AERODYNE RESEARCH, Inc.

Aerodyne Mini-TILDAS CO_2 Isotope Monitor

Unprecedented precision and time response for $\delta^{13}C$ and $\delta^{18}O$ isotopic ratios in a compact, transportable package.

Features:

- ·< 0.10 ‰ precision for δ13C, δ18O in 1 s
- < 0.03 ‰ precision for δ13C, δ18O in 100 s
- Fast time response (10 Hz)
- Direct measurement of CO2 isotopes in air without sample processing
- Dual laser package allows simultaneous measurement of water isotopes or 12C17O16O or “clumped” CO2: 13C18O16O.
- Repeatability exceeding 0.01 per mil for δ13C and δ18O for a
- 30 minute measurement including balanced working reference measurements.

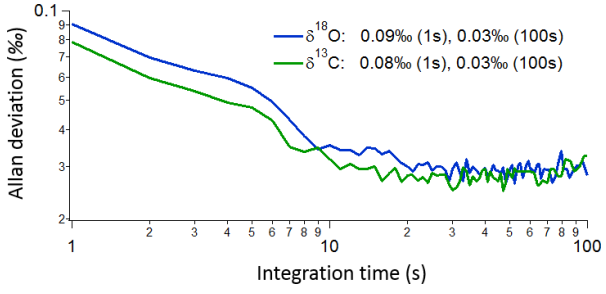
Rugged, field-ready instruments

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 76 m. Direct absorption spectroscopy allows for fast (<1 sec) absolute trace gas concentrations without need for elaborate calibration procedures. Moreover, TILDAS instruments are relatively free of measurement interference from other molecular species, enabling extremely specific detection.



APPLICATIONS

- Determination of atmospheric sources, sinks, and transport through CO_2 isotopic ratios.
- Biosphere exchange.
- Analysis of CO2 samples derived from marine carbonate.
- Laboratory measurements of discrete samples.
- Carbon capture and sequestration monitoring.
- Breath analysis.

AERODYNE CO_2 ISOTOPE ADVANTAGES

- Measurement precision comparable to much larger and more expensive IRMS instruments.
- Time response up to 10 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 backgrounds and calibrations.
- 19” rack mountable for easy installation.
- Turn-key design allows unattended operation in remote field sites.

Mini-TILDAS CO2 Isotope Monitor

SPECIFICATIONS

Isotope ratio precision (1σ)*

	1 sec	100 sec
$\delta^{13}C$	0.1 ‰	0.03 ‰
$\delta^{18}O$	0.1 ‰	0.03 ‰

*Accuracy before calibration is typically 20‰

Species Precision (1σ @ 400 ppm CO_2)

	1 sec	100 sec
CO_2	25 ppb	10 ppb

Time Response

1-10 Hz data rate
0.05 s minimum Rise/Fall time (1/e)
(depends on vacuum pump)

Dynamic Range (air)

	min	max
CO_2	0 ppm	5,000 ppm

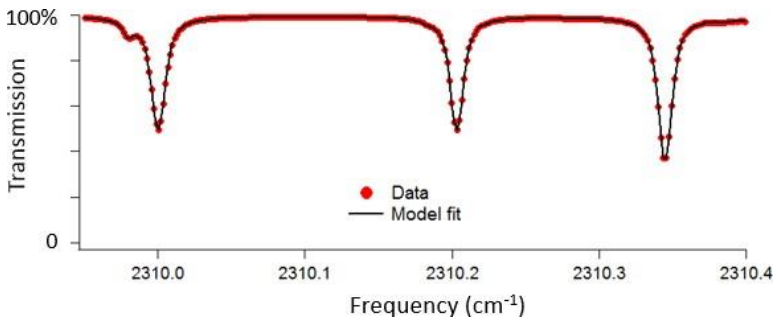
Related Instruments

Dual laser isotope monitor for $\delta^{13}C$, $\delta^{18}O$ and $\Delta^{17}O$ of CO_2

Single laser isotope monitor for $\delta^{18}O$ and $\Delta^{17}O$ of CO_2

Dual laser monitor for CO_2 ($\delta^{13}C$, $\delta^{18}O$) and water ($\delta^{18}O$, δ D) isotopes

Experimental spectrum acquired at 1 Hz



Installation

19” rack mountable or benchtop
Flushing the optics with CO_2-free gas is recommended

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: 440 mm x 660 mm x 6U (267mm) (W x D x H)
Weight: 35 kg (core instrument) + 15 kg (chiller) + pump weight
Electrical Power: 250 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

Wehr, R., Munger, J.W., McManus, J.B., Nelson, D.D., Zahniser, M.S., Davidson, E.A., Wofsy, S.C. and Saleska, S.R., Seasonality of temperate forest photosynthesis and daytime respiration, Nature, 534(7609), 680-683, 2016.

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CO2_Isotope