iso **FLOW GHG**

High performance sample preparation system for trace greenhouse gas isotope analysis

High sensitivity

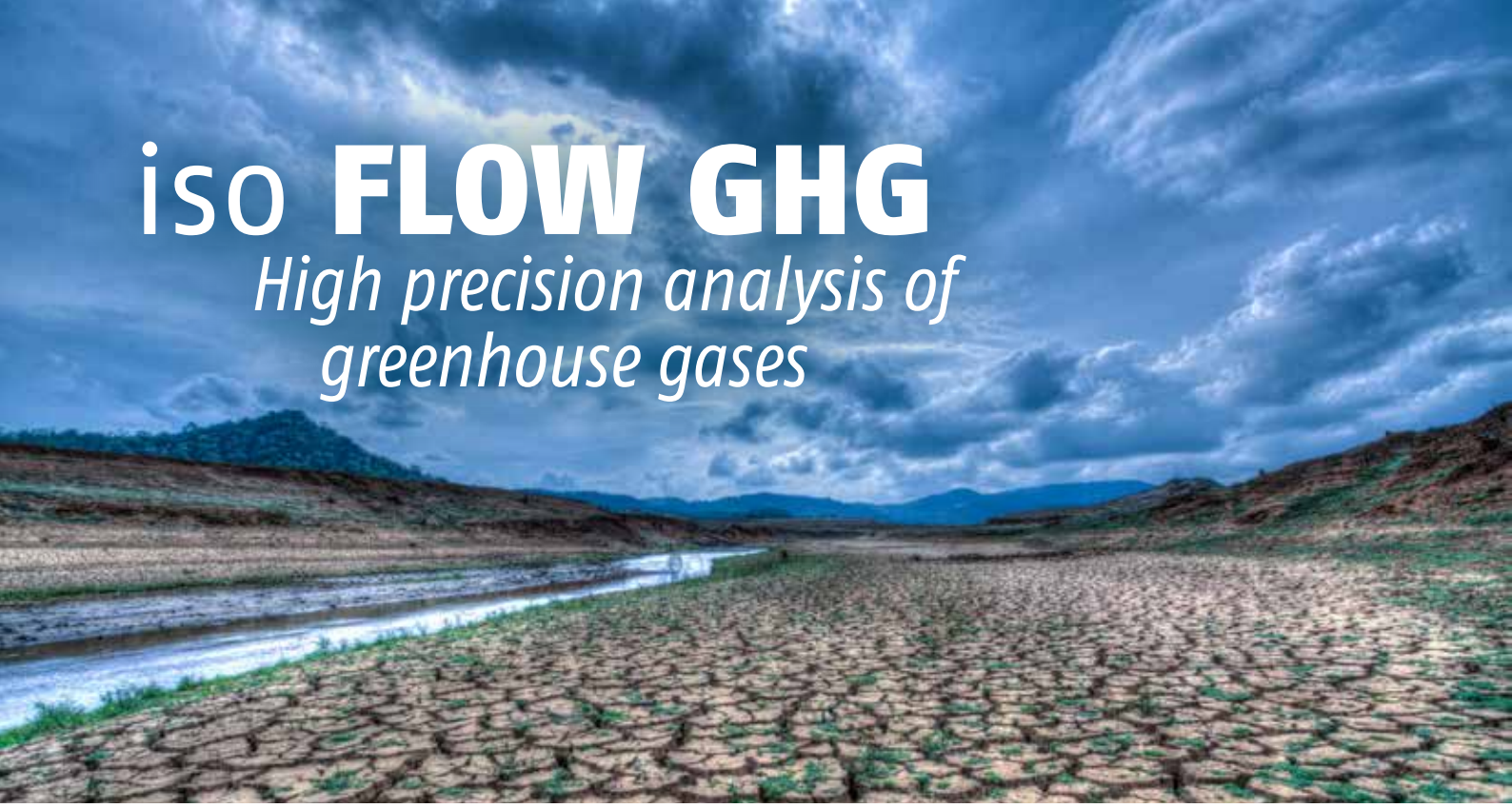
Great flexibility

High data quality

Ease of use

elementar

EXCELLENCE IN ELEMENTS



iso **FLOW GHG**

High precision analysis of greenhouse gases

Greenhouse gases in the atmosphere are major drivers for climate change and so it is essential that we uncover the complex cycling mechanisms of these gases throughout the natural world. At the same time, we must seek to understand the anthropogenic contribution of these gases so that we can develop successful strategies to mitigate and counter-act humankind's damaging impact on the careful balances in the natural world.

Isotopic analysis of atmospheric greenhouse gases (GHGs) is a critical tool in climate research thanks to the ability for isotopic analysis to elucidate the origin of a sample. The iso **FLOW GHG** is a fully automated, continuous flow preparation system for the isotopic analysis of greenhouse gases originating from a range of sample matrices and is a key tool in the fight against climate change. Trace concentrations of CO_2, N_2O and CH_4 in atmospheric samples are measured using cryogenic pre-concentration, gas chromatography and chemical traps to deliver the highest precision isotopic analysis.

A powerful combination.

Market leading **isoprime precisION** stable isotope analyzer

iso **FLOW GHG** sample preparation system with autosampler

Flexible sample handling

Atmospheric trace greenhouse gas analysis is performed using 100 ml, flow-through sample flasks. For high throughput analysis of gases and the determination of dissolved nitrate samples presented in septum-sealed vials the instrument can be equipped with an autosampler compatible with multiple sample vial types with up to 220 x 12 ml sample vials or 70 x 20 ml sample vials. A manual injector port is also optionally available for direct injections of gases into the iso **FLOW GHG**.

