

WEST Systems



**Soluzioni per il monitoraggio e
la salvaguardia ambientale**

Environmental monitoring systems



Consiglio Nazionale delle Ricerche

WEST Systems Srl è una società che opera da più di 20 anni, a livello nazionale ed internazionale, nel campo dell'innovazione tecnologica e della ricerca applicata nel settore delle Scienze della Terra e monitoraggio ambientale.

Progettazione, realizzazione, installazione e assistenza di sistemi e strumentazioni sono la risposta di WEST Systems alle esigenze dei ricercatori e della industria.

WEST Systems ha una notevole esperienza nella realizzazione di strumenti per lo studio degli scambi gassosi all'interfaccia suolo-atmosfera nei vari campi applicativi quali vulcanologia, geotermia, discariche, siti inquinati e seepage.

La società è in grado di sviluppare, inoltre, sistemi di monitoraggio e software per la soluzione di problemi specifici del cliente grazie ad uno staff di professionisti composto da ingegneri, geologi, informatici e tecnici altamente specializzati, tutti motivati dal comune entusiasmo e dalla condivisione delle idee.

WEST Systems is a company with over 20 years of experience, that operate worldwide on the development of technological innovation and applied research in the field of earth sciences and environmental monitoring.

WEST Systems has wide experience carrying out equipments for the study of gas exchange at the soil-atmosphere interface, and its instrumentations are applied in many fields such as volcanology, geothermal, landfills, contaminated sites and hydrocarbons seepages.

Moreover, the company is able to develop monitoring systems and software to solve specific customer problems through a professional staff composed of engineers, geologists, computer scientists and highly skilled technicians, all motivated by enthusiasm and common goals.

Certificazioni - Certifications

Qualità Quality



La norma ISO 9001 specifica i requisiti che l'Azienda deve rispettare per fornire prodotti e servizi conformi ai requisiti dei Clienti e per gestire i processi aziendali, affinché questi siano indirizzati alla soddisfazione del Cliente ed al miglioramento continuo dell'organizzazione.

The ISO 9001 standard specifies the requirements for the Company to provide products and services that meet customer requirements. The ISO 9001 standard represent a valid tool to manage business processes in order to achieve customer satisfaction and continuous improvement of the organization.

Salute e Sicurezza sui Luoghi di Lavoro Occupational health and safety



La certificazione OHSAS 18001 verifica l'applicazione volontaria di un Sistema di Gestione della Salute e Sicurezza sui Luoghi di Lavoro che permette la definizione di procedure di identificazione dei pericoli e valutazione dei rischi, la definizione di obiettivi e programmi di miglioramento, oltre che il massimo rispetto delle normative cogenti.

OHSAS 18001 certifies the voluntary implementation of a Occupational health and safety Management System in order to define procedures for hazard identification and risk assessment, target setting and improvement programs, as well as the maximum compliance with safety standards.

Awards

Gonfalone d'argento Silver Gonfalone Anno 2008 Year 2008



La West Systems da sempre si occupa di tecnologie emergenti nel settore dell'elettronica applicata. In Toscana è leader nella ricerca tecnologica e nelle sue applicazioni e per questo il Consiglio Regionale, sensibile alla valorizzazione delle realtà emergenti, ha ritenuto giusto premiarla col Gonfalone d'argento.

West Systems has always dealt with emerging technologies in the applied electronics industry. It is a regional leader in technology research and its applications, receiving full encouragement by the Regional Council with the silver Gonfalone award.

Premio dell'Innovazione Innovation Award Anno 2006 Year 2006



La Camera di Commercio di Pisa ha ritenuto opportuna la premiazione dell'impegno e degli sforzi di West Systems nell'ambito della salvaguardia ambientale, tramite la realizzazione di strumenti per monitoraggio delle emissioni gassose.

The Chamber of Commerce of Pisa has also acknowledged the commitment and efforts of West Systems as a contribution to the environmental protection through the creation of instrumentation for the monitoring of not controlled gas emissions.

Distributori internazionali WEST Systems WEST Systems International distributors

CHINA

CHANNEL TECHNOLOGY GROUP LIMITED

www.qudaotech.com - sales@qudaotech.com



Beijing Office

Suite 7B15 Huajie Plaza, 13
Dazhongsi, Haidian District, Beijing
100098, China
ph. 86-10-62111044
fax 86-10-62114847

Shanghai Office

Building 42, Caifuxingyuan, No.188 Maoting
Rd, Chedun, Songjiang, Shanghai, 210611,
China
ph. 86-21-37620451
fax 86-21-37620450

Kunming office

Room 401, Unit 1, No.16, HeSheng Lane, LiangJiaHe,
West RenMin Rd., KunMing, YunNan Prov., 650100,
China.
ph. 86-871-8215582
fax 86-871-8215582

EcoTech Science and Technology Ltd.



