

## Technical sheet of Ecotron analysers for trace gas and stable isotopes measurements

### LI-7000 (Licor, Inc) IRGA: CO<sub>2</sub> and H<sub>2</sub>O mixing ratios

- For CO<sub>2</sub> (0-3000ppm) and H<sub>2</sub>O (0-60mmol/mol)
- Simultaneous and continuous measurement
- Differential, non-dispersive infrared gas analyser.
- Noise specification at 1s: 25ppb for CO<sub>2</sub> at 370ppm.
- 4 units



### LI-6400 XT (Licor, Inc): Integrated system for photosynthetic and respiration fluxes

- For CO<sub>2</sub> (0-3100ppm) and H<sub>2</sub>O (0-75mmol/mol)
- Simultaneous and continuous measurement
- Non-dispersive infrared gas analyser.
- CO<sub>2</sub> noise specification at 1s and 350ppm: 0.07ppm
- H<sub>2</sub>O noise specification at 1s and 20mmol/mol: 0.009mmol/mol
- Soil CO<sub>2</sub> flux chamber available
- Leaf chamber fluorometer available
- 1 unit



### LI-8100A and LI-8150 multiplexer: Integrated system for soil respiration fluxes

- For CO<sub>2</sub> (0-20000ppm) and H<sub>2</sub>O (0-60mmol/mol)
- Simultaneous and continuous measurement
- Non-dispersive infrared gas analyser.
- CO<sub>2</sub> noise specification at 1s and 370ppm: <1ppm
- H<sub>2</sub>O noise specification at 1s and 10mmol/mol: <0.01mmol/mol
- 1 unit equipped with 1 survey chamber or up to 16 long-term chambers (clear or opaque)
- Compatible with Picarro G2508



### G2508 (Picarro Inc) laser spectrometer: N<sub>2</sub>O, CH<sub>4</sub>, CO<sub>2</sub>, NH<sub>3</sub>, H<sub>2</sub>O mixing ratios

- For N<sub>2</sub>O (0.3-200ppm), CH<sub>4</sub> (1.5-12ppm), CO<sub>2</sub> (380-5000ppm), NH<sub>3</sub> (1-300ppb) and H<sub>2</sub>O (0-3%)
- Simultaneous and continuous measurement at 1Hz
- Cavity Ring-Down Spectroscopy
- 1 $\sigma$  precision (+0.05% of reading): <25ppb for N<sub>2</sub>O; <10ppb for CH<sub>4</sub>;  $\leq$ 600ppb for CO<sub>2</sub>;  $\leq$ 5ppb for NH<sub>3</sub>;  $\leq$ 500ppm for H<sub>2</sub>O
- 1 unit
- Compatible with LI-8100 automated soils CO<sub>2</sub> flux system and LI-8150 multiplexer
- Installed in a transportable frame



### G2311f (Picarro Inc) laser spectrometer: CO<sub>2</sub> and CH<sub>4</sub> mixing ratios

- For CO<sub>2</sub> (300-500ppm) CH<sub>4</sub> (1-3ppm) and H<sub>2</sub>O (0-3%v H<sub>2</sub>O 25°C dew point)
- Simultaneous and continuous measurement at 10 and 0.2 Hz
- Cavity Ring-Down Spectroscopy
- Flux modes 10Hz – 1 $\sigma$  precision:  $\leq$ 200ppb for CO<sub>2</sub>;  $\leq$ 3ppb for CH<sub>4</sub>;  $\leq$ 6ppm + 0.3 of reading for H<sub>2</sub>O
- 1 unit



### G2301 (Picarro Inc) laser spectrometer: CO<sub>2</sub> and CH<sub>4</sub> mixing ratios

- For CO<sub>2</sub> (300-700ppm) CH<sub>4</sub> (1-3ppm) and H<sub>2</sub>O (0-3%v H<sub>2</sub>O 25°C dew point)
- Simultaneous and continuous measurement at 1Hz
- Cavity Ring-Down Spectroscopy
- 1 $\sigma$  of raw 5s precision:  $\leq$ 70ppb for CO<sub>2</sub>;  $\leq$ 0.5ppb for CH<sub>4</sub>;  $\leq$ 80ppm for H<sub>2</sub>O
- 1 unit



