



CH₄ Isotope Monitor for $\delta^{13}\text{CH}_4$ and $\delta\text{CH}_3\text{D}$

Direct Spectroscopic Measurement of Both Methane Isotopes with No Chemical Processing or Separation.



Features:

- < 1 ‰ precision for $\delta^{13}\text{CH}_4$ in air in 1 s
- < 20 ‰ precision for $\delta\text{CH}_3\text{D}$ in air in 1 s
- Fast time response (4 Hz)
- Repeatability exceeding 0.1 ‰ for $\delta^{13}\text{CH}_4$ and 3 ‰ for $\delta\text{CH}_3\text{D}$ for a 30 minute measurement including balanced working reference measurements
- Direct measurement of methane isotopes in air without chemical processing or separation

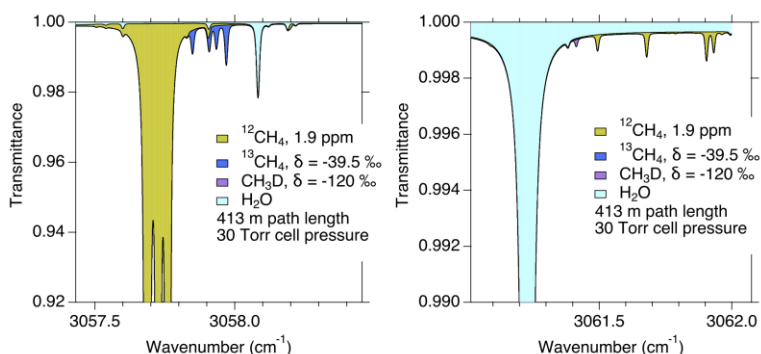
Rugged, field-ready instruments

Direct absorption spectroscopy allows for highly specific and accurate gas detection

Mid-IR detection enables maximum measurement sensitivity

TILDAS Technology

Aerodyne instruments use tunable infrared laser direct absorption spectroscopy (TILDAS) at mid-IR wavelengths to probe molecules at their strongest “finger-print” transition frequencies. We further enhance sensitivity by employing a patented multi-pass broad-band absorption cell that provides optical path lengths up to 400 m. Direct absorption spectroscopy allows for fast (<1 sec) absolute trace gas concentrations without need for elaborate calibration procedures. Moreover, TILDAS instruments are free of measurement interference from other molecular species, enabling extremely specific detection.



Applications

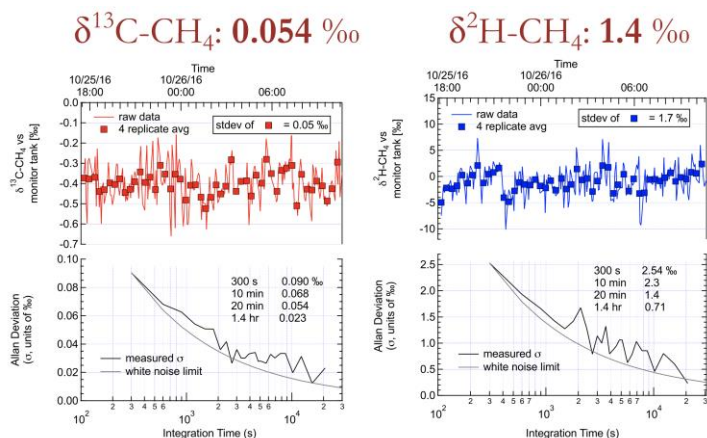
- Determination of atmospheric sources, sinks, and transport through CH₄ isotopic ratios.
- Biosphere exchange.
- Laboratory measurements of discrete samples.
- Breath analysis.

Aerodyne CH₄ Isotope Advantages

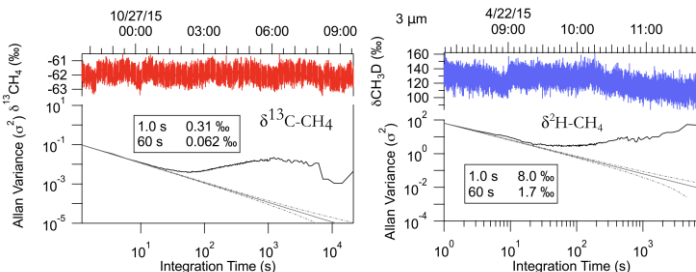
- Measurement precision comparable to much larger and more expensive IRMS instruments.
- Time response up to 4 Hz enables eddy covariance studies.
- Powerful TDLWintel software provides flexible instrument control, and real-time data analysis.
- Valve control capable of complex scheduling and automatic background and calibrations.
- Turn-key design allows unattended operation in remote field sites.
- Optional automated sample handling system providing automatic dilution for samples with high methane concentrations.

Performance Specifications:

Best Precision for Discrete Samples with Sample/Reference Switching



Best Precision During Continuous Flow Air Measurements



Related Instruments

Dual laser monitor for CH_4 ($\delta^{13}\text{C}$) and N_2O ($\delta^{15}\text{N}_\alpha$, $\delta^{15}\text{N}_\beta$ and $\delta^{18}\text{O}$) isotopes

Dual laser monitor for “clumped” isotope of methane: $^{13}\text{CH}_3\text{D}$

Instrument Operations

Operating temperature: 10 to 35 °C

Sample flow rate: 0 to 20 slpm

Instrument Components

Core instrument

Thermoelectric chiller

Keyboard, mouse, and monitor

Vacuum pump (customer specified)

Inlet sampling system (customizable)

Data Outputs

RS-232, USB drive, ethernet

Size, Weight, Power

Dimensions: 560 mm x 770 mm x 640 mm (W x D x H)

Weight: 75 kg

Electrical Power: 250-500 W, 120/240 V, 50/60 Hz (without pump)

Aerodyne specializes in collaboration and custom design. Please contact us if you would like to discuss additional measurement options and applications.

REFERENCES:

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McCalley, C.K., B.J. Woodcroft, S.B. Hodgkins, R.A. Wehr, E-H. Kim, R. Mondav, P.M. Crill, J.P. Chanton, V.I. Rich, G.W. Tyson, S.R. Saleska (2014), Methane dynamics regulated by microbial community response to permafrost thaw, Nature, 514:478-481, doi:10.1038/nature13798.

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