ICOS ECOSYSTEM OBSERVATIONS

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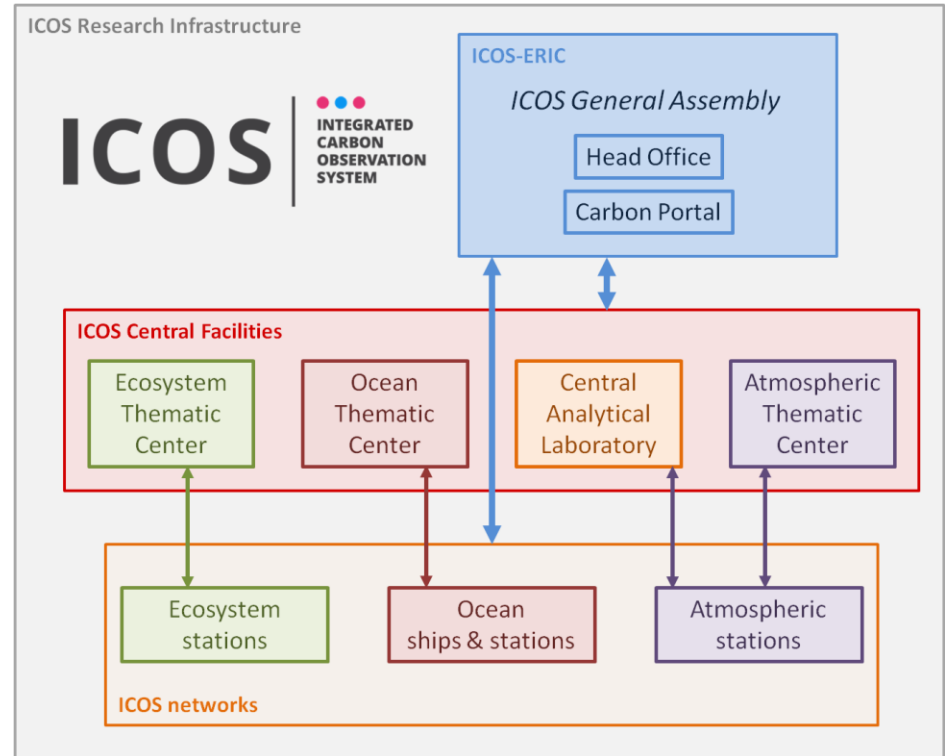Miro Demol and many others…

What is ICOS

European ESFRI Research Infrastructure dedicated to greenhouse gases monitoring.

Network of distributed stations in Europe (and outside EU).

Open access and long term funding.

High standardization

The ICOS Ecosystem Network

Class 1 and Class 2 are the high quality sites (currently 40 in the network)

Site	Setup	Metadata	Processing	Data	Variables
Class 1	Standard	Mandatory	Centralized	Raw data, NRT	CO_2, CH_4 and N_2O, full set of meteo
Class 2	Standard	Mandatory	Centralized	Raw data, NRT	CO_2, large set of meteo
Associated	Free	Basic	Postprocess	HH, every 6 months	One flux and basic meteo

Standardized, full metadata, data in Near Real Time.

All data processed centrally at the ICOS Ecosystem Thematic Centre (ETC)

