Enviro News

Atmospheric / Environmental Science Edition

enviro technology services

August 2016 Vol 2

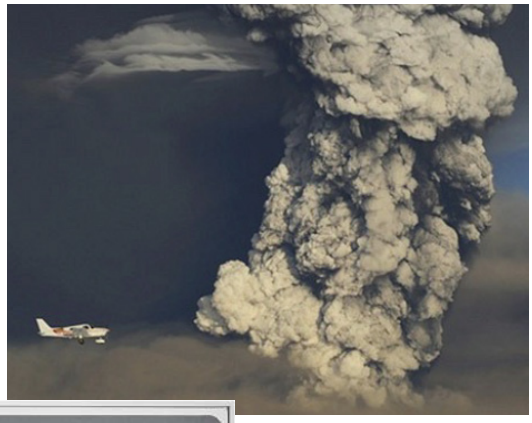
In this issue:

- ***The NEW Xact 630 XRF metals in air analyser.*** *Identification and measurement of as many as 69 elements simultaneously.*
- ***Sigma Space Micro Pulse LiDAR (MPL).*** *A versatile tool for cloud and atmospheric aerosol observations and weather forecasting.*
- ***Met One BC1054 multi-wavelength black carbon analyser.***
- ***The LGR micro-portable GGA.*** *Weighing in at less than 6kg it's the world's smallest, lightest, cavity-ringdown greenhouse gas analyser.*
- ***NEW Ultraportable N_2O/CO and N_2O/CH_4 analysers from LGR.*** *Taking the "lab to the field".*
- ***Eosense gas flux chambers*** *"Get to the root of soil flux studies!"*
- ***AQMV and the power of fast responding analysers, GPS and GIS.***

Plus:

- ***ET expands Scientific Sales Team with the appointment of Lewis John.***

tel: 01453 733200 sales@et.co.uk www.et.co.uk



Welcome

Welcome to the second edition of Enviro News Sci, the atmospheric / environmental science newsletter from Enviro Technology Services.

Remarkably it is eighteen months since we produced our first version and I'm pleased to say we have been very busy during this time, both with instrument sales and sourcing and bringing to market new products, many of which are spotlighted in this edition.

Two amazing new products I'd like to personally introduce here are the ***Xact 630 continuous near real-time metals in air analyser*** and the ***Sigma Space remote-sensing Mini-MPL aerosol LIDAR profiling system.***

Due to their toxicity and persistence, heavy metals are becoming more and more of an environmental and public health issue. Traditionally, airborne metals are sampled in the field with subsequent elemental identification and quantification carried out in the lab. Obviously this does not allow for near real-time information (i.e. hourly averages) and results might take weeks coming back from the lab and when they do, they will generally be weekly or monthly averages.

> *Wouldn't it be amazing to know, what are the metals concentrations right now and what have the 15 minute averages been looking like this morning?*

Imagine a simple to use, rack mounted instrument that can continuously measure up to 69 elements in ambient air in near real-time. Imagine that this instrument can be housed in a relatively small shelter or even in a trailer or mobile lab. Imagine that you can leave it to monitor unattended for weeks on end and "remote in" to get the data from wherever you are.

Well there is no need to imagine any longer, or wish that you could see your metals data on-line whenever you need to.

We are pleased to introduce the brand new ***Cooper Environmental Xact 630 Ambient Multi-Metals Monitor.*** Read more on the following page.

ET has long been an advocate of remote sensing technology and we have a long-standing track record in introducing optical remote sensing technology to the UK market. Examples include the Opsis (Sweden) UV open-path multi-gas DOAS system for air quality monitoring and the Accuscan (USA) UV/IR vehicle emissions monitoring system which measures tailpipe emissions from individual vehicles, in-situ.

As well as being able to measure multiple gases over a horizontal open path of up to a kilometre with Opsis DOAS and vehicle emissions over the width of a road, we are now turning our attention skyward with the ***Sigma Space MPL system (Micro Pulse LIDAR).***

We are extremely excited to be working with Maryland based Sigma Space Corporation. Sigma Space has been producing Micro Pulse Lidar systems under license from NASA since 2004.

