Geophysical Research Abstracts
Vol. 12, EGU2010-5155-1, 2010
EGU General Assembly 2010

Hybrid N_2O production in a soil due to codenitrification of NH_2OH

Oliver Spott and Claus Florian Stange
Helmholtz Centre for Environmental Research, Soil Physics, Halle/Saale, Germany (oliver.spott@ufz.de)

It was shown by only a few studies that hydroxylamine (NH_2OH) can be co-metabolically introduced into the reaction pathway of denitrification (i.e. codenitrification) resulting in hybrid N_2O production (due to the binding of NH_2OH-N and NO_2^--N) concomitant to commonly denitrified N_2O. Up to now a hybrid N_2O formation by codenitrification was only evidenced on microbial species level (most of them known as common denitrifiers; e.g. *Pseudomonas spec.*), but was never reported to occur in terrestrial environments.

Based on a ^{15}N tracer experiment N_2O release of an anaerobically incubated soil suspension (black earth soil; Haplic Phaeozem) was studied with respect to the addition of NH_2OH and/or NO_3^- under non-sterilized and sterilized conditions. In fact, it could be evidenced for the first time that hybrid N_2O was effectively produced in a soil due to a co-metabolic denitrification when both NH_2OH and NO_3^- (mol ratio 10:1) were applied. By contrast, no hybrid N_2O production occurred when a sterilized soil suspension was used or in the absence of NO_3^-. By means of a new ^{15}N-aided mathematical approach the total soil N_2O release in the presence of $^{15}NO_3^-$ and NH_2OH could be differentiated into three different pathways related to (i) abiotic NH_2OH decomposition, (ii) denitrification, and (iii) codenitrification. With respect to the calculated contribution of each considered N_2O source (i-iii) it follows that that codenitrification was in general the prevailing pathway of soil N_2O production. However, even if codenitrification was provoked by the addition of NH_2OH it can be concluded that the used black earth soil has potentially the capability to perform codenitrification, i.e. inhabits denitrifying species which allow both denitrification and codenitrification.