

The $\delta^{15}\text{N}$ and $\delta^{18}\text{O}$ values of soil emitted N_2O from a New Zealand pasture amended with lactose-depleted dairy factory effluent and urea – preliminary results.

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Introduction

Lactose extraction at NZ dairy factories has resulted in dairy factory effluent that is lactose (carbon)-depleted (LD-DFE). More information is currently required on the fate of nitrogen in LD-DFE irrigated onto land with respect to decisions in environmental management and future resource consent hearings. The N_2O emitted from soils via nitrification and denitrification produce different isotope signatures with the highest $\delta^{15}\text{N}$ and $\delta^{18}\text{O}$ values resulting from denitrification. This specific study presents some preliminary data of the influence of LD-DFE on the $\delta^{18}\text{O}$ and $\delta^{15}\text{N}$ values of emitted N_2O from a NZ pasture soil.



Figure 1. Collecting gas samples using the closed chamber technique.

Methods

Data was collected in December 2003 from the LD-DFE lysimeter experiment at Lincoln University (Lincoln, NZ). The study is part of a larger project examining the fate of N in LD-DFE in a “grazed” pasture system (with urine inputs), i.e. soil N losses through leaching, denitrification, plant uptake and immobilisation in the soil. Headspace gas samples were collected using a closed chamber technique (Fig. 1). Samples were then analysed to determine the $\delta^{18}\text{O}$ and $\delta^{15}\text{N}$ value of the soil emitted N_2O .

Results

The initial results indicated that the isotopic signatures were comparable to those of other pasture soils (Bol et al. 2003). The isotopic content of emitted N_2O varied between field samples taken during the first five days after the LD-DFE additions and those collected later (after 14 days), pointing to a possible shift in the production pathway or source of the emitted N_2O .

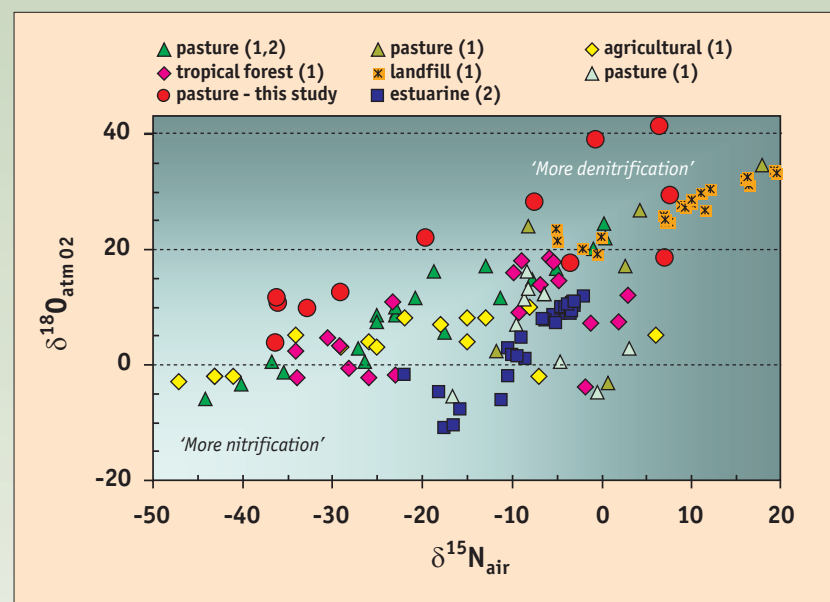


Figure 2. Relationship between $\delta^{15}\text{N}$ and $\delta^{18}\text{O}$ values of emitted N_2O in various agricultural and other soil systems

(1), (2) = Reference number from which the data was compiled

References

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Acknowledgements

We are grateful to Fonterra Cooperative for funding of the main lysimeter experiment.

R. Bol thanks the OECD for the fellowship award. IGER is grant aided by the Biotechnology and Biological Research Council (UK)

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