MPL systems are deployed worldwide in atmospheric monitoring stations both as standalone and networked instruments. MPL systems provide a powerful tool for continuous, unattended monitoring of aerosol and cloud profiles.

mini MPL

Following the success of the MPL systems, Sigma introduced the MiniMPL system in 2010; improving portability, power efficiency and lowering cost, while maintaining the high signal-to-noise ratio of the original design. This instrument is designed for cloud and aerosol profiling up to 15 km. The MiniMPL provides superior cloud layer mapping compared to ceilometers, as well as high temporal and spatial resolution boundary layer measurements.
It has rapidly gained recognition in the atmospheric research and meteorological communities for its ability to provide enhanced information for boundary layer studies, air quality and forecasting applications.

Duncan Mounsor, Managing Director
duncan.mounsor@et.co.uk tel: +44(0)1453 733232 mob: +44(0)7968 769919

COOPER ENVIRONMENTAL

Cooper Environmental Xact 630 Metals-in-Air Analyser

The Best Just Got Better!

Building on the hugely successful Xact 625 metals-in-air analyser, Cooper have gone several steps better and have recently launched the Xact 625's successor, the Xact 630.

Totally re-designed from the bottom up, the Xact 630 is smaller, lighter and more powerful than the Xact 625. It features improved detection limits, can measure more elements and unbelievably comes in at a significantly lower price than it's predecessor.

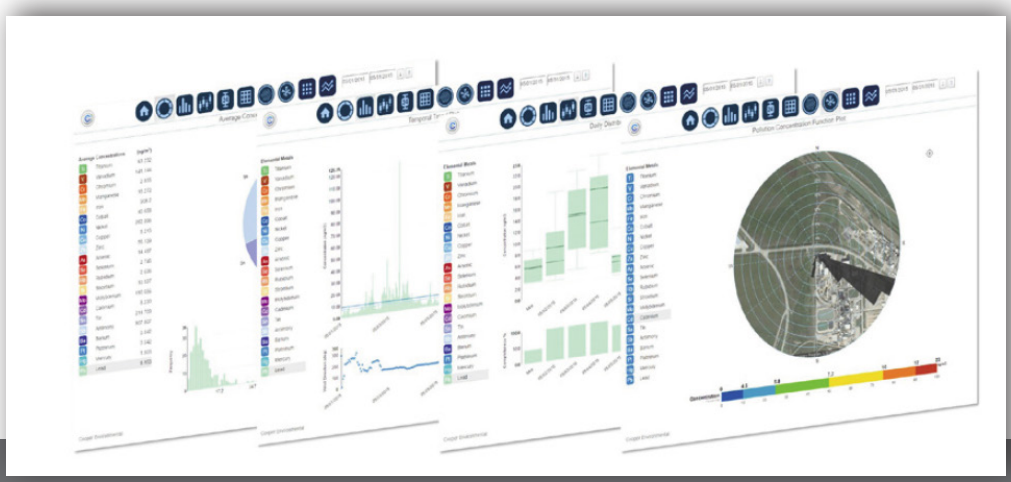
Xact 630 Metals in Air Analyser

Highlights of the Xact 630

- The latest incarnation of Cooper Environmental Services' ambient multi-metals monitor features a significantly reduced size, while also improving on detection limits for many of the measurable elements.
- Capable of measuring up to 69 elements simultaneously, including S, Cr, Ni, As, Cd, Hg, and Pb.
- Linear response over a vast range of concentrations, from pg/m^3 to µg/m^3.
- Near real-time reporting allows spikes and variations in metal concentrations to be easily distinguished.
- Wind speed and direction sensors allow pollution sources to be tracked and identified.
- Integrated 10.1" touch screen provides greater usability with full control of Cooper's ADAPT software, with no need for an external computer.
- Remote access and system control as standard.
- Suitable for installation in static enclosures as well as mobile monitoring platforms.

