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Supplement of

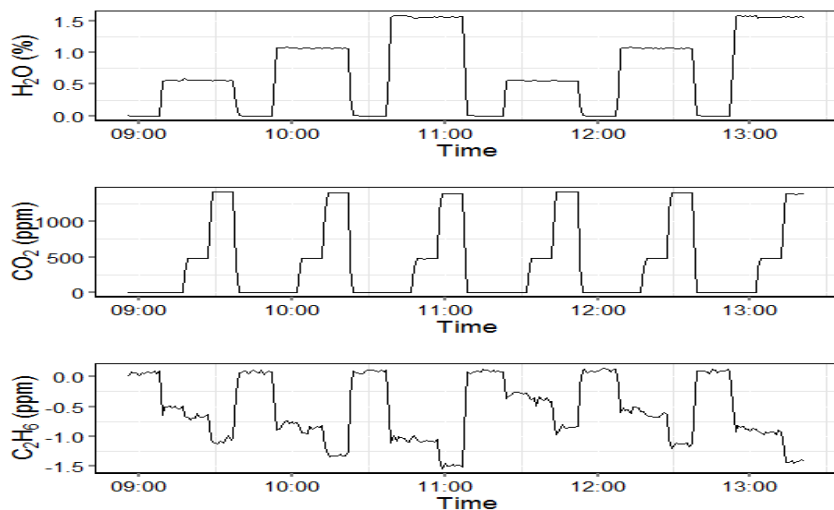
Characterization of interferences to in situ observations of $\delta^{13}\text{CH}_4$ and C_2H_6 when using a cavity ring-down spectrometer at industrial sites

Sabina Assan et al.

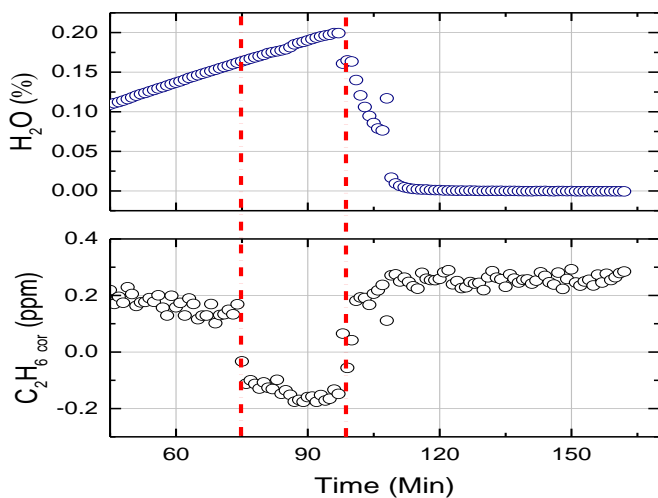
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1 **Supplement**



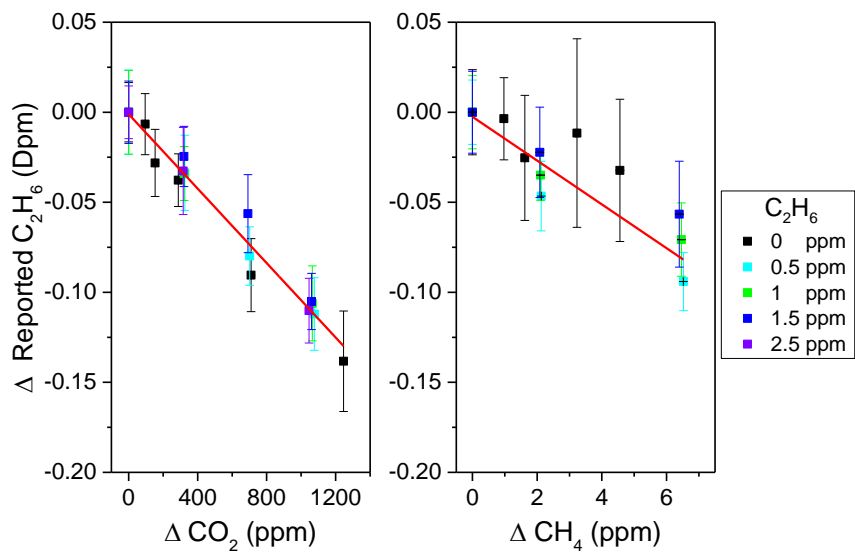
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3 Figure S1: Time series of CO₂ interference experiment at varying H₂O concentrations. As H₂O and CO₂ are altered,
4 the reported C₂H₆ is expected to be constant given there is no C₂H₆ input. However due to interference the
5 corresponding shifts of reported C₂H₆ are evident



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7 Figure S2: Time series of the discontinuity for instrument CFIDS 2067, the H₂O content is increased and decreased
8 crossing the 0.16% H₂O threshold twice. The point at which 0.16% H₂O humidity is reached is marked by red dashed
9 lines. The discontinuity is present when moving from dry to wet air, and inversely from wet to dry air.

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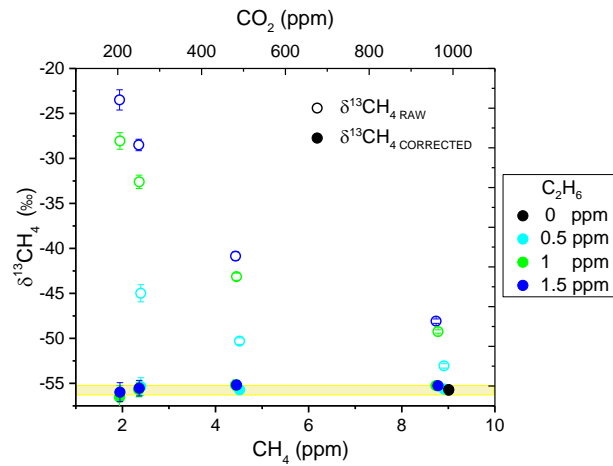
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13 Figure S3: Relationship between the reported C₂H₆ and concentration changes of CO₂ (left) and CH₄ (right) at 5
 14 C₂H₆ concentrations for instrument CFIDS 2072. The concentration change (from background levels) of the targeted
 15 gas is plotted on the x-axis, while the change in reported C₂H₆ is plotted on the y-axis. Markers represent a 20 minute
 16 average, with error bars denoting the standard deviation. For each dilution series, C₂H₆ concentration was kept
 17 constant at different concentrations, represented by the coloured markers. The CH₄ correction was examined up to
 18 1.5 ppm C₂H₆ to sustain a C₂H₆:CH₄ ratio <1, well above the upper range expected from natural gas sources. At all
 19 C₂H₆ concentrations examined, for both ΔCO₂ and ΔCH₄, the response function agreed within the uncertainties to
 20 that calculated at 0 ppm C₂H₆. The red line represents the linear fit taking into account both X and Y error; Pearson's
 21 R is -0.99 and -0.89 for concentration changes of both CO₂ and CH₄ respectively.

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26 Figure S4: Isotopic signal (raw and corrected) from the CRDS for varying mixtures of CH₄, CO₂ and C₂H₆ at ~0%
 27 H₂O. The top and bottom x-axis represent the CO₂, and CH₄ concentration respectively. The y-axis represents the
 28 methane isotopic signal before and after correction, shown by empty and filled markers respectively. For each
 29 dilution series, CO₂ and CH₄ were altered while C₂H₆ concentration was kept constant at different concentrations
 30 (ppm), represented by the coloured markers. The raw δ¹³CH₄ signal is subject to large biases, while the corrected
 31 δ¹³CH₄ maintains the standard value, -55.7 +/- 0.2 (highlighted in yellow).

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