Comparison of Eq. [3] and [6] would resolve whether or not the equilibrium assumption is valid. Since the authors have put considerable effort into the development of methodology that looks promising, it would be a pity to proceed with a time-consuming field trial without first resolving this issue. They have nothing to lose and everything to gain by trying.

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References


Reply to “Differences in Nitrogen-15 Enrichments of Evolved Nitrous Oxide and Dinitrogen and the Question of a Uniform Nitrate-15 Pool”

In response to Dr. Focht’s comments concerning our paper (Mulvaney and Kurtz, 1984), we would like to point out first of all that the work reported in this paper was designed with two objectives in mind: (i) to establish trends in evolution of N2 and N2O associated with the wetting and drying of soils, and (ii) to assess the relative significance of nitrification and denitrification as sources of the N2O evolved from NH4-fertilized soils. The procedures we employed in this work for analysis of N2 and N2O provide information concerning the 15N enrichments of the N2 and N2O evolved from soils treated with 15N-labeled fertilizer (see Mulvaney and Kurtz, 1982; Siegel et al., 1982), and we included some of these results in our discussion of the uniform nitrate-15 pool.

We acknowledge that our procedures for analyzing N2 and N2O are based on the assumption that the N2O evolved can be considered to exist in a single pool which is isotopically uniform. Work on this subject is currently in progress in our laboratory.

We find it difficult to understand why Dr. Focht objects to our procedures. We appreciate the fact that Dr. Focht took the time to read our paper because the work reported in this paper was designed to determine whether and when this assumption holds for a single pool which is isotopically uniform. There are several other possibilities, however, for why the enrichments of N2 and N2O evolved during denitrification in soils could differ, and we mentioned one of them in our paper. We realize that further work is needed to establish whether the NO3 denitrified in soil has the same 15N enrichment of the N2O evolved during denitrification and should, therefore, have the same ratio difference.

We concur with Dr. Focht’s view that further work is needed to establish whether the NO3 denitrified in soil has the same 15N enrichment of the N2O evolved during denitrification and should, therefore, have the same ratio difference.

\[ \Delta r' = \frac{30N_{2,\text{sample}}}{28N_{2,\text{sample}} + 29N_{2,\text{sample}}} - \frac{30N_{2,\text{std}}}{28N_{2,\text{std}} + 29N_{2,\text{std}}} \]

be measured before and after dilution of the N2O-evolved gas. Unfortunately, this measurement would be performed before dilution of the N2O because our equipment is designed to allow quantitative transfer of NO3 into the sample (see Note 1) and excessive dilution of the N2O sample (see Note 2). Moreover, both measurements must be performed on the same sample of N2O because the apparatus described by Mulvaney and Kurtz (1982) is not designed to allow quantitative transfer of NO3 into the sample (see Note 3), the major collector (which collects the beams), the minor collector (which collects the minor beam) has a higher input resistance than the electrometer connected to the major collector (which collects the beams) of the mass spectrometer or dilution of N2O to N2 because of insufficient memory effects during isotope-ratio analysis and recovery of N2O-N.

Notes

1. Most isotope ratio mass spectrometers have limited significance without further information concerning the isotopic uniformity of the NO3 pool undergoing reduction to N2O.