See the Xact 630 product page on our website here.

Xact 630's predecessor - The Xact 625



ADAPT Screenshots

Cooper Environmental products are exclusively available in the UK through Enviro Technology Services Plc

FOCUS on SigmaSpace

Micro Pulse Lidar (MPL)

The Micro Pulse LiDAR product family from Sigma Space offers the most versatile laser remote sensors for aerosol and cloud profiling. Equipped with the most sensitive single photon-counting technology, these LiDARs are in use worldwide for aerosol research, planetary boundary layer observation, air-quality monitoring and forecasting.

Based on the same principle as radar, MPL transmits laser pulses that scatter (reflect) off particles in the atmosphere. MPL then measures the intensity of backscattered light using photon-counting detectors, and transforms the signal into atmospheric information in real time.

Sigma Space has been manufacturing MPL systems since 2004 under license from NASA*.

MiniMPL is a Sigma Space innovation that takes lidar technology to a new level of portability, power efficiency, and cost effectiveness, while maintaining an exceptional signal-to-noise ratio.

High-resolution aerosol profiling

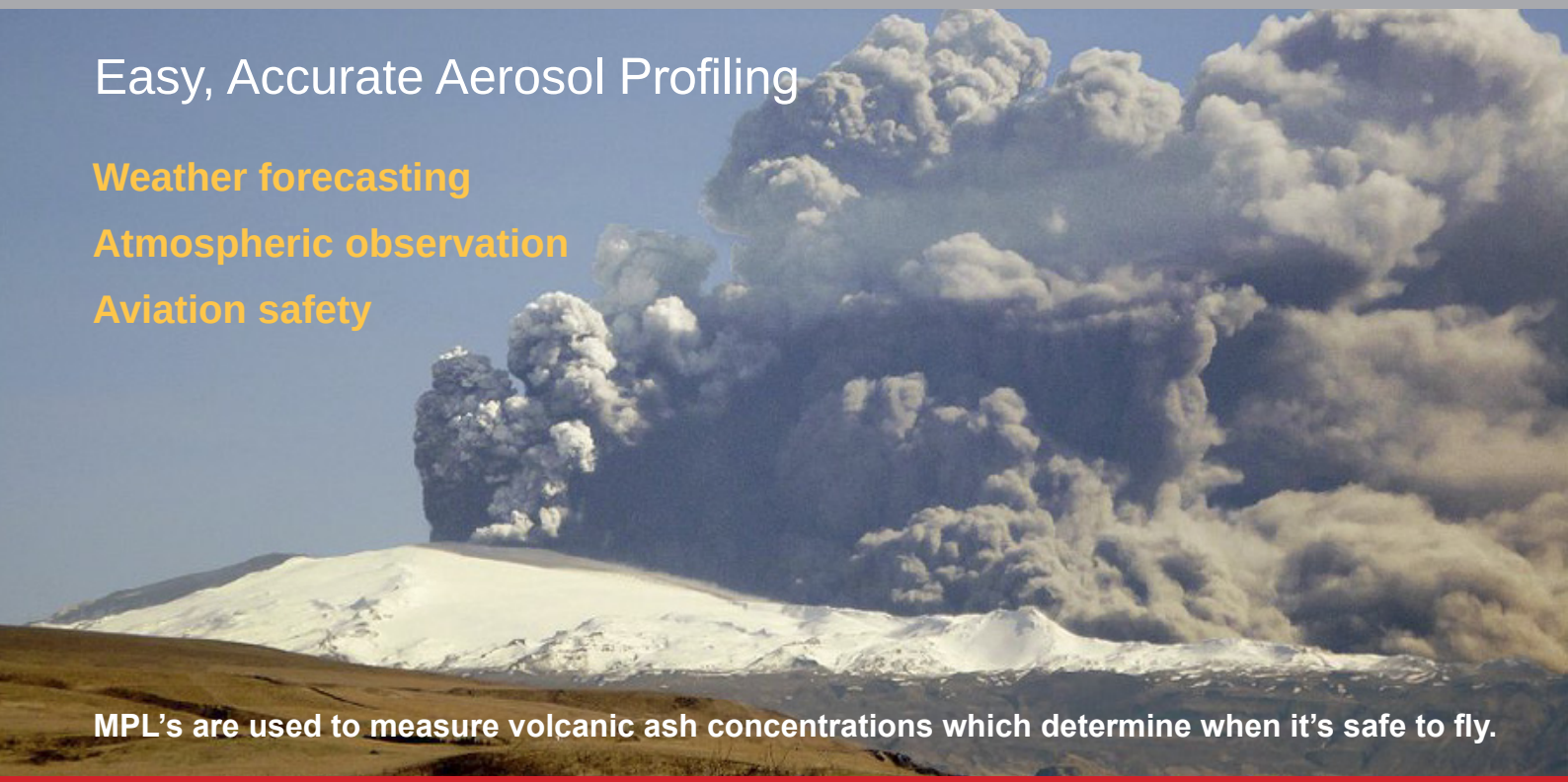
Optically robust, resistant to misalignments