19A of Heyday Center, No.89 of Zhong Guan Cun East Road,
Haidian District, Beijing 100190
ph. 86-10-82611269, 82611572
fax 86-10-62536325
www.eco-tech.com.cn - info@eco-tech.com.cn

LICA United Technology Ltd.



Kaicheng Times Building, #2-203 ShuimuTiancheng, QingheBeijing, China
ph. 86-10-51292601
fax. 86-10-82899770
www.li-ca.com - info@li-ca.com

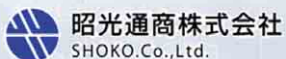
PRI-ECO Company Ltd.



Room 1701, 17F., Henan Building, No. 90, Jaffe Road, Wan Chai, Hong Kong
ph. +86-10-5170-8959
fax. +86-10-5170-8959
www.pri-eco.com - Angus@pri-eco.com

JAPAN

SHOKO CO. LTD



7-13,1-chome, Shibakoen, Minato-ku Tokyo 105-8432, Japan
ph. 03-3459-5106
fax 03-3459-5081
www.shoko.co.jp - s-isotope@shoko.co.jp

Convenzione - *Convention*

WEST Systems - Institute of Geosciences and Earth Resources (IGG) - CNR

In data 21/01/2010 è stata stipulata una convenzione quadro fra WEST Systems Srl e l'Istituto di Geoscienze e Georisorse del CNR.

La WEST Systems e l'IGG, nei loro specifici ambiti, si occupano di settori affini per obiettivi e metodologie e presentano competenza umane e risorse strumentali capaci di integrarsi in una sinergia di reciproco vantaggio.

Tale convenzione si pone come principale scopo quello di raggiungere livelli di eccellenza nel campo della ricerca ed innovazione tecnologica.



On January 21st, 2010 took place a framework convention signed between WEST Systems and the Institute for Geosciences and Earth Resources, CNR (IGG-CNR). WEST Systems and IGG with their specific resources create a synergy for the mutual benefit of both parts, to achieve excellence in the field of research and technological innovation.



UNIVERSITÀ DI PISA

Consiglio Nazionale delle Ricerche

Referenze - *References*

- > Evans et al., 2009: Diffuse gas emissions at the Ukinrek Maars, Alaska: Implications for magmatic degassing and volcanic monitoring. *App. Geochem.* 24, 527-535.
- > Carapezza et al., 2009: Active degassing structures of Stromboli and variations in diffuse CO₂ output related to the volcanic activity. *J. Volcanol. Geotherm. Res.* 182, 231-245.
- > Viveiros et al., 2008: Environmental influences on soil CO₂ degassing at Furnas and Fogo volcanoes (São Miguel Island, Azores archipelago). *J. Volcanol. Geotherm. Res.* 177, 883-893.
- > Werner et al., 2008: Volatile emissions and gas geochemistry of Hot Spring Basin, Yellowstone National Park, USA. *J. Volcanol. Geotherm. Res.* 178, 751-762.
- > Padrón et al., 2008: Diffuse CO₂ emission rate from Pululahua and the lake-filled Cuicocha calderas, Ecuador. *J. Volcanol. Geotherm. Res.* 176, 163-169.
- > Barberi et al., 2007: Gas blowout from shallow boreholes at Fiumicino (Rome): Induced hazard and evidence of deep CO₂ degassing on the Tyrrhenian margin of Central Italy. *J. Volcanol. Geotherm. Res.* 165, 17-31.
- > Bergfeld et al., 2006: Carbon dioxide emissions from vegetation-kill zones around the resurgent dome of Long Valley caldera, eastern California, USA. *J. Volcanol. Geotherm. Res.* 152, 140-156.
- > Notsu et al., 2005: Diffuse CO₂ efflux from Iwojima volcano, Izu-Ogasawara arc, Japan. *J. Volcanol. Geotherm. Res.* 139, 147-161.
- > Chiodini et al., 1998: Soil CO₂ flux measurements in volcanic and geothermal areas. *App. Geochem.*, 13, 543-552.
- > Hernandez et al., 2001: Carbon dioxide degassing by advective flow from Usu Volcano, Japan. *Science.*, 292, 83-86