INNOVATIVE CAPABILITIES

iso **FLOW GHG** can accommodate up to two 30 m capillary GC columns in a thermocouple-controlled heated oven with a maximum temperature of 300 °C allowing new possibilities for enhanced GC chromatographic techniques. As well as this, the optional combustion furnace can operate at temperatures up to 1,500 °C allowing researchers to explore alternative furnace chemistries and target novel isotope species.

Complete automation

The analysis of your precious samples using the iso **FLOW GHG** is made substantially simpler thanks to the complete automation of the instrument. Using electronic flow and pressure controllers to precisely deliver gases and control sample flows throughout the system, all of which are under control from lytic**OS**® software leads to significantly reduced operator contact time. Automated system checks, leak checking and system configuration changes makes the instrument easier to run for operators with diverse levels of experience.

Extend your $\delta^{15}N$ analysis further

The iso **FLOW GHG** offers multiple opportunities to further your analysis. When performing $\delta^{15}N$ and $\delta^{18}O$ isotope analysis of atmospheric N_2O, the system can optionally also measure $\delta^{15}N$ of N_2 atmospheric gas from a single sample vial or flask. The **isoprime precisION** isotope ratio mass spectrometer can also be optionally configured with a dedicated Faraday collector array for the site-specific isotope analysis of $\delta^{15}N$ of N_2O for better understanding of the biological pathways responsible for the production of N_2O.

iso **FLOW GHG** KEY FEATURES

- Capacity for up to 2 capillary GC columns with a maximum temperature of 300 °C
- Automated control of all parameters driven by modern lytic**OS**® software
- Reduced consumption of laboratory resources with sleep / wake-up functionality
- Flexible sample handling options for multiple sample types
- Dual-core needle for analysis of dissolved nitrate and gas samples from septum sealed vials
- Optional 1,500 °C high temperature furnace
- Optional N_2 / N_2O simultaneous analysis
- Optional autosampler with capacity for up to 220 samples
- Optional automated LN_2 dispenser for extended analytical run times

Source apportionment of GHGs

	N_2O			N_2		CO_2			CH_4	
	Height (nA)	$\delta^{15}N$	$\delta^{18}O$	Height (nA)	$\delta^{15}N$	Height (nA)	$\delta^{13}C$	$\delta^{18}O$	Height (nA)	$\delta^{13}C$
AIR SAMPLE 01	2.88	−9.39	−19.33	2.68	−0.53	20.15	−14.18	−2.85	2.41	−40.60
AIR SAMPLE 02	3.15	−9.93	−19.50	2.73	−0.52	20.52	−14.16	−2.90	2.12	−40.99
AIR SAMPLE 03	3.08	−9.84	−19.47	2.71	−0.56	20.48	−14.23	−2.86	2.23	−40.53
AIR SAMPLE 04	3.13	−9.11	−19.40	2.73	−0.56	20.07	−14.20	−2.90	2.39	−40.91
AIR SAMPLE 05	3.19	−9.78	−19.56	2.74	−0.56	20.31	−14.19	−2.88	2.44	−41.41
AVERAGE	3.09	−9.61	−19.45	2.72	−0.55	20.31	−14.19	−2.88	2.32	−40.89
ST.DEV (1σ)	0.12	0.35	0.09	0.02	0.02	0.20	0.03	0.02	0.14	0.35

CARBON DIOXIDE

The atmospheric concentration of CO_2 has rapidly increased over the past 250 years and is currently over 400 ppm. Isotopic analysis tells us this increase is due to the burning of fossil fuels which are depleted in $\delta^{13}C$. Isotopic analysis also elucidates the terrestrial biosphere sink of atmospheric CO_2 allowing us to understand how the earth may respond to future atmospheric CO_2 forcing.

NITROUS OXIDE

Nitrous oxide concentration is very low in the atmosphere (~330 ppb) but it has almost 300x the warming potential of CO_2. Thanks to isotope analysis, we know that approximately 75 % of N_2O atmospheric emissions originate from agricultural activities and the technique is crucial to further our understanding of other mechanisms at play in the global N_2O cycle.

METHANE

Atmospheric methane concentrations have been increasing rapidly since 2007 but the reasons for this increase are not clear. We do not know the extent of methane trapped in permafrost or possibly released from wetlands and wildfires. These phenomena have the capacity to form run away feedback loops as further warming increases atmospheric emissions. Coupled with increased production of natural gas due to "fracking", these sources must be apportioned and isotope analysis is an essential tool to achieve a fuller understanding of the global CH_4 cycle.

The iso **FLOW GHG** sample preparation system provides a fully automated, high performance, compact bench top solution for the isotopic analysis of these trace greenhouse gases.

High sensitivity

Analyze trace greenhouse gases with the highest degree of confidence.

Great flexibility

A modular system ensures the instrument is right for you.

High data quality

Achieve the highest analytical performance with the most precise instrument available.

Ease of use

Complete automation of every parameter makes operation very simple.

Elementar – your partner for excellent elemental analysis

Elementar is the world leader in high performance analysis of organic and inorganic elements. Continuous innovation, creative solutions and comprehensive support form the foundation of the Elementar brand, ensuring our products continue to advance science across agriculture, chemical, environmental, energy, materials and forensics markets in more than 80 countries.

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