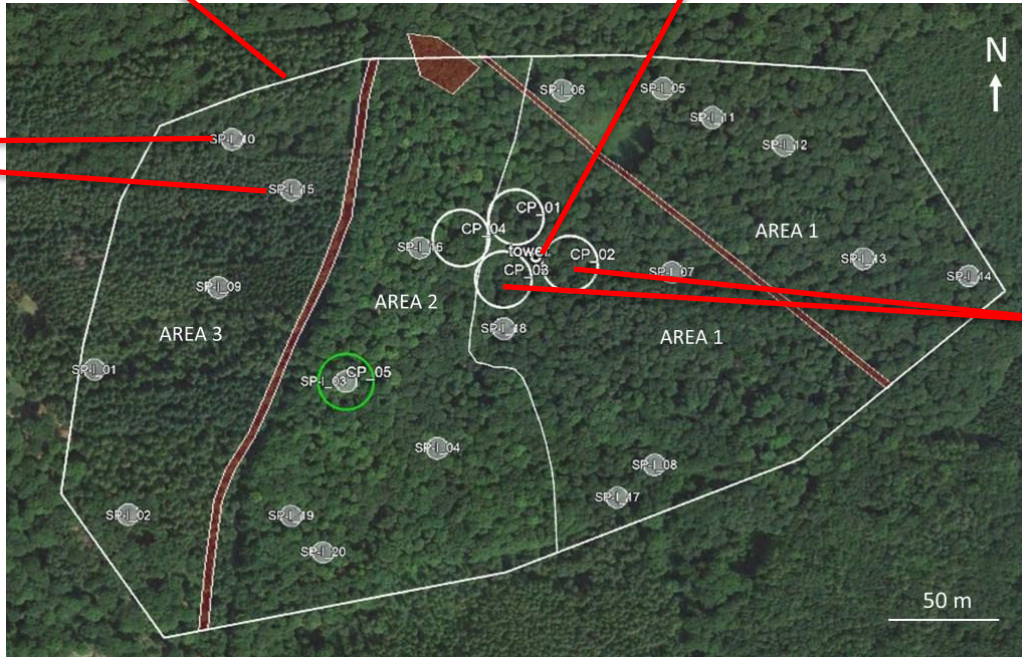Standard protocols applied are available here:

www.icos-etc.eu/documents/instructions

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Monitoring strategy summary

Target area

EC tower and air meteo

SP-I

every 5-10 years
- Tree parameters
- GAI
- Soil C and N

CP

every year (multiple)
- Tree parameters
- GAI
- SWC, TS (continuous)
- Leaves nutrients
- Litter production
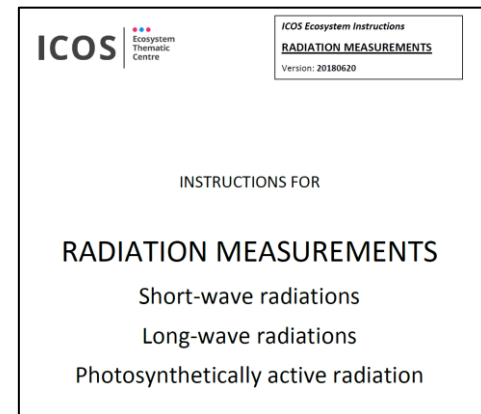
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Radiation and Meteo measurements

Among the different meteorological parameters in the ICOS stations there are continuous measurements of:

- Shortwave Longwave Incoming and Outgoing (and so Net Radiation and Albedo)

- PAR (Incoming, in some cases Outgoing, in some site below canopy)

- Diffuse radiation

- Soil water content and Soil temperature

- All the main meteorological parameters (humidity, temperature, precip.)

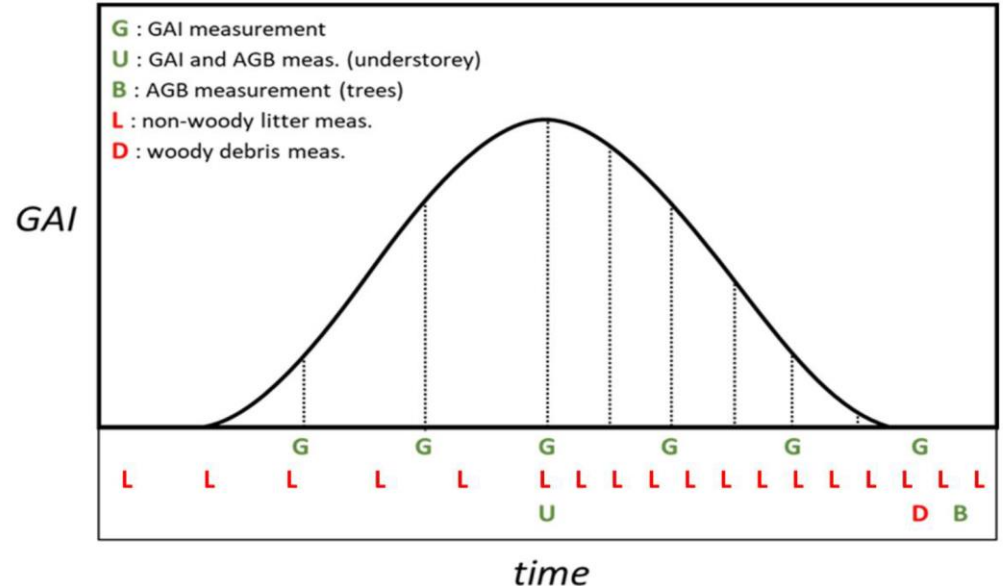Data (collected at 20 seconds resolution) and full metadata (sensor model, position, calibration etc.)