Diffuse Degassing
continuous monitoring systems

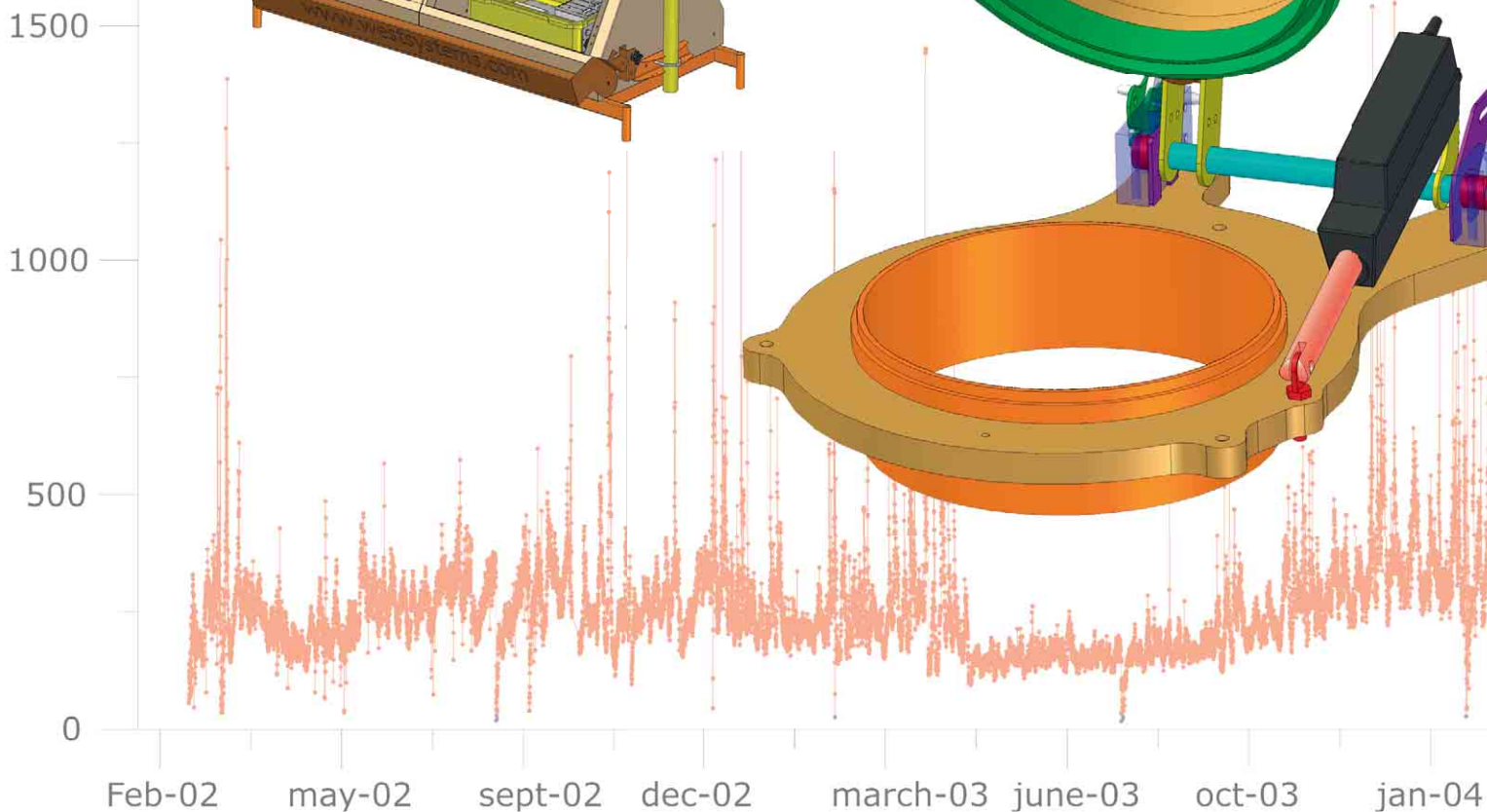
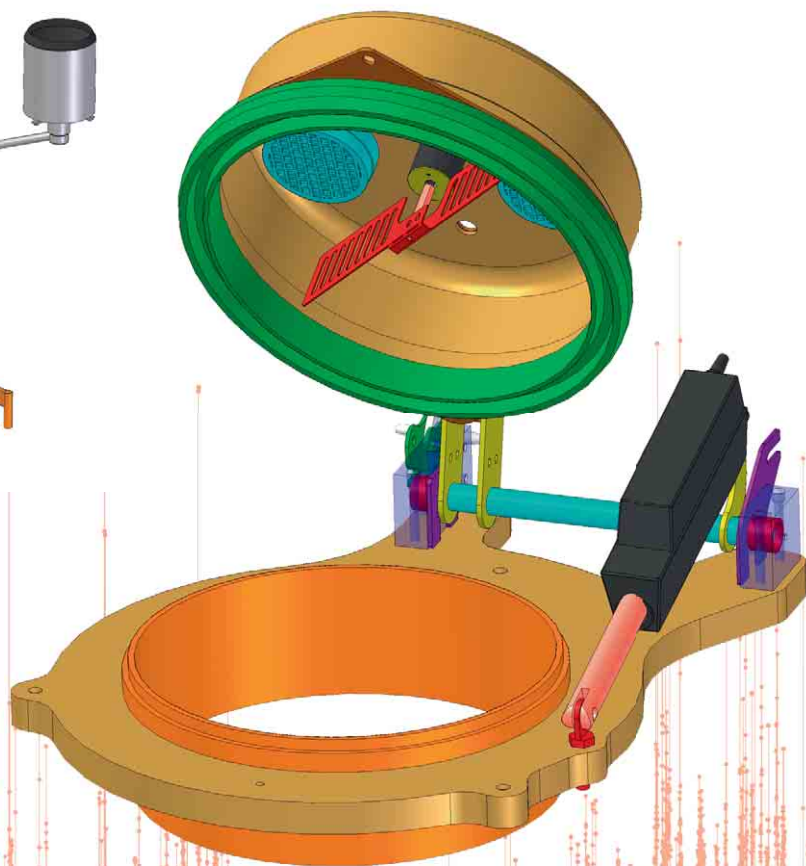
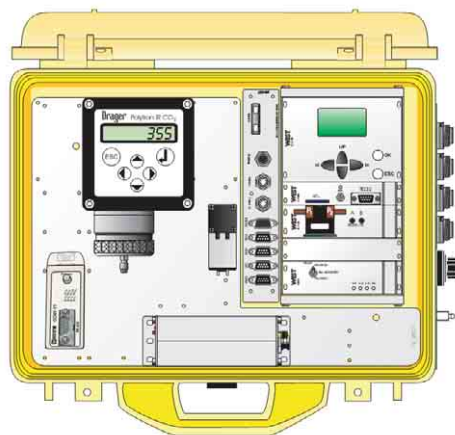