Low-maintenance, optimized laser

Eye safe (ANSI Class II)

Continuous, autonomous data collection

Operational in minutes



Easy, Accurate Aerosol Profiling

Weather forecasting

Atmospheric observation

Aviation safety

MPL's are used to measure volcanic ash concentrations which determine when it's safe to fly.

See the MPL product page on our website here.

See the MiniMPL product page here.

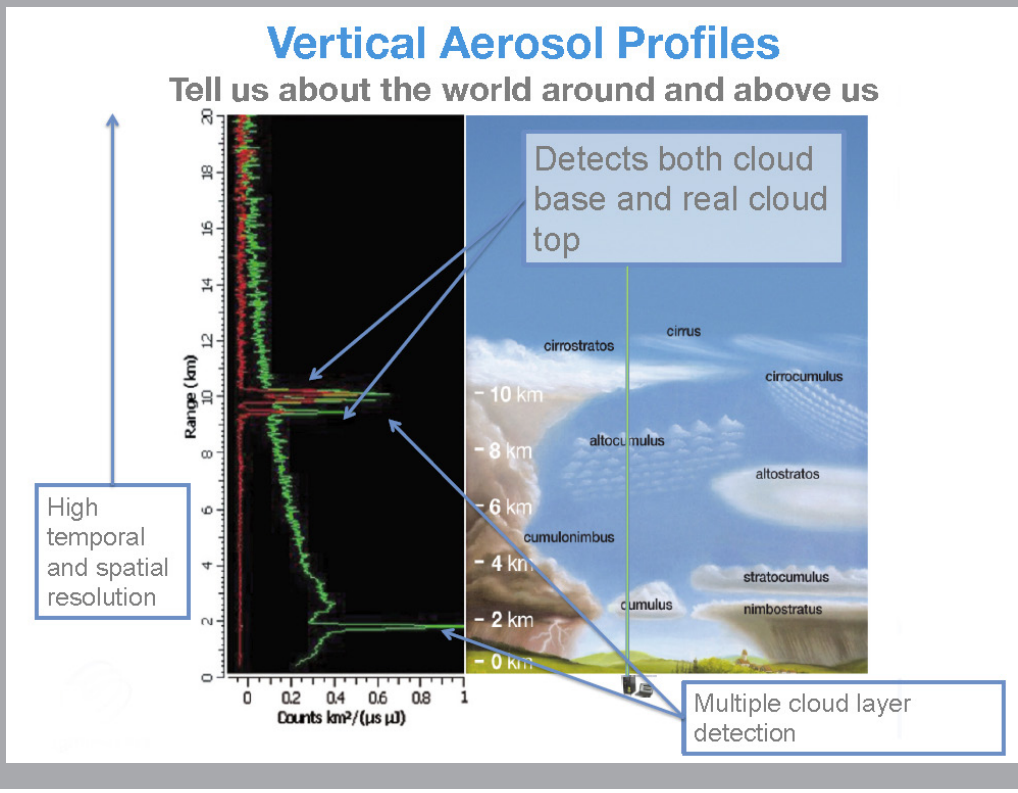
FOCUS on SigmaSpace

Displaying Data

MPLs measure aerosol type, structure, and layers, and display these characteristics in two basic kinds of plots

