

Appendix 2.1

Intercomparison of the performance of gas chromatographs used by the different institutes in the InveN₂Ory (AC0116) project

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The rationale for this intercomparison was; (1) to compare the performance of the electron capture detectors (ECD) of the gas chromatographs (GC) used in the analysis of the chamber air samples collected in the *InveN₂Ory* project (AC0116), and (2) to ensure that the analysis for nitrous oxide (N₂O) is not compromised by the carbon dioxide concentrations in the sample. This can be a problem, especially when, as in our case, N₂ is used as carrier gas (Zheng et al. 2008).

Methods: CEH sent out in stainless steel pressurised gas bottles (borrowed from the Karlsruhe Research Institute, Germany) containing the following concentrations (Table 1) (certified to <= 2%) of N₂O, CH₄ and CO₂ in N₂ with 20% O₂ to all InveN₂Ory partners. The gas mixtures were purchased from BOC.

Table 1. Concentrations of mixed greenhouse gases in the standards used for the inter-GC comparison.

standard	N₂O (ppm)	CH₄ (ppm)	CO₂ (ppm)
1	0.502	2.01	353.7
2	1.000	2.01	351.5
3	0.504	2.01	1007.0
4	1.000	2.01	1002.0

The concentrations were unknown to the analysts but were well within the range of concentrations usually measured from soils. Each standard concentration was analysed 5 to 10 times by the laboratories. Concentrations of N₂O were then calculated using their own certified gas standards, which are different at the different institutes.

Results: A paired two sample t-test carried out for the two different CO₂ concentrations and 0.5 ppm or 1 ppm N₂O respectively resulted in no significant difference of the means of the samples (p=0.061 for 0.5 ppm N₂O and p=0.991 for 1.0 ppm N₂O, respectively). The most likely explanations for the deviations from the 0.5 and 1.0 ppm norm standards seen in Figure 1 are; 1) the level of uncertainty of the individual calibration standards used by the respective laboratories, or 2) that the non-linearity of ECD detectors for high concentrations of N₂O may not have been

considered. It was reassuring that high CO₂ concentrations did not compromise the analysis of N₂O for all GCs tested.

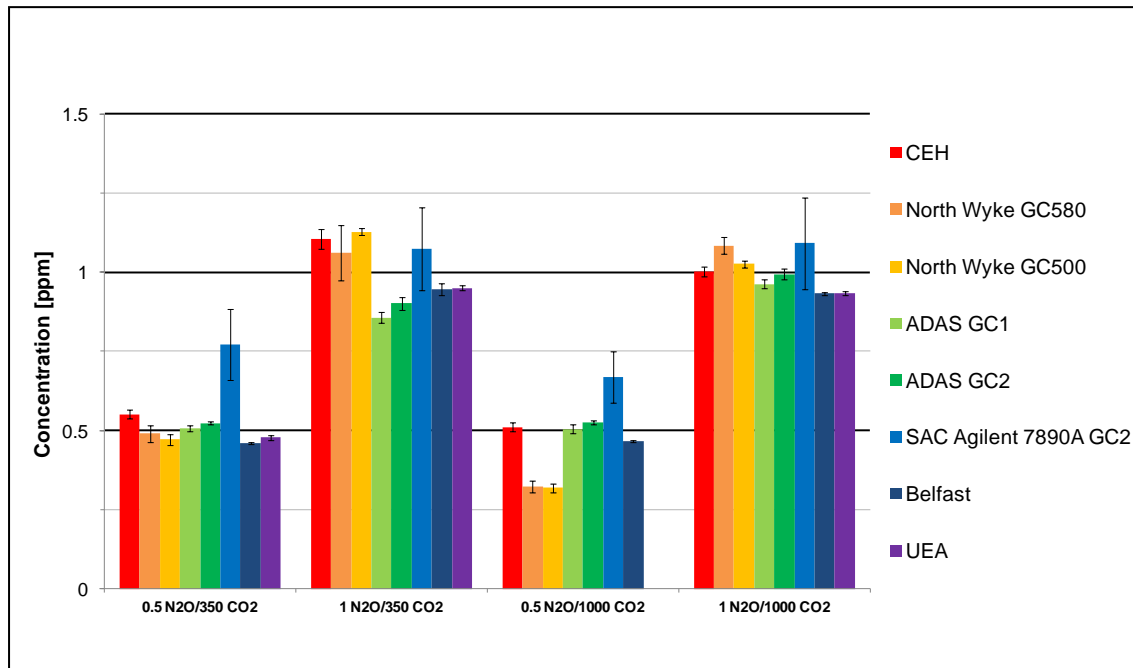


Figure 1. Analysis of 4 standard gas concentrations on ECD detectors used in the analysis of the chamber air samples collected by the partners of the InveN₂Ory project. Error bars are standard deviations.

References cited

Zheng et al. (2008) Quantification of N₂O fluxes from soil–plant systems may be biased by the applied gas chromatograph methodology. *Plant and Soil* 311, 211 - 234