Diffuse Degassing continuous monitoring systems

The station is able to measure:

- Carbon dioxide diffuse flux from soil by means of the accumulation chamber method.
- [Optionally]: Hydrogen Sulfide diffuse flux by means of the accumulation chamber method.
- Air temperature
- Soil temperature
- Wind speed and direction
- Relative humidity in air
- Soil water content
- Barometric pressure
- Gas flow in the sampling line
- Rain fall

This is a completely automatic station, power supplied with a solar cell and backup battery, which performs the measurements cycle with a configurable frequency (default every hour).



CM.HWR8 SoilGas station

CPU	a custom programmed microcontroller that manages the functioning of the station, and the communications with the master center. The CPU stores the data into a removable SD memory (1 GB storage capacity).
Display	the station is equipped with a LCD monochromatic display for configuration and testing of the sensors.
Acquisition system	analog to digital conversion board with 8 analog inputs;
Flowmeter AWM3300	This sensor measures the quantity of gas mixture that is pumped into the measurement line. It's useful to know the pump and filters status.
Barometric pressure sensor: Vaisala Barocap PTB110	Temperature compensation. Measurements range 600-1100 hPa Linearity and hysteresis : ± 0.3 hPa
Power requirements	Low power consumption , less than 5 mA @ 12 Volts in standby
Accumulation chamber	Aluminum accumulation chamber with internal mixing device; Chamber footprint ~ 700 cm ²

CO₂ detector: Drager Polytron IR CO₂

CO₂ flux measurement range:

1 to 350 moles/m²·day precision $\pm 10\%$

350 to 600 moles/m²·day precision $\pm 25\%$

600 to 1500 moles/m²·day precision $\pm 25\%$

Environmental parameters sensors

Soil temperature sensor: Temperature Pt100 probe 0 ~ 200 °C

Soil water content by using a time Domain reflectometry probe;

Range 5- 50% (Volume of water / Volume of Soil)%

Sonic Wind speed and direction gauge;

Measurements range 0..60 m/sec. 0-360°

Thermohygrometer with double antiradiation protection.

Relative humidity range : 10~98%

Temperature range : -30~70°C

Other detectors are available on request.

Power supply

The station is supplied by solar panels.

During night and in periods of low solar radiation the power is supplied by means of a buffered battery. To avoid damage to the battery, a dedicated circuit allows the station to turn off when there is low battery power.

Shelter

The enclosure for the station is made in AISI316 steel, and supports the meteo sensors and the solar cells power supply system.