Vertical Aerosol Profile

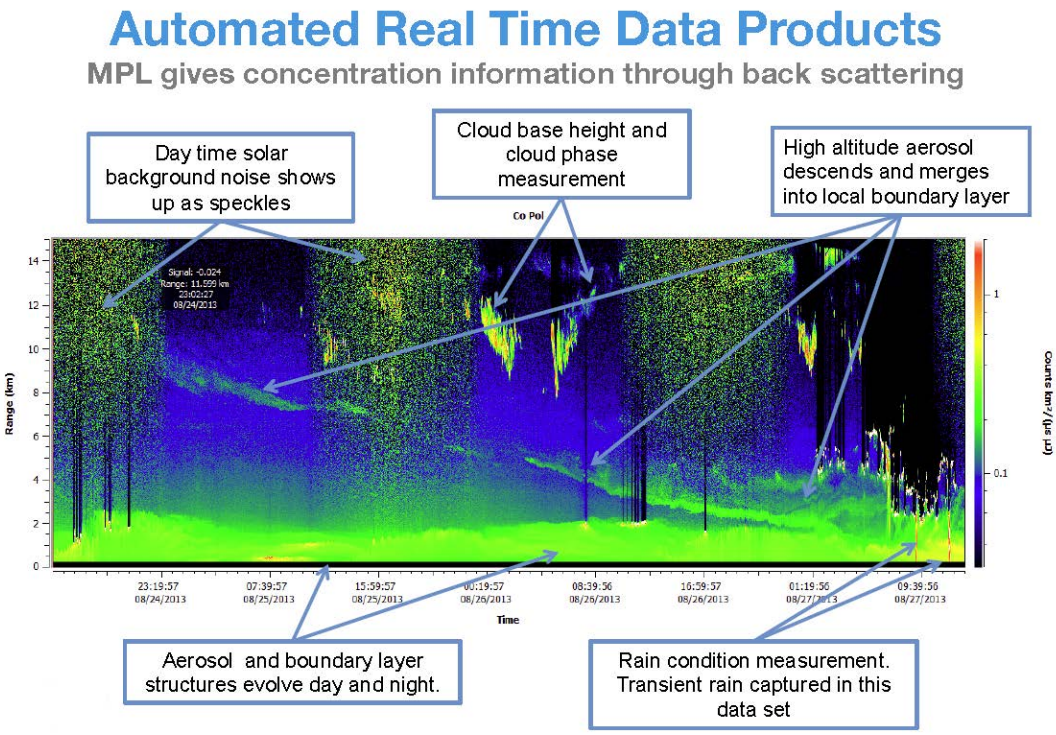
The diagram on the right shows a vertical aerosol profile of clouds produced by MiniMPL, and cloud diagram. On the left is a 30-second averaged profile of normalized relative backscatter (NRB) intensity, indicating a thin water cloud near 2 kilometers (green peak), and multiple layers of clouds containing both water and ice in the 9–10 kilometer range (green and red peaks). A cloud diagram is shown on the right for illustration purposes.



Time Sequence Plot

Stacked plots lead to a clear picture of the atmosphere emerging

- **Track cloud evolution**
- **See temporal variations**
- **Understand lower troposphere dynamics**
- **Discover localized aerosol/pollution patterns**



The Micro Pulse Lidar systems from Sigma Space are exclusively available in the UK through Enviro Technology Services Plc

Met One Instruments

Met One Instruments BC-1050 & BC-1054

The BC-1050 and BC-1054 are optical, reel-to-reel type black carbon monitors based on the time proven BAM-1020 beta attenuation particle mass monitor.

