



Towards a more detailed study of the nitrous oxide production by ammonia oxidizers

Ping Han (1), Dongyao Sun (1), Mengyue Zhao (1), Lijun Hou (2), and Min Liu (1)

(1) School of Geographic Sciences, East China Normal University, Shanghai, China , (2) State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, China

Autotrophic ammonia oxidation, the first and rate limiting step of the nitrification process, is catalyzed by three phylogenetically different groups of microorganisms: ammonia-oxidizing bacteria (AOB), ammonia-oxidizing archaea (AOA) and the recently discovered complete ammonia oxidizers (Comammox) that as single organism oxidizes ammonia to nitrate via nitrite. Studies have shown that all sorts of ammonia-oxidizing microorganisms could produce nitrous oxide (N₂O), biologically or via abiotic reactions during ammonia oxidation. Here we conducted a detailed study regarding the N₂O production by ammonia oxidizers under various conditions. Results showed that among the three tested ammonia oxidizers, Comammox Nitropsira released the highest amount of N₂O, suggesting that Comammox might be a quite overlooked contributor to the gross N₂O production in terrestrial environment. Unexpectedly, the tested AOB strain produced the least N₂O, which could be explained by the absence of genes for “nitrifier denitrification” in its genome. Results collectively indicated a more dynamic and complex mechanism of ammonia-oxidizer mediated N₂O production than previously reported.