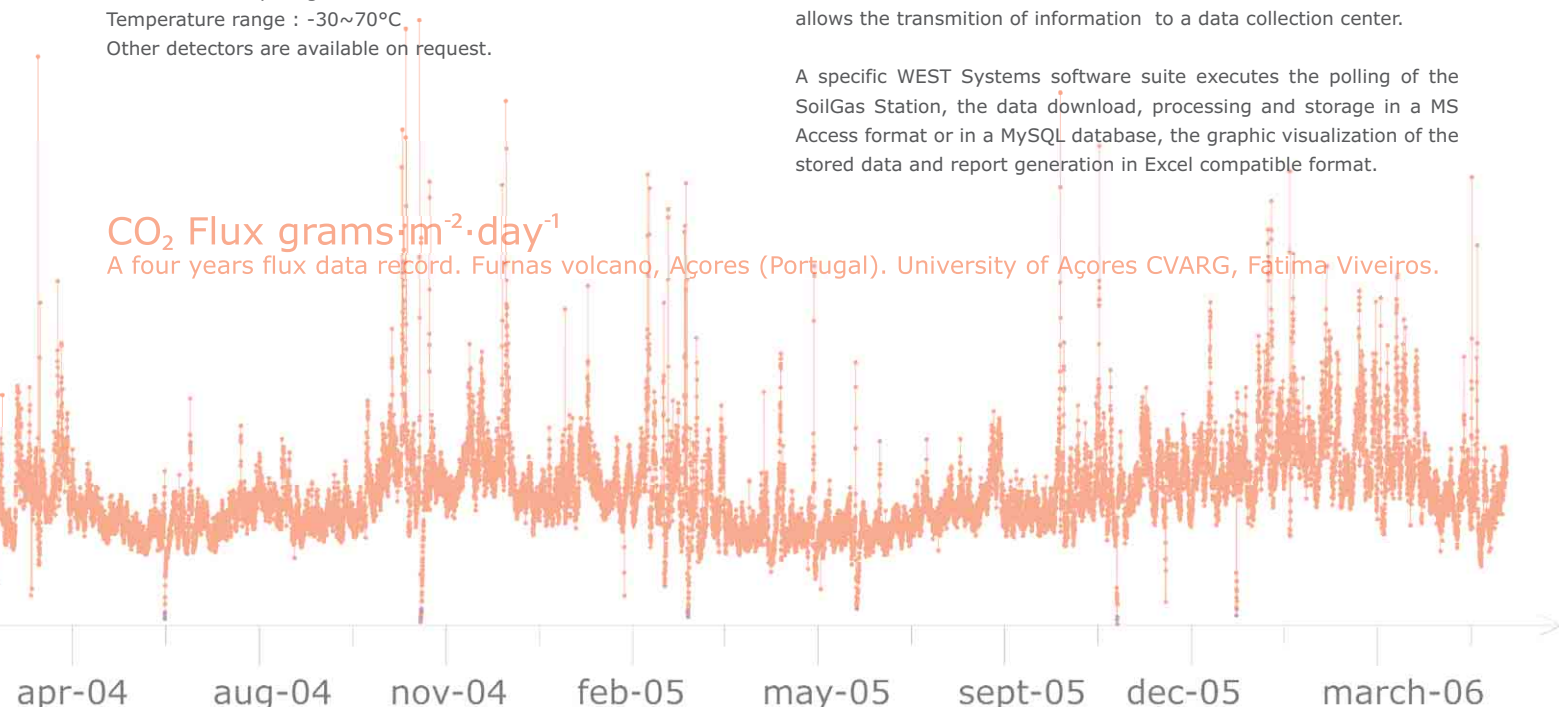
Data acquisition and processing

The station is equipped with a datalogger for acquisition and storage of the monitored parameters. A radio modem, or a GSM/GPRS modem, allows the transmission of information to a data collection center.

A specific WEST Systems software suite executes the polling of the SoilGas Station, the data download, processing and storage in a MS Access format or in a MySQL database, the graphic visualization of the stored data and report generation in Excel compatible format.

CO₂ Flux grams·m⁻²·day⁻¹

A four years flux data record. Furnas volcano, Açores (Portugal). University of Açores CVARG, Fatima Viveiros.



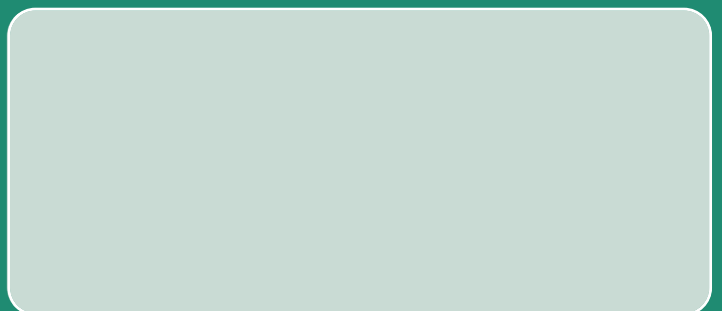


Head Quarter

Via Don Mazzolari 25
Zona Industriale La Bianca
56025 Pontedera (PI)
ITALY
tel. +39 0587 294216
tel. +39 0587 483335
fax +39 0587 296068

info@westsystems.com
sales@westsystems.com
www.westsystems.com

Local representative



Portable soil Fluxmeter

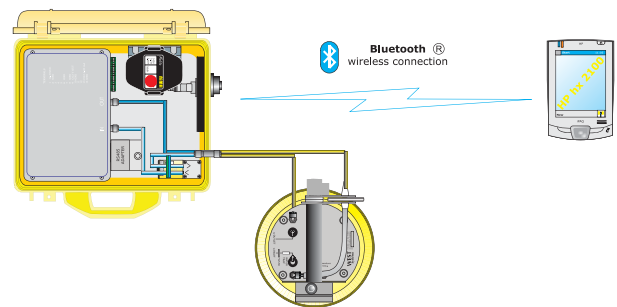


Portable soil Fluxmeter

The WEST Systems Fluxmeter is a portable instrument for the measurement of diffuse degassing phenomena, based on the accumulation chamber method, suitable for volcanic and geothermal areas as well as soil respiration rate in agronomy.