- Capable of sub-ng/m^3 sensitivity on an hourly timescale.
- Adjustable measurement rate with a 1-minute minimum, enabling rapidly fluctuating concentrations to be studied.
- The BC-1050 measures absorption at 375 nm (organic carbon), and 935 nm (elemental carbon).
- The BC-1054 measures absorption at 10 separate wavelengths, from 375 to 950 nm, enabling contributions from black carbon, organic carbon, and brown carbon to be better distinguished.
- Suitable for long-term unattended operation with full remote control capability.
- Data retrieval via serial, USB, or cloud storage.

BC-1050

BC-1054

The BC 1054 Multi-Spectrum Black Carbon Monitor provides a reliable, cost effective solution for collection of high time resolution data across the near-infrared to near-ultraviolet spectrum that may be used for:

Near-Roadside Monitoring **Visibility Studies** **Source Apportionment**

Air Quality Surveillance **Global Warming Studies** **Particulate Emissions Studies**

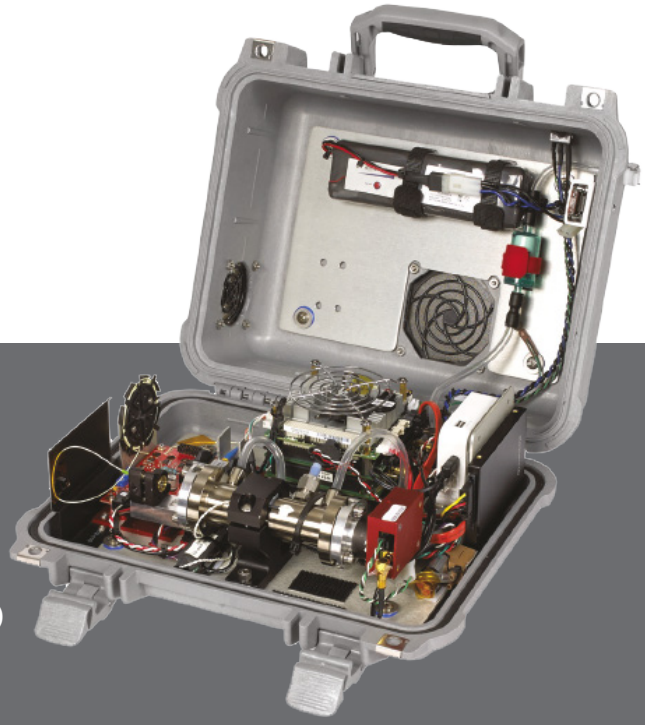
See the BC-1050 & BC-1054 product on our website here.

Met One products are exclusively available in the UK through Enviro Technology Services Plc

Microportable Gas Analyser (CH_4, CO_2, H_2O)

Simultaneously reports measurements of methane, carbon dioxide and water vapor in a crushproof, compact case.

The Microportable Gas Analyser (µGA) from Los Gatos Research is simple to use making it ideal for natural gas leak detection and other field studies, compliance monitoring, air quality studies and soil flux studies, and wherever measurements of methane, carbon dioxide and water vapor are needed quickly and sensitively.



Microportable Gas Analyser (CH_4, CO_2, H_2O)

The world's smallest, lightest, cavity-ringdown greenhouse gas analyser.

weighs less than 6kg

- The µGA from Los Gatos Research builds on many of the features that have made the ultraportable greenhouse gas analyser so popular, with a weight of just over 5kg and an internal Li-ion battery, the µGA is well suited to many difficult and unusual applications, such as wildfire studies and UAV/drone mounted measurements.
- Utilises the same patented Off-Axis ICOS technology as larger LGR analysers.
- True 10 Hz measurements without the need for an external pump.
- Capable of 0.5 ppb precision for CH_4 and 1 ppm precision for CO_2 (10 s rate).
- Available with shoulder harness and sampling wand for easy one-person operation.
- Built in Wi-Fi router enables remote control of the analyser using almost any PC, Laptop, tablet or mobile phone.
- Built into a compact, rugged Pelican case.