### L2140i (Picarro Inc) laser spectrometer: water isotopic analyser

- For  $\delta^{18}\text{O}$ ,  $\delta^{17}\text{O}$ ,  $^{17}\text{O}$ -excess and  $\delta\text{D}$
- Streamlined, simple and simultaneous measurement in liquids and vapor at  $\sim 1\text{Hz}$ .
- Cavity Ring-Down Spectroscopy
- Vapor specifications:
  - 1000 – 50000ppm
  - $1\sigma$  precision at 12500ppm ( $^{17}\text{O}$ -excess mode): 0.04‰ for  $\delta^{18}\text{O}$  at 300 sec; 0.04‰ for  $\delta^{17}\text{O}$  at 300 sec; 0.1‰ for  $\delta\text{D}$  at 300 sec; 0.015‰ for  $^{17}\text{O}$ -excess at 3,600 sec
- Liquids specifications (high precision vaporizer) :
  - Up to 160 injections per day
  - $1\sigma$  precision: 0.025‰ ( $\delta^{18}\text{O}$ ), 0.025‰ ( $\delta^{17}\text{O}$ ), 0.1‰ ( $\delta\text{D}$ ) and 0.015‰ ( $^{17}\text{O}$ -excess)
- MCM module (organics removal)
- Induction Module (leaf water extraction)
- 1 unit



### G2101i (Picarro Inc) laser spectrometer: CO<sub>2</sub> isotopic analyser

- For  $\delta^{13}\text{C}$  (380-500ppmv) and  $\text{CO}_2$  (380-500ppmv)
- Simultaneous and continuous measurement at 1Hz
- Cavity Ring-Down Spectroscopy
- $1\sigma$  – 5min precision for  $\delta^{13}\text{C}$ :  $<0.3\text{‰}$
- $1\sigma$  – 30sec precision for  $\text{CO}_2$ : 200ppbv ( $^{12}\text{C}$ )/10ppbv ( $^{13}\text{C}$ )
- 1 unit



### N<sub>2</sub>O Isotope Monitor (Aerodyne Research Inc)

- For N<sub>2</sub>O,  $\delta^{15}\text{N}$  and  $\delta^{15}\text{N}_{\alpha\beta}$
- Simultaneous and continuous measurement at 1Hz or flask measurement using the dual inlet module
- Tunable Infrared Laser Direct Absorption Spectrometry
- $1\sigma$  – 100 sec precision for N<sub>2</sub>O: 0.01 ppb
- $1\sigma$  – 100 sec precision for  $\delta^{15}\text{N}_{\alpha}$  and  $\delta^{15}\text{N}_{\beta}$ : <0.5‰
- 1 unit



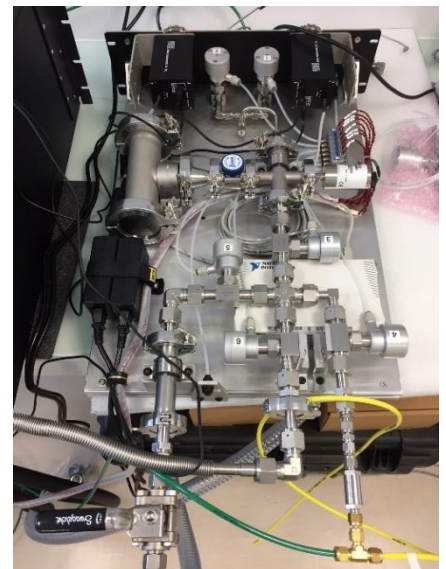
### CO<sub>2</sub> Isotope Monitor (Aerodyne Research Inc)