All processed at the ETC, output halfhourly

ICOS Ecosystem Thematic Centre

ICOS Ecosystem Instructions
RADIATION MEASUREMENTS
Version: 20180620

INSTRUCTIONS FOR

RADIATION MEASUREMENTS
Short-wave radiations
Long-wave radiations
Photosynthetically active radiation

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Vegetation characteristics

Measured at the 20 SP-I location every 7-10 years and every year at the **Continuous Plots (CP)** (2,000 m² circular)

- **Tree diameters and heights**
- **Tree healthy status**
- **Green Area Index**
- **Litterfall** (Class 1 only)
- **Nutrients in the leaves**

G : GAI measurement
U : GAI and AGB meas. (understorey)
B : AGB measurement (trees)
L : non-woody litter meas.
D : woody debris meas.

Green Area Index measurement

Green Area Index is measured with one of these two methods:

DHP (if LAI<6)   Ceptometer (LAI>6)

Processing is centralized at the ETC with a tool shared in GitHub:

https://github.com/ETC-UA/LeafAreaIndex.jl

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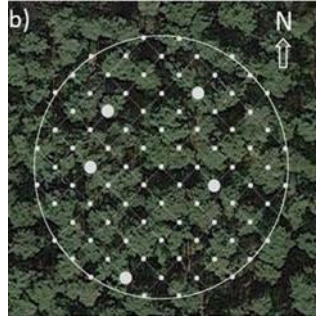INTEGRATED
CARBON
OBSERVATION
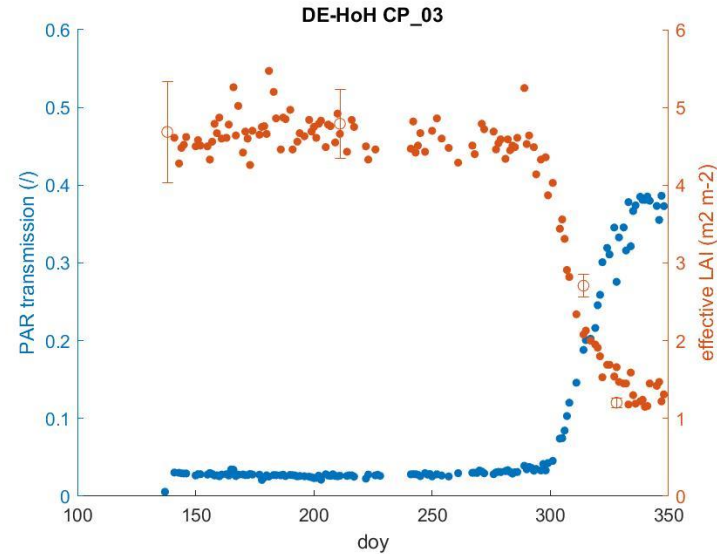SYSTEM

Green Area Index and below canopy PAR

Below Canopy PAR measurements for GAI estimation under test. Mainly due to difficulties to find optimal conditions for DHP
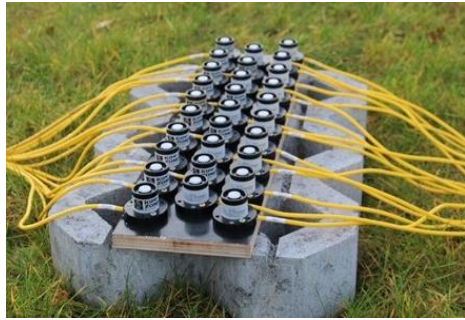
Cross-calibrated sensors with strict specifications