Los Gatos Research products are exclusively available in the UK through Enviro Technology Services Plc

See the Microportable Gas Analyser product page on our website here.

Taking the “lab to the field”

NEW Ultraportable N_2O/CO and N_2O/CH_4

LGR’s N_2O/CO Analyser (Nitrous Oxide and Carbon Monoxide Analyser) is the first instrument capable of continuously measuring ambient levels of nitrous oxide and carbon monoxide (with precision better than 0.1 ppb in 1 second) in real time (data rates to 10 Hz with optional external pump). Users can set up the instrument in minutes. Since CO is an excellent tracer of anthropogenic emissions, simultaneous measurements of CO and N_2O can allow scientists to correlate the sources of N_2O emissions. The N_2O/CO Analyser now also simultaneously measures water vapor mole fraction. As a result, the instrument reports N_2O and CO on a dry mole basis (accurately corrects for water vapor dilution and absorption line broadening effects) without the need for sample drying or empirical corrections.

The Zeppelin Observatory. Photo by: Ove Hermansen / Norwegian Institute for Air Research (NILU)

LGR’s CH_4/N_2O Analyser (Methane and Nitrous Oxide Analyser) continuously measures ambient levels of methane and nitrous oxide simultaneously in real time with data rates and flow response rates as fast as 10 Hz. As with all LGR Analysers, users can set up the instrument in minutes. Simultaneous measurements of CH_4 and N_2O can allow scientists to correlate the sources of emissions of these important greenhouse gases. The CH_4/N_2O Analyser also simultaneously measures water vapor concentration. As a result, the instrument reports gas concentrations on a dry mole basis directly (accurately corrects for water vapor dilution and absorption line broadening effects) without the need for sample drying or empirical corrections.

The CH_4/N_2O analyser is designed for many demanding applications including trace-gas (air quality) monitoring (e.g., GAW stations), eddy-correlation flux measurements, and chamber flux measurements.

The analyser is particularly well suited for measurements in the field and on-board aircraft for measurements in the upper troposphere / lower stratosphere. The CH_4/N_2O Analyser is unaffected by other atmospheric gases or changes in atmospheric pressure.

See the Ultraportable N_2O/CO product page on our website here.

See the Ultraportable N_2O/CH_4 product page on our website here.

Get to the root of soil flux studies

with autochamber systems from Eosense

The study of greenhouse gas fluxes from soil is a rapidly developing area of research, and one that ET has been at the forefront of for quite some time. Trace gas analysers from Los Gatos Research, such as the innovative ultraportable greenhouse gas analyser, or UGGA, are among our best selling products in the scientific sector, and have been used in numerous flux monitoring applications all over the world. Until recently, many researchers have hand-built their own static chambers, but now ET is able to offer a sophisticated, complete solution to meet the requirements of soil flux scientists.

Eosense (formerly Forerunner Research) are a Canadian manufacturer of soil flux autochamber systems, designed to interface directly with gas analysers from Los Gatos Research and other manufacturers. Founded by a team of soil flux scientists, Eosense remain very much involved in ongoing research, and pride themselves on producing easy to use hardware and software with expert knowledge and enthusiastic support.

The EosMX and EosMX-P recirculating multiplexers communicate with LGR analysers via USB, and are fully controllable through the analyser's own software. Data from up to 12 connected EosAC autochambers (as well as any connected temperature and relative humidity probes) are recorded onto the analyser's file system with a common timestamp, greatly simplifying data management. Eosense soil flux systems are robust, weatherproof, and suitable for use in a wide variety of challenging locations, from the tropical rainforests of Puerto Rico to the frigid marshlands of Nova Scotia.