This method studied for soil respiration in agronomy (Parkinson, 1981) and for soil degassing in volcanic areas (Cioni et al. 1998), has been designed by WEST Systems to obtain a portable instrument that allows the performance of measurements with very good accuracy in a short time. The instrument allows a wide range evaluation of the amount of soil gas flux, and can be also used for the survey of biogas non controlled emissions on landfills. The instrument is extremely versatile and allow

measurement of flux in 2/4 minutes. A floating adapter for the accumulation chamber allows to measure flux at the water-atmosphere interface; (bubbling at the surface of sea, lakes, rivers, wetlands, rice paddies, pools).



Characteristics

Specifications

Total Weight: less than 8.2 Kg/16 lbs to be carried using the backpack-like support vest. The field operator will also have to carry one of the accumulation chambers and the palmtop.

Warm Up & battery endurance

Only at instrument cold start-up a warm-up time of 20 minutes is required. The typical measurement time ranges from 2 to 4 minutes and the autonomy of the instrument is about 4 hours with a single NiMH 14.4 Volts, 2.6 A/h battery. The instrument comes with two interchangeable batteries.

Accumulation Chamber specifications

Accumulation chamber A diameter : 200 mm / Height: 100 mm / weight: 1.25 Kg/2.8 lbs
Accumulation chamber B diameter : 200 mm / Height: 200mm / weight : 1.60 Kg /3.6 lbs
Accumulation chamber C diameter : 300 mm / Height: 100mm / weight : 1.75 Kg /3.9 lbs

Palm top computer and Software

The instrument is supplied with a custom software, FluxManager, installed on a PocketPC Color Display based on Windows Mobile operating systems that is connected to the instrument by bluetooth connection.

This software allows recording and real time visualization of the increase in concentration of the target gas in the accumulation chamber, and then the flux calculations. By using the palmtop embedded GPS the flux measurement points are automatically geo-referenced. The measurements obtained can be saved on the palmtop computer and then transferred to a desktop PC by using the SD card.

The instrument is supplied complete with:

- › Backpack-like support vest
- › Carrying case for transport and storage
- › 2 batteries NiMH 14.4 Volts 4.5A/h and 1 NiMH battery charger and one accumulation chamber, to be choosed at order time;
- › Palmtop Pocket PC
- › User Manual, in English
- › FLUX Manager Software for Windows Mobile, in English
- › A suite of PC based software for the data post-processing

The standard flux meter configuration is supplied with a single gas detector, normally the carbon dioxide detector. The fluxmeter can host maximum 3 sensor by the way special release, based on specific customer request.

Gas detectors

WS-LI820-CO₂

The LI-820 is a double beam infrared carbon dioxide sensor compensated for temperature and atmospheric pressure. Accuracy of concentration reading is 2% and repeatability is ± 5 ppm.

The accuracy depends on the measured flux:

- 0 to 0.5 moles·m⁻²·day⁻¹ $\pm 25\%$
- 0.5 to 1 moles·m⁻²·day⁻¹ $\pm 15\%$
- 1 to 150 moles·m⁻²·day⁻¹ $\pm 10\%$
- 150 to 300 moles·m⁻²·day⁻¹ $\pm 10\%$
- 300 to 600 moles·m⁻²·day⁻¹ $\pm 20\%$

WS-DRAGER CO₂

The WS-DRAGER is double beam infrared carbon dioxide detector compensated for temperature. Accuracy of concentration reading is 3%. The accuracy depends on the measured flux:

- 0.5 to 5 moles·m⁻²·day⁻¹ $\pm 25\%$
- 5 to 350 moles·m⁻²·day⁻¹ $\pm 15\%$
- 350 to 600 moles·m⁻²·day⁻¹ $\pm 10\%$
- 600 to 1500 moles·m⁻²·day⁻¹ $\pm 10\%$

WS-HC-IR

The hydrocarbons detector is based on a IR spectrometer. Accuracy of concentration reading is 5%, repeatability is 2%, detection limit is 60 ppm and resolution is 22 ppm.

The accuracy depends on the measured flux:

- 0.2 to 10 moles·m⁻²·day⁻¹ $\pm 25\%$
- 10 to 150 moles·m⁻²·day⁻¹ $\pm 15\%$
- 150 to 300 moles·m⁻²·day⁻¹ $\pm 20\%$

WSI-HC-DA

The hydrocarbons detector is based on a array of sensors to cover the entire range from few ppm up to 100%. The accuracy is of $\pm 5\%$ of reading, and repeatability is $\pm 3\%$.

