



# ICOS Ecosystem Thematic center

### Bert Gielen

Antwerp ETC team





ICOS Belgium study day – University of Antwerp – April 22nd 2015

ICOS INTEGRATED CARBON OBSERVATION SYSTEM



A European infrastructure dedicated to high precision monitoring of greenhouse gas fluxes







### **Ecosystem Thematic Center organization**





### Current state of the Ecosystem network



- Ready to go operational in late 2015  $\checkmark$
- 31 site in 8 Countries funded  $\checkmark$

(Belgium, Norway, Finland, France, Germany, Sweden, Switserland, Italy)

- +20 sites in 4 countries (UK, Netherlands,  $\checkmark$ Czech Republic, Poland) applied for funding
- more than 20 associated sites  $\checkmark$





### Main features of ICOS Ecosystem stations

- 1. Measurement of GHGs fluxes between ecosystems and atmosphere by eddy covariance and chambers & ancillary data
- 2. Two types of sites (Class 1- full suite of parameters and Class 2 subset of variables) plus the possibility to have Class 3/Associated Sites
- 3. <u>Standardization</u> of methods (through protocols) and equipment (e.g. LI-7200 & Gill HS)
- 4. Centralized <u>data processing</u>, storage and distribution
- 5. Completely open data access and data use policies









### Measured parameters at the ICOS Ecosystem Stations

### <u>continuous</u>:

- ✓ CO<sub>2</sub>, H<sub>2</sub>O, CH<sub>4</sub>, N<sub>2</sub>O, sensible heat fluxes;
- $\checkmark$  CO<sub>2</sub> and H<sub>2</sub>O vertical profiles (High precision for CO<sub>2</sub>);
- ✓ Dew point mirror;
- All radiation components:
  - Net SW and LW radiation
  - Incoming shortwave radiation (Cat II WMO)
  - Outgoing shortwave radiation
  - Incoming longwave radiation
  - Outgoing longwave radiation
  - Incoming Photosynthetic Active Radiation (PAR)
  - Diffuse PAR
  - **Reflected PAR**
  - Below canopy PAR
  - Spectral reflectance

### periodic, yearly:

- Soil carbon content;
- Leaf N content;
- C and N in/out on managed sites;
- Above ground biomass

- vertical temperature and relative humidity profile;
- Rain and snow precipitation (+ WMO precipitation)
- Snow height
- Soil water content profiles
- ✓ Soil temperature profiles
- ✓ Air pressure
- Trunk and branches temperature
- Groundwater level
- Wind speed and direction;
- Back up meteo station (Ta, Rh, SWin, Precipitation)

### periodic, daily to monthly:

- ✓ LAI;
- Above ground biomass
- ✓ Litter fall
- ✓ Phenocam;
- Soil respiration (chamber);
- ✓ CH<sub>4</sub>, N<sub>2</sub>O (chambers);





## Measurement protocols

- 1. Introduction (Editors)
- 2. Eddy Covariance sensors (M. Aubinet + H. Schmid)
- 3. Eddy Covariance setup (C. Rebman)
- 4. Eddy covariance of  $N_2O$  and  $CH_4$  (E. Nemitz)
- 5. Storage fluxes and meteorological measurements (L. Montagnani)
- 6. Eddy covariance data processing (D. Papale)
- 7. Chamber measurements of soil fluxes (M. Pavelka + R. Kiese)
- 8. Precipitations (S. Dengel)
- 9. Radiation components (A. Carrara)
- 10. Soil climate (M. Op de Beeck)
- 11. Phenological cameras (L. Wingate)
- 12. Ancillary vegetation measurements in:
  - 1. Forest (B. Gielen)
  - 2. Cropland (B. Gielen)
  - 3. Grassland (M. Op de Beeck)
  - 4. Mires (M. Op de Beeck)
- 13. Soil sampling and analysis (D. Arrouays)
- 14. Vegetation sampling and analysis (D. Loustau)
- 15. Lateral Fluxes (M. Saunders)
- 16. QAQC and multiple constraints (M. Op de Beeck)







### Central data processing

 

 ICOS
 Ecosystem Thematic Centre

 People & Structure
 ICOS Demo Experiment
 Variables
 Working Groups
 Forum

### NEAR REAL TIME DATA

Access Near-Real-Time (NRT) Eddy-Covariance (EC) data has become important to improve model data fusion (MDF) processing and in particular land surface model (LSM) which simulate terrestrial biosphere exchanges of matter and energy. As known and unfortunately, EC flux data are noisy and potentially biased. This means that each calculated flux contains the "true" value plus both systematic and random errors, which represent the total uncertainties resulting from sample measurements and also from processing options. Because uncertainties enter directly into MDF, misspecification of this quantity affects parameter estimates and propagates into the model predictions.



#### **FR-Fon**





IT-SR2



FI-Hvv











Fontainebleau-

San Rossore 2

Hyttyala

Norunda

Lochristi





## Central data processing







## LAI - Hemitool



- Expert meeting held in Antwerp March 2015
- Develop tool for automatic processing of digital hemispherical pictures to derive LAI for forest ecosystems





## LAI - Hemitool



Hello, Test Account 1: Log off Home Overview Contact

#### Upload LAI pictures

Site:

Test 1A (TE-st1A) Person:

Slope (0° - 90°):

Slope Aspect (0° - 360°):

Camera Setup:

Camera type:

Camera Serial number:

Lens Type:

Lens Serial Number:

Lens Center Rowpixel:

Lens Center Columnpixel:

Lens Type Projectionfunction A Parameter:

Lens Type Projectionfunction B Parameter:

+ Add files... (1) Start upload (2) Cancel uploa

# test version available at https://icos.ua.ac.be/



Developed by ir. Ken Bastiaensen & Emmy Jacobs





## LAI - Hemitool



test version available at <a href="https://icos.ua.ac.be/">https://icos.ua.ac.be/</a>

**Test Phase during growing season 2015** 





## collaboration









**CEOS Working Group on Calibration and Validation** 

**Land Product Validation** 

Subgroup





### Second Announcement

France June, 2-12

# Carbon Workshop 2015 Observatoire de Haute-Provence

<b>Session 1.</b> Overview	<b>Session 4.</b> Carbon Portals
GHG measurements in the Atmosphere and	Importance of interoperability, ICOS Carbon Portal,
Ecosystem, Remote Sensing, Global integration	NOAA Carbon Portal, NEON data portal, etc.
<b>Session 2.</b> Atmosphere approaches	<b>Session 5</b> . New frontiers of carbon science
Trend analysis, isotopic measurements, inverse	Urban Carbon, Lidar remote sensing of forest and
modelling, data assimilation, Bayesian approaches	biomass, Methane measurements,
<b>Session 3.</b> Ecosystem approaches Data mining, parameterization and validation of models, data assimilation. Bayesian approaches	Session 6. Project Small group collaborative projects and presentations.

Registration and detailed information http://carbonws2015.sciencesconf.org







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# Thank you!