In addition to soil flux chambers and multiplexers, Eosense also produce the EosFD, a completely standalone CO_2 flux sensor, utilising the same patented forced diffusion technology as the EosAC, and the EosGP, a small, submersible CO_2 sensor suitable for all but the harshest of environments.

eosAC Autochamber

eosFD CO_2 Soil Flux Sensor

12-channel eosAC Autochamber Multiplexer

In working with both Eosense and LGR, ET is able to offer a variety of monitoring solutions to the growing field of soil flux research (no pun intended).

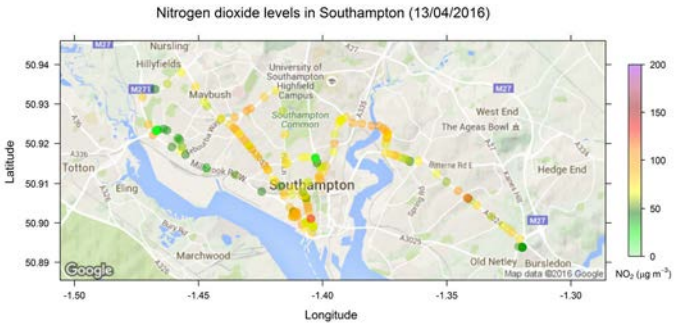
See the Eosense product pages on our website here.

Lewis John - ET expands its scientific team

I joined ET as a chemistry graduate in January this year, and since then I've had quite a bit to learn about air pollution, atmospheric chemistry, and the wide variety of instrumentation that exists to study it. My course at Manchester Metropolitan University was very much focused on the analytical and spectroscopic areas of chemistry, which has certainly helped me to understand the principles of operation underlying much of our equipment, though I am still learning something new every day. Getting out and about and speaking with academics and researchers has been a great way for me to familiarise myself with atmospheric science, and I was also fortunate enough to attend the European Geosciences Union 2016 in Vienna, where I saw some very interesting and novel applications for the instrumentation we provide at ET.

One of the more exciting aspects of my role as a sales engineer is my involvement with our air quality monitoring vehicle, "The Smogmobile". The network of stationary monitoring stations across the UK is undoubtedly an effective and much needed means of gathering air quality data, but having a suite of analysers on a mobile platform opens up a plethora of new applications and experiments, and in my opinion is key to achieving a deeper understanding of air pollution.

ET has been building bespoke mobile laboratories like the Smogmobile for 30 years, for a variety of clients including regulatory agencies and various academic institutions such as the University of Chester, however, the Smogmobile is the first such vehicle to be fully electric, producing no emissions of its own that could influence measurements. The analysers installed in the Smogmobile, an LGR UGGA, Teledyne-API T400 and T500U, and Met One ES-642, were selected for low power consumption and fast response, resulting in fine temporal and spatial resolution of data, and a run time of 6 to 8 hours from the on-board UPS.



A sample graph plotting NO_2 in Southampton

With the Smogmobile, we are able to correlate concentration data for 6 key pollutants to precise GPS coordinates, and most importantly, we can monitor while on the move. This capability, combined with appropriate post processing software such as OpenAir, allows us to map both the temporal and spatial distribution of air pollutants on simple street maps, which are both informative and easy to understand. We have already used the Smogmobile for pollution studies in several towns and cities with great success, in some cases even identifying previously unknown "hot spots" as the vehicle passed them. I believe that this type of monitoring represents a great step forward, not only does it compliment the data from AQM stations, but it also provides an ideal platform for fence line monitoring, "hot spot" identification, natural gas leak detection, and numerous other applications where conventional monitoring is unfeasible. I am intrigued to see how mobile air quality monitoring will progress in the future, and I look forward to my next excursion in the Smogmobile.

You can learn more about the Smogmobile here.

tel: +44 (0) 1453 733200 info@et.co.uk www.et.co.uk

enviro technology services

Kingfisher Business Park, London Road, Stroud, Gloucestershire, GL5 2BY