- For CO<sub>2</sub>,  $\delta^{13}\text{C}$ ,  $\delta^{18}\text{O}$ ,  $\delta^{17}\text{O}$
- Simultaneous and continuous measurement at 1Hz or flask measurement using the dual inlet module
- Tunable Infrared Laser Direct Absorption Spectrometry
- Possible upgrade for  $\Delta^{17}\text{O}$
- $1\sigma$  – 300 sec precision for  $\delta^{13}\text{C}$ : < 30 per meg
- $1\sigma$  – 300 sec precision for  $\delta^{18}\text{O}$ : < 30 per meg
- $1\sigma$  – 300 sec precision for  $\delta^{17}\text{O}$ : < 0.1 ‰
- 1 unit



### Dual inlet module for flask sampling (Aerodyne Research Inc)

- Compatible with the N<sub>2</sub>O or CO<sub>2</sub> Aerodyne analyser
- For CO<sub>2</sub>,  $\delta^{13}\text{C}$ ,  $\delta^{18}\text{O}$ ,  $\delta^{17}\text{O}$ ,  $\Delta^{17}\text{O}$ , N<sub>2</sub>O,  $\delta^{15}\text{N}$  and  $\delta^{15}\text{N}_{\alpha\beta}$
- Compatible with ICOS flasks
- 1 unit



### Oxy1-SMA probe (PreSens)

- For O<sub>2</sub> (0-100%) in liquid and gas phase
- Continuous measurement at 1Hz
- Optode (optical measurement)
- Detection limit: 15ppb dissolved oxygen
- 1σ – 30 min precision at 21% O<sub>2</sub>: <0.1% O<sub>2</sub>
- 1 unit

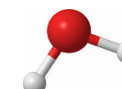
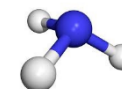
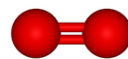
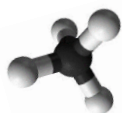
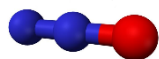
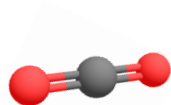


### Delta V Plus (ThermoFisher Scientific) Isotope Ratio Mass Spectrometer

- For CO<sub>2</sub>, N<sub>2</sub>, O<sub>2</sub>, H<sub>2</sub>, Ar, δ<sup>13</sup>C, δ<sup>18</sup>O, δ<sup>15</sup>N, δ<sup>2</sup>H
- ConFlo IV
- Gasbench II with optional cryogenic trap for small samples
- Dual Inlet Module
- 10 collector assembly (air-ratio)
- Special specifications for δ<sup>13</sup>C and δ<sup>18</sup>O of CO<sub>2</sub> in very small air samples: precision <0.2‰ (n=5) for 1 ml of ambient air (400ppm CO<sub>2</sub>).
- 1 unit



## Sum up of all the equipment and measurements available at the European Ecotron of Montpellier



	CO <sub>2</sub>	N <sub>2</sub> O	CH <sub>4</sub>	O <sub>2</sub>	N <sub>2</sub>	NH <sub>3</sub>	H <sub>2</sub> O
<b>Mixing Ratio</b>	G2301 G2311f Li7000 Aerodyne CO <sub>2</sub>	G2508 Aerodyne N <sub>2</sub> O	G2301 G2311f	Oxy1-SMA Delta V Plus	Delta V Plus	G2508	L2140i
<b>δ<sup>2</sup>H</b>			non mesuré			non mesuré	L2140i
<b>δ<sup>13</sup>C</b>	G2101i Aerodyne CO <sub>2</sub> Delta V Plus		non mesuré				
<b>δ<sup>15</sup>N</b>		Aerodyne N <sub>2</sub> O			Delta V Plus	non mesuré	
<b>δ<sup>15</sup>N<sub>αβ</sub></b>		Aerodyne N <sub>2</sub> O					
<b>δ<sup>17</sup>O</b>	Aerodyne CO <sub>2</sub>	non mesuré		non mesuré			L2140i
<b>Δ<sup>17</sup>O</b>	Aerodyne CO <sub>2</sub> (modifié)	non mesuré		non mesuré			L2140i
<b>δ<sup>18</sup>O</b>	Aerodyne CO <sub>2</sub> Delta V Plus	Delta V Plus (modifié)		Delta V Plus			L2140i