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Supplementary material for

**Cavity ring-down spectroscopy is a precise and accurate
method for measuring $^{15}\text{N-NO}_3^-$ in soil extracts**

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Contents of this file

Supplementary methods

Figure S1

Supplementary methods

^{15}N in NO_3^-

Soil extracts were prepared for ^{15}N - NO_3^- analyses using the Titanium (III) method (Altabet et al., 2019), where NO_3^- is chemically reduced to N_2O using TiCl_2 in the acidic (HCl) media, followed by ^{15}N - N_2O analysis of headspace gas by isotope ratio mass spectrometry (IRMS) or cavity ring-down spectroscopy (CRDS). The method is, to a certain extent, sensitive to N_2O concentration (Altabet et al., 2019). We equalized the concentrations in the 3 ml of final sample used for the reaction to $14.3 \mu\text{mol N l}^{-1}$ by diluting them. The samples that were low in NO_3^- concentration and cannot achieved the target concentration was skipped (12 sample total). For each sample batch (Ti-method), we included duplicate standards (STDs) with the same concentration as in the samples plus low concentration of $7 \mu\text{mol N l}^{-1}$ and high conc of $21 \mu\text{mol N l}^{-1}$ and with three different at% levels: natural abundance (0.366 at%), 5 at%, and 10 at%. The at% results in the samples measured on the IRMS/CDRS were then corrected using the STD curve of actual vs. measured at% in the STDs.

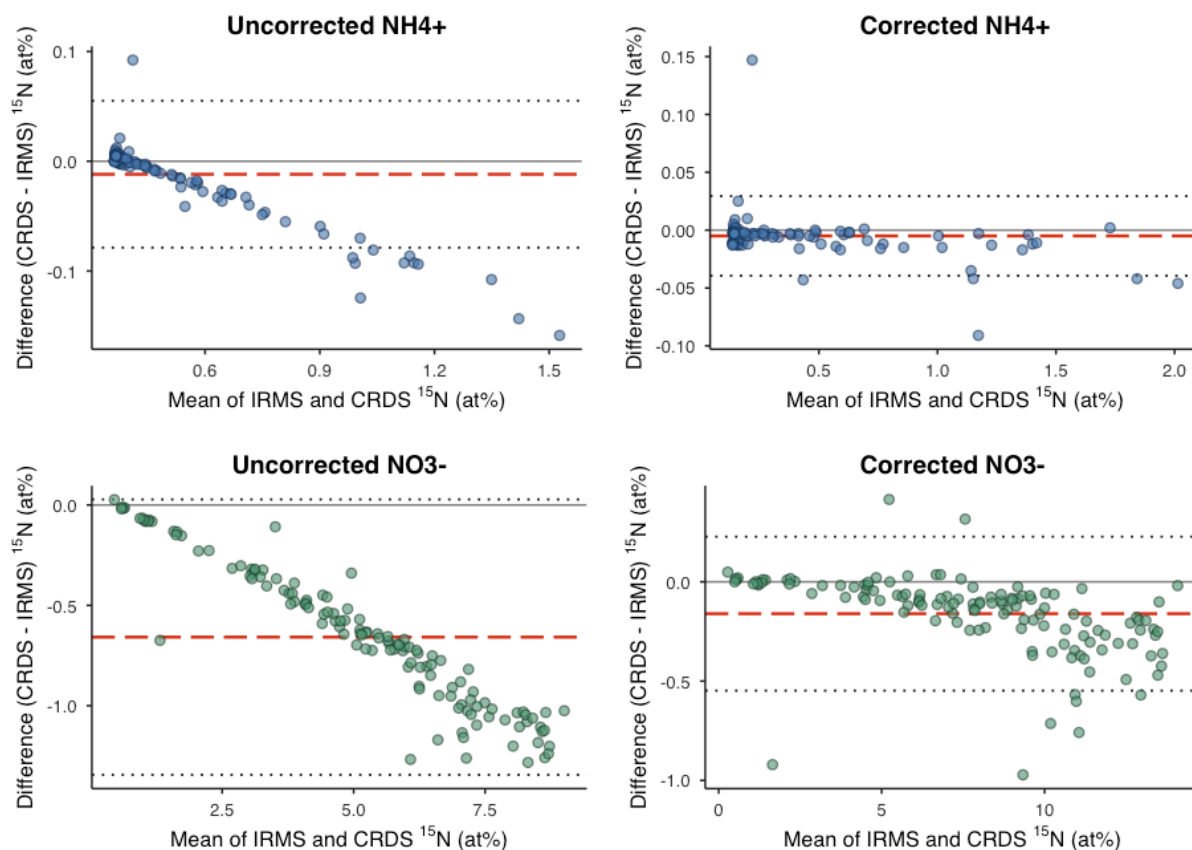


Figure S1. Bland-Altman plots assessing the agreement between CRDS and IRMS measurements for ^{15}N at%. The panels display uncorrected (left column) and corrected (right column) isotopic measurements for NH_4^+ (top row) and NO_3^- (bottom row). The x-axis represents the mean of the paired CRDS and IRMS measurements, while the y-axis shows the absolute difference between the two instruments (CRDS - IRMS). The solid gray line indicates perfect agreement (zero difference). The dashed red line represents the systematic bias (mean difference), and the dotted black lines indicate the 95% Limits of Agreement (bias $\pm$ 1.96 standard deviations). The shift of the mean bias towards zero and the narrowing of the limits of agreement in the corrected panels demonstrate the effectiveness of the calibration in reducing systematic Instrumental error.