



Using stable isotope enrichment approaches to determine the significance of nitrifier denitrification as a soil source of nitrous oxide

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Nitrous oxide in the atmosphere is an important greenhouse gas, and is as such included in predictions of future climate scenarios. The ability of soil ammonia oxidising bacteria to denitrify (nitrifier denitrification) has recently been discovered, but the involvement of this process in N₂O production in soils has been ignored to date mainly due to problems in its determination. Increased understanding of the significance of this new pathway is critical for the development of appropriate mitigation strategies for N₂O.

We have adopted and further developed a ¹⁵N-¹⁸O stable isotope approach to quantify N₂O production during nitrifier denitrification in soil. This has facilitated the first determinations of the contribution of nitrifier denitrification to N₂O emissions from soils under different environmental conditions, and these results will be presented here. Nitrifier denitrification is demonstrated to occur in soils under a wide range of environmental conditions, supporting indications from our physiology experiments that the ability to undertake nitrifier denitrification may be a universal trait in the betaproteobacterial ammonia oxidising bacteria. Thus this process may be much more important in soil N cycling than originally thought.