The accuracy depends on the measured flux:

- 1 to 1000000 millimoles·m⁻²·day⁻¹ $\pm 20\%$

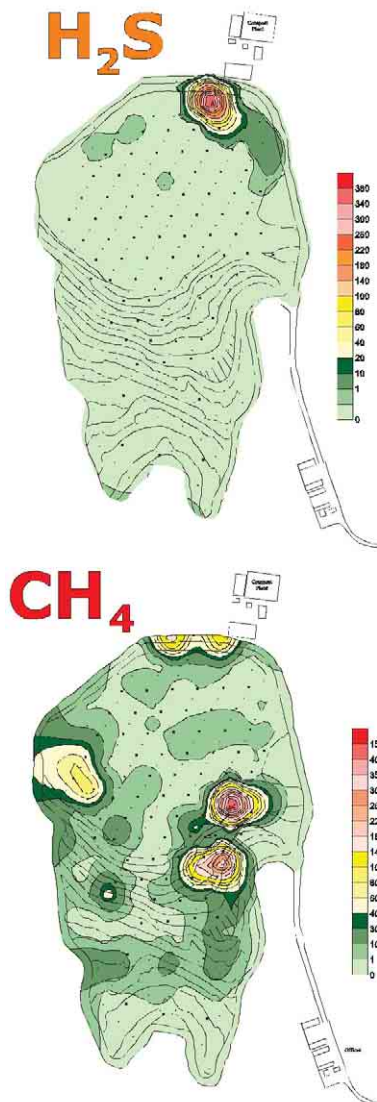
WS-H₂S

The hydrogen sulphide detector is a electrochemical cell. Full scale range is 20ppm, with a precision of 3% of reading and the repeatability is 1.5 % of span with a zero offset of 0.3%.

H₂S Flux measurement range is from 0.0025 to 0.5 moles·m⁻²·day⁻¹.

The accuracy depends on the measured flux:

- 0.0025 to 0.05 moles·m⁻²·day⁻¹ $\pm 25\%$
- 0.05 to 0.5 moles·m⁻²·day⁻¹ $\pm 10\%$



0 50 100 m

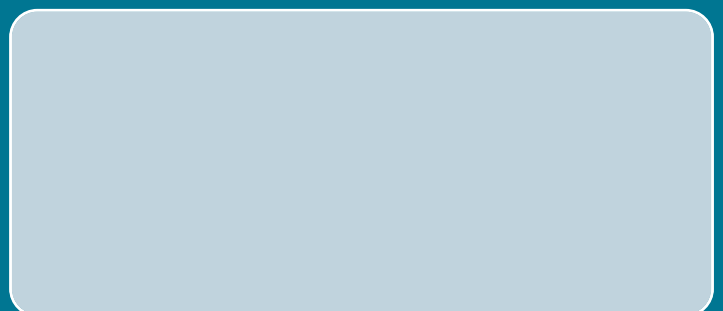


Head Quarter

Via Don Mazzolari 25
Zona Industriale La Bianca
56025 Pontedera (PI)
ITALY
tel. +39 0587 294216
tel. +39 0587 483335
fax +39 0587 296068

info@westsystems.com
sales@westsystems.com
www.westsystems.com

Local representative



Scout: WEST Systems compact
fluxmeter



Scout: WEST Systems compact fluxmeter

Scout is a portable and very compact instrument for the flux measurement based on the accumulation chamber method. Scout is the latest version of the WEST Systems portable fluxmeter, very light and easy to handle.



Operating principles

The fluxmeter is equipped with the Vaisala GP343 carbon dioxide detector. Its working principle is exactly the same as the classical



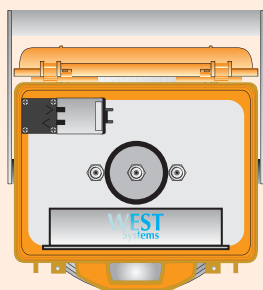
fluxmeter.

The only remarkable difference consists of the absence of an electromechanical mixing device that is substituted by a long porous tube that allows a perfect mixing of the gas inside the accumulation chamber. The carbon dioxide detector is placed following the longitudinal axis of the chamber.

The efficiency of the new mixing device was demonstrated by the linearity of the measured concentration versus time curves and by the correct instrument response during the lab test; before the actual implementation of the instrument several laboratory and on-field tests were performed, firstly by WEST Systems and later by E. Padron and P.Hernandez of the ITER group (Tenerife, Spain).

The microcontroller that manages the system, the battery and the pump are hosted in a box on the top of chamber; the same box can host also a hydrogen sulfide or a hydrocarbons detector. The instrument is managed by a specific software that runs on a palmtop computer connected to the fluxmeter via Bluetooth.

