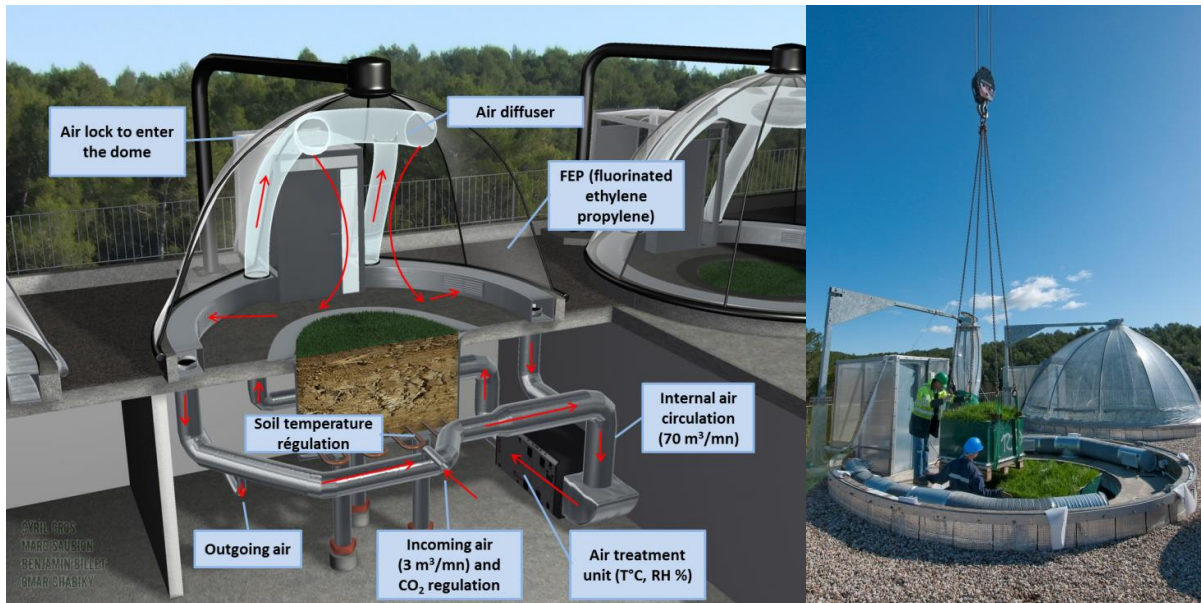


# Macrocosms platform data sheet

The Macrocosms platform of the Montpellier European Ecotron is a 100 m long building which houses 12 identical and independent experimental units. It is composed of 14 transparent domes on the roof of the building (2 serves to eliminate the border effect) and of 12 rooms housing for each experimental unit, the soil part of the terrestrial ecosystems (lysimeters) and the machinery for the environmental controls (see table 1 for specifications). Each experimental unit has a volume of 40 m<sup>3</sup> and can receive lysimeters from 2 to 12 tonnes. For the measurements of ecosystem fluxes (CO<sub>2</sub>, CH<sub>4</sub>, ...) each unit works like a large open gas exchange system (see figure 1 and table 1 for specifications). Design to work with natural light, each unit can also be run under controlled light conditions with a totally opaque cover blocking sunlight.

**Figure 1.** (Clockwise from top left) Scheme describing the components of a macrocosm with the air circuits (Cros, Saubion, Billet, Chabiky), lysimeters insertion (photothèque CNRS H. Raguét), instrumented lysimeter (photo J. Roy), gas and isotopes measurements laboratory (photo Cl. Piel).