Five sensors per plot in representative locations selected after campaign
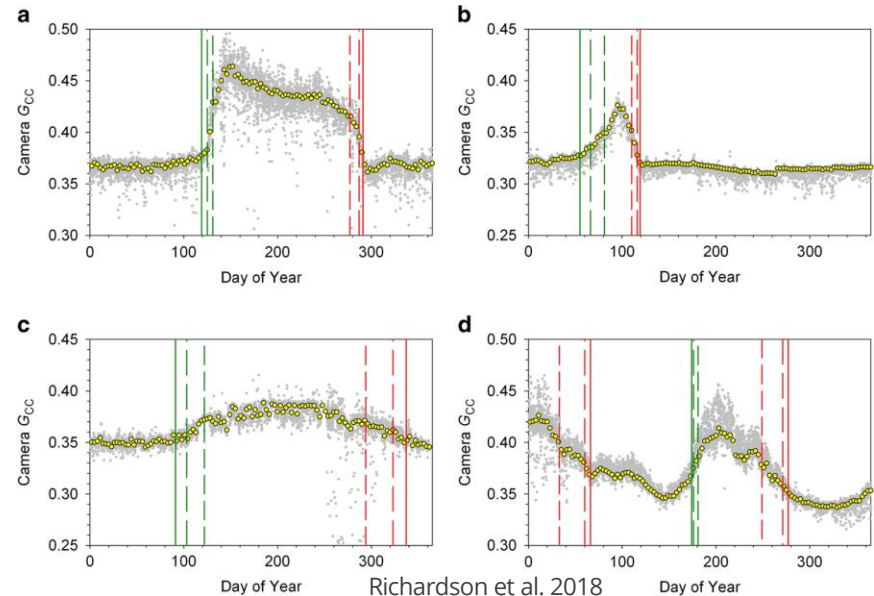

Comparison with DHP estimations

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Phenology measurements

Phenocam (same standard used in the US Phenocam network) for the analysis of the phenology and greenness under implementation.

Richardson et al. 2018

Above-ground Biomass measurement

Tree position, DBH, height, species, healthy status and allometric relations using the FieldMap.

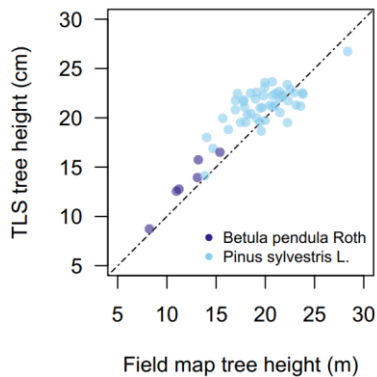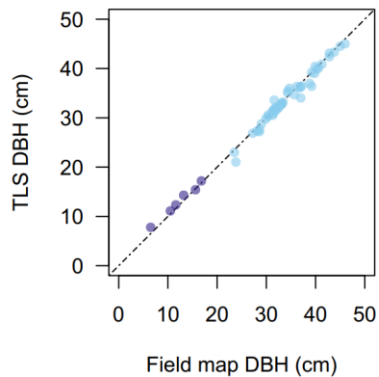Test with TLS scanning the CP of the forest stations (same operator, same instrument, centralized processing)

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TLS in ICOS

TLS scanning funded by a project, **currently not foreseen for the other ICOS stations**.

Data available (raw and results)

Data availability

Official ICOS data (FAIR) available in the ICOS Carbon Portal under CC-BY:

https://data.icos-cp.eu/portal/

ICOS has as **main target the monitoring of GHGs** and for this reason the data products released are optimized for this main topic (aggregation, format, resolution, processing etc.).

It is **possible** (and relatively easy) **to implement specific processing and format** to meet the user communities needs. This is better than a parallel re-processing...

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Adapting/Adjusting protocols

The ICOS community and ETC are available and happy to evaluate all the **possible changes and adaptations of the protocols**.

For the ICOS characteristics (long term, standardization etc.), changes that add **costs must be evaluated and approved**.

Some measurements could be proposed as **facultative** to the stations. In this case however we **still need a clear protocol** and to build the **structure to handle these data**.

Possible to **install** on the stations **third parties sensors** for specific measurements. Procedure not defined but will be possible and easy.

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Why LPV should consider ICOS

ICOS is a **stable**, **long term** and **sustained** European ESFRI Research Infrastructure that ensures **timely**, **high quality** and **open access** data to the scientific communities

These stations and system to manage them **are expensive** (in particular Person Months). **Duplicating a network is a waste of resources.**

ICOS is available to **discuss new products, adaptation of the protocols and new sensors** to meet the requirements

Additional sensors developed by the LPV community (spectral reflectance, SIF etc.) can be proposed and added. Will be managed by the ICOS Station Teams

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Thanks for the attention

for questions and feedbacks:
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