

## ICOS PROJECT OBJECTIVES

Climate change is one of the most critical issues to which humanity will be faced in the coming decades. It is extremely likely (IPCC, 2013) that the measured increase in global temperatures is due to the increase in the greenhouse gas (GHG) into the atmosphere due to human activities.

Natural ecosystems reabsorb about half of the carbon dioxide emitted by anthropogenic emissions: they behave as carbon sinks. In their absence, atmospheric CO<sub>2</sub> concentration would grow twice as fast. However, processes involved are not well understood and it is not known if, in the future these sinks will increase, decrease or decay. It is thus necessary to better understand mechanisms of greenhouse gas emission and absorption by ecosystems and their long term changes..

### In this context, ICOS project has the following aims :

1. establish an integrated, long term, CO<sub>2</sub> and GHG observation infrastructure at European scale ;
2. determine CO<sub>2</sub> and GHG fluxes from observations and to relate them to emission and absorption processes.

## Complementary experiments

Terrestrial observatories are open to the development of original experiments. They are a core on which can join complementary experiences, working in synergy with the ICOS system.

These experiences may benefit from an access to the infrastructure (power line, tower, internet access) and to the existing data (fluxes, meteo, biometric measurements).

# ICOS

INTEGRATED  
CARBON  
OBSERVATION  
SYSTEM

ICOS is structured as an european triple network - atmospheric, terrestrial and oceanic – in which CO<sub>2</sub> and GHG concentration and fluxes are measured.

In Belgium, ICOS has developed an ecosystem network of six terrestrial observatories (three in Flanders, three in Wallonia) over crops, forests and greenlands.

## ICOS PARTNERS FÉDÉRATION WALLONIE-BRUXELLES



Gembloux Agro-Bio Tech  
Université de Liège



Wallonie



SPW  
Service public  
de Wallonie



ISSEP  
Institut scientifique  
de service public  
Intégration - Analyse - Synthèse  
Recherche - Analyses  
Évalué - Expérimenté



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[www.icos-belgium.be](http://www.icos-belgium.be)

[www.icos-infrastructure.eu](http://www.icos-infrastructure.eu)



# ICOS Wallonia

Integrated Carbon  
Observation System in Wallonia  
[www.icos-belgium.be](http://www.icos-belgium.be)





Lonzée terrestrial observatory ^

## ► LONZÉE

TERRESTRIAL  
OBSERVATORY  
2004

**SITE :** 4 year rotation, typical of central Belgium.  
Eddy covariance measurements at 3 m height.

**MICROMETEOREOLOGIC STATION :** Follow up of net CO<sub>2</sub> flux ecosystem exchange, impact on fluxes of climate, species and crop management . Crop and rotation carbon budget.

**COMPLEMENTARY MEASUREMENTS :** Intensive biomass follow up, soil respiration (autotrophic and heterotrophic discrimination), soil carbon content, NDVI, PRI, nitrogen deposition, VOC fluxes, N<sub>2</sub>O fluxes

Part of CARBOEUROPE network.

Site upgrade and integration in ICOS network in 2014.



^ La Robinette terrestrial observatory

## FLUX TOWERS

Flux towers are at the heart of terrestrial observatories. They measure fluxes with the eddy covariance method, which is based on an atmospheric turbulence analysis. This technique requires the capture and treatment of 300.000 measurements every half hour. Computed on several decades, these fluxes are representative of the net flux of an ecosystem of several hectares and reveal the budget of all processes at work in the ecosystem.



## ► LA ROBINETTE

TERRESTRIAL  
OBSERVATORY  
2007

**SITE :** Spruce forest cut (1996) and reforested (1998) with a mix of deciduous species.

**SITE SPECIFICITY:** Follow up of source and sink dynamics during forest growth after reforestation. Spruce – deciduous succession.

**LONG TERM RESEARCHES:** Evolution of nutrients losses and deposition, DOC losses and concentration in soil solution, losses at the outlet.

**COMPLEMENTARY MEASUREMENTS:** Soil respiration, soil carbon content, nutrient return, biogeochemical processes, wood mineral element content, critical load, soil exchangeable elements, litter decomposition, biological soil quality indicators.

Part of CARBOEUROPE network.

Upgrade and integration in ICOS in 2015.

Flux responses to climate, management and climatic anomalies are then analyzed. These measurements are complemented with micrometeorological measurements in order to characterize climate conditions in which the fluxes occur. Extensive biomass samplings are made to follow up biomass dynamics (stems/trunks, leaves, fruits, etc..) as well as carbon and nitrogen content..

## ► VIELSALM

TERRESTRIAL  
OBSERVATORY  
1996

One of the longest and most complete data series in Europe.

**SITE:** Mature mixed forest (beech, Douglas fir, Spruce, 70 to 100 years).

Eddy covariance measurements, 52 m height.

**COMPLEMENTARY MEASUREMENTS:** Forest inventory, soil respiration, advection, site water balance, CO<sub>2</sub> and <sup>13</sup>CO<sub>2</sub> diffusion in the soil, VOC fluxes, soil carbon content, nitrogen deposition.

Part of Euroflux and CARBOEUROPE networks.

Upgrade and integration in ICOS in 2014.

Vielsalm terrestrial observatory v