**Table 1.** Major characteristics of the Macrocosms platform at the Montpellier European Ecotron

| <b>Macrocosms – Montpellier European Ecotron</b> (see <a href="http://www.ecotron.cnrs.fr">www.ecotron.cnrs.fr</a> for more details) |  |
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| <b>General characteristics</b>   |  |
| Design   | Set of experimental units designed for the environmental control and process measurements of large terrestrial ecosystems  |
| Dimensions   | Above ground compartment and air circuit: 40 m <sup>3</sup><br>Lysimeter: 0,5 to 2 m deep, area: 2, 4 or 5 m <sup>2</sup> (round, square, round respectively)  |
| Replicates   | 12 independent experimental units  |
| Confinement  | Confined, not closed, controlled environment facility<br>Possibility to separate canopy fluxes and soil fluxes   |
| <b>Environment control</b> – continuous automated control  |  |
| Temperature  | Above ground : -10°C to +50°C (± 0.5°C) with season's constraints on the extremes<br>Soil: vertical gradient through lysimeter base temperature control (+12 to +30 °C)  |
| Air humidity   | 30 % to 85 % RH depending on temperature   |
| Soil moisture  | Automated watering (sprinklers, drip irrigation, water table)  |
| Lighting   | Natural light conditions: transmission PAR: 80 %, UVa 60 %, UVb 40%<br>Possibility of neutral shadings<br>Controlled lighting: Plasma lamps with solar-like spectrum: 500 μmol/m <sup>2</sup> /s at 40 cm  |
| <b>Atmospheric chemistry control</b> – continuous automated control  |  |
| CO <sub>2</sub>  | Daytime: 380- 1000 ppm ± 10 ppm (lower level dependent upon photosynthesis)<br>Night time: control only above 500 ppm (no CO <sub>2</sub> trap)  |
| <sup>13</sup> C  | <sup>13</sup> C enrichment with injection of <sup>13</sup> CO <sub>2</sub>   |
| <b>Process measurements</b> on line  |  |
| Evapotranspiration   | Continuous lysimeters' weight measurements (300 g loss detectable)   |
| Ecosystem net CO <sub>2</sub> exchange   | Measurements every 12 mn, whole system independent calibration (accuracy 0,5 μmol m <sup>-2</sup> s <sup>-1</sup> )  |
| CanopyCO <sub>2</sub> exchange   | Measurements every 12 mn (not compatible with Net ecosystem CO <sub>2</sub> exchange)  |
| SoilCO <sub>2</sub> concentration  | Measured continuously on several strata. Used with soil moisture and soil diffusivity to calculate soil respiration per strata. Possibility to measure δ <sup>13</sup> C of CO <sub>2</sub> and CH <sub>4</sub> mole fraction with a manual sampling system (1 measurement per hour for a given strata). |
| Discrimination δ <sup>13</sup> C of the net CO <sub>2</sub> flux   | 3 measurements per hour to be done on one dome (or on several domes with a proportional lower frequency)   |
| Net CH <sub>4</sub> exchange   | 8 measurements per hour to be done on one dome (or several domes with a proportional lower frequency). Resolution limit : 0.5 nmol.s <sup>-1</sup> (installed either on the Macrocosms platform or on the Mesocosms one)   |
| <b>Environmental measurements</b>  |  |
| Light  | Quantum sensors  |
| Temperature, RH  | PT100, RH and T probes (Michell)   |
| CO <sub>2</sub>  | LiCor 7000, Picarro G2301, Vaisala GMT222 and GMP343   |
| Methane  | Picarro G2301 (range 0 to 20 μmol.mol <sup>-1</sup> , precision : 0.3 nmol.mol <sup>-1</sup> ) (installed either on the Macrocosms platform or on the Mesocosms one)   |
| δ <sup>13</sup> C of CO <sub>2</sub>   | Picarro G2101-i (accuracy from 0.2 to 0.5‰ depending on sampling frequency).   |
| Soil moisture and T°C  | TDR sensors (Pico 32 Trime)  |
| <b>Data retrieval</b>  |  |
| All data   | Automated quality check; real time (+1h) viewing and retrieval of data through a customized software (Liaison) allowing also to establish the experimental design  |
| <b>Mobile instrumentation</b>  |  |
| Light  | Spectrometer (Jaz Ocean Optics) / Sunshine sensor (BF5 DeltaT), line quantum sensor (LiCor)  |
| Wind   | Hot wire anemometer (Ahlborn)  |
| Canopy structure   | SunScan (DeltaT)   |
| Leaf gas exchange chlorophyll fluoresc.  | Portable gas exchange system with leaf and soil chambers and fluorescence system(LiCor 6400)   |

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| Water potential       | Pressure chambers (2) ( PMS Instrument)  |
| Stomatal conductanc   | Porometer (SC1 Decagon)  |
| Leaf area             | Bench belt leaf area meter (LI3100-C LiCor)  |
| Data acquisition      | Data loggers (Campbell CR211)  |
| <b>Study systems</b>  |  |
| Intact ecosystems     | Intact terrestrial ecosystem sampled <i>in natura</i> or from <i>in situ</i> experimental plots  |
| Reconstructed systems | Terrestrial ecosystems can be assembled with soil and planted/sown vegetation with or without plant/soil animals diversity manipulations |