place between H_2O and intermediates during the denitrification process. Several studies showed that O-exchange of bacterial denitrifiers varies, but information about fungal O-exchanges is lacking.

The objectives of the study presented are i) to verify SP of fungal N_2O reported for two strains from pure culture studies and ii) to analyze the oxygen exchange between intermediates and H_2O during denitrification in fungal pure cultures. Six different fungal pure cultures known to be capable of denitrification were incubated under anaerobic conditions, either with nitrite or nitrate. Gas samples were analysed for concentration and isotopic signatures (SP, average $\delta^{15}N$, $\delta^{18}O$) of N_2O. To investigate the oxygen exchange, both treatments were also established in a tracer experiment where ^{18}O-labelled water was used in the medium.

The fungal strains evaluated so far indicate similar SP as reported previously. Concerning the amount of N_2O produced, the nitrite led to a higher yield than nitrate.

O-exchange with ^{18}O-labelled water during fungal denitrification was visible. Using nitrite, the exchange ranged amounted from 39% to full exchange while nitrate led to exchange rates between 13% and full exchange. Detailed results will be presented.