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The European Ecotron of Montpellier: experimental platforms to study ecosystem response to climate change

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The sustainability of agricultural, forested and other managed or natural ecosystems is critical for the future of mankind. However, the services provided by these ecosystems are under threat due to climate change, loss of biodiversity, and land use changes. In order to face the challenges of preserving or improving ecosystems services and securing food supply we need to understand and forecast how ecosystems will respond to current and future changes. To help answer those questions Ecotrons facilities are born. Such infrastructures provide sets of confinement units for the manipulation of environmental conditions and real-time measurement of ecological processes under controlled and reproducible conditions, bridging the gap between the complexity of in natura studies and the simplicity of laboratory experiments.

The European Ecotron of Montpellier (www.ecotron.cnrs.fr) is an experimental research infrastructure for the study of the impact of climate change on ecosystem functioning and biodiversity. This infrastructure offers, through calls open to the international community, three experimental platforms at different scales. The Macrocosms platform is composed of twelve 40 m³ units, each able to host 2-12 t lysimeters, with a 2-5 m² canopy area and a soil depth of up to 2 m. The Mesocosms one has eighteen 2-4 m³ units, each able to host lysimeters of 0.4-1 m depth and 0.4-1 m² area. The Microcosms platform consists of growth chambers (1 m height, 1 m² area) in which smaller units (with photosynthetic plants, soils, insects, etc.) can be installed. Each experimental unit of each platform allows to confine terrestrial ecosystems. This way, environmental parameters such as temperature (-10 to +50   C), relative humidity (20-80 %), precipitation (sprinkler or drip) and atmospheric CO₂ concentration (200-1000 ppm) are strictly and continuously controlled and recorded. But the uniqueness of the European Ecotron of Montpellier lies on its ability to also continuously measure, in each unit, net gas exchange (evapotranspiration, CO₂ / CH₄ / N₂O net fluxes) that occur in between the ecosystem studied and the atmosphere, as well as CO₂, H₂O, N₂O and O₂ isotopologues. Those tools are powerful and remarkable to access additional information about processus involved in ecosystem functioning.

The aim of this presentation is to describe the Macrocosms and the Mesocosms platforms through examples of international projects recently run in these platforms.