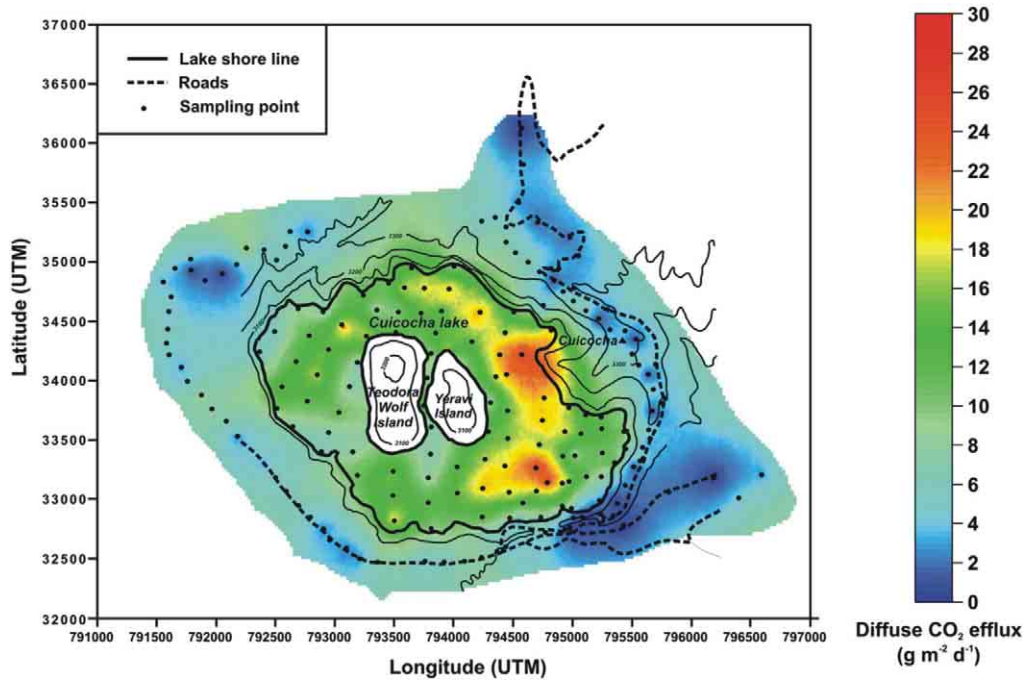
Wireless Bluetooth connection



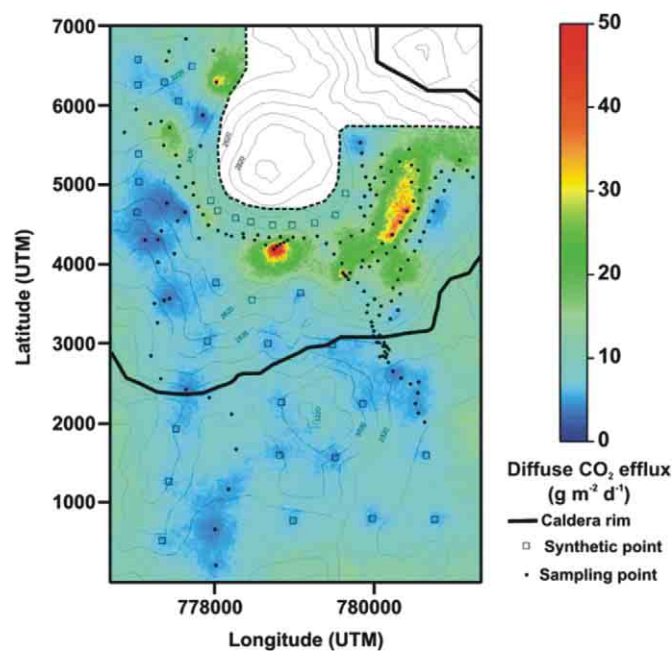
Bluetooth ®
wireless connection



In the picture the results of some flux mapping performed with Scout



Spatial distribution of the average of the 100 sequential Gaussian simulations obtained for the Cuicocha volcano. (Da Padrón et al. 2008. Diffuse CO₂ emission rate from Pululahua and the lake-filled Cuicocha calderas, Ecuador)



Spatial distribution of the average of the 100 sequential Gaussian simulations obtained for the Pululahua volcano. (Da Padrón et al. 2008. Diffuse CO₂ emission rate from Pululahua and the lake-filled Cuicocha calderas, Ecuador)



Head Quarter

Via Don Mazzolari 25
Zona Industriale La Bianca
56025 Pontedera (PI)
ITALY
tel. +39 0587 294216
tel. +39 0587 483335
fax +39 0587 296068

info@westsystems.com
sales@westsystems.com
www.westsystems.com

Local representative

