ICOS INWIRE

ICOS improved sensors, network and interoperability for GMES

ICOS-INWIRE overview

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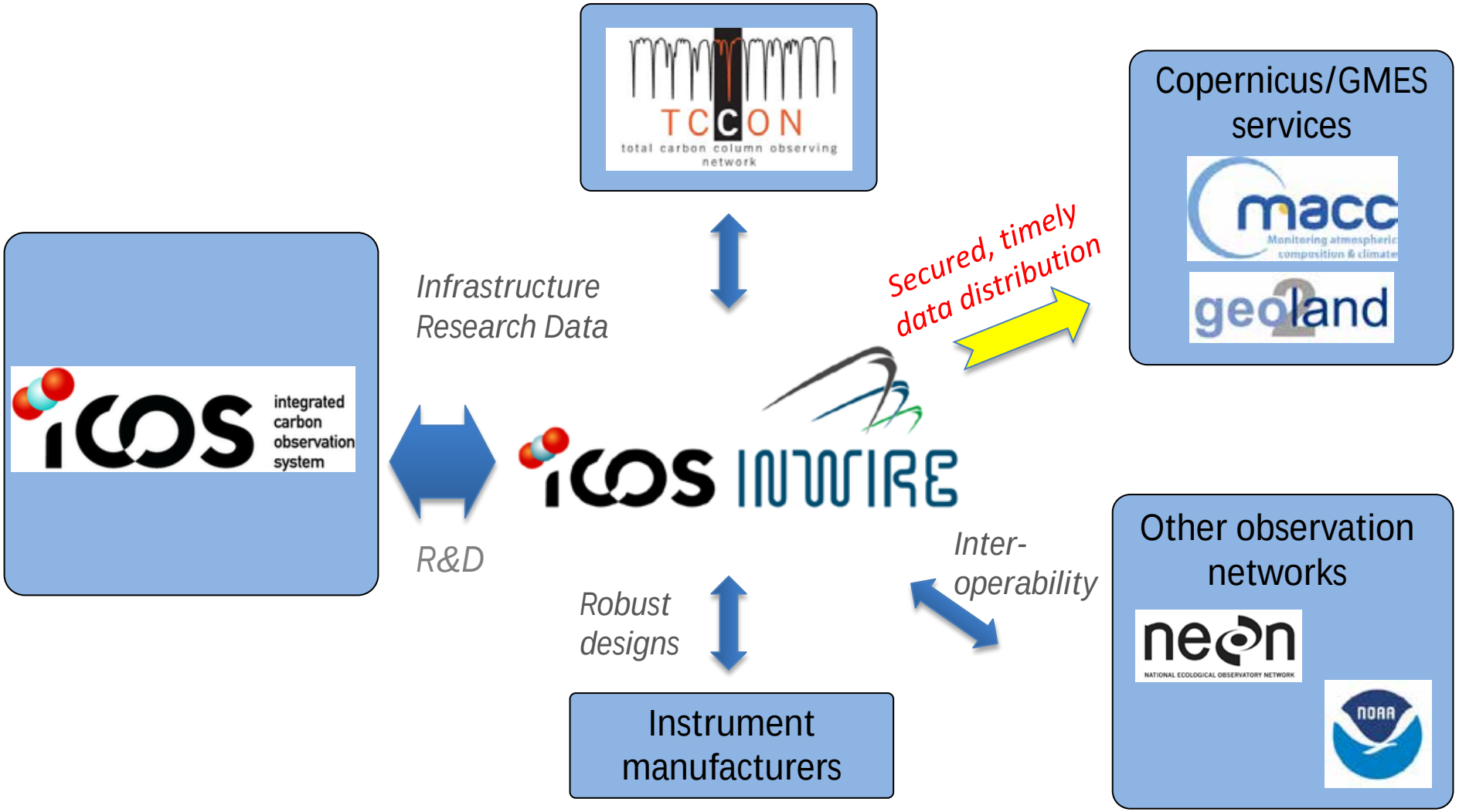
The project is funded by the European Community's Seventh Framework Programme.

Main objectives of ICOS-INWIRE

- **Autonomous GHG sensors systems**
  - Enable new sensor systems for GHG flux and concentration measurements in challenging environments, including hot and cold, wet and dry , polluted, etc.
  - **Development, test and validation of instrument, data transmission systems, and sampling protocols in these environment**
- **Improved GHG tracer transport models** through Boundary Layer Height data
  - develop new software to process BLH LIDAR data operationally at ICOS stations, and transmit this information to data assimilation systems
- **Enhance GHG data provision to GMES** Atmosphere and Land modeling communities
  - develop for GMES operational users both NRT GHG data products, and elaborated delayed-mode products from multiple data sources, including ICOS, TCCON and other monitoring networks
- **Convergence with space systems**
  - develop a new fast–delivery (one month) data product from 4 European TCCON stations for GMES/MACC-II

ICOS-INWIRE in its ecosystem



WP2: Autonomous GHG atmospheric sensor

Requirement specifications for GHG atmospheric stations in extreme environments

a few partners are being consulted

Improve data transmission package

Improve flask sampler

Industry liaison for analyzer improv/t

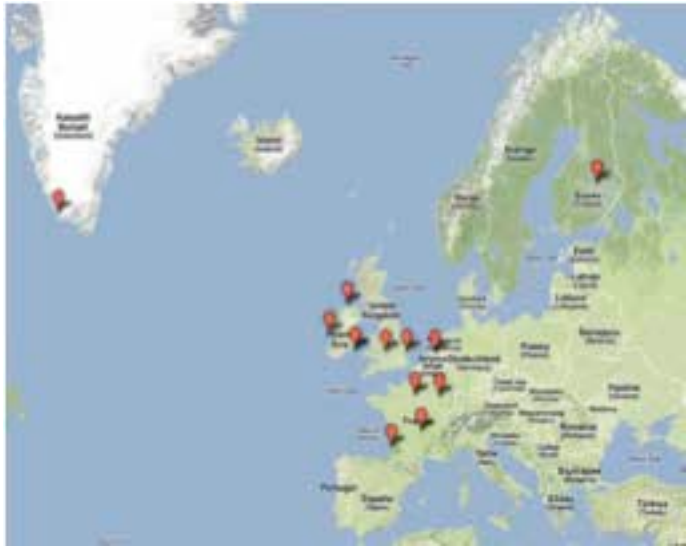
Testing ‘heavy-duty’ atmospheric CO2/CH4/Meteo sensor systems for **remote areas and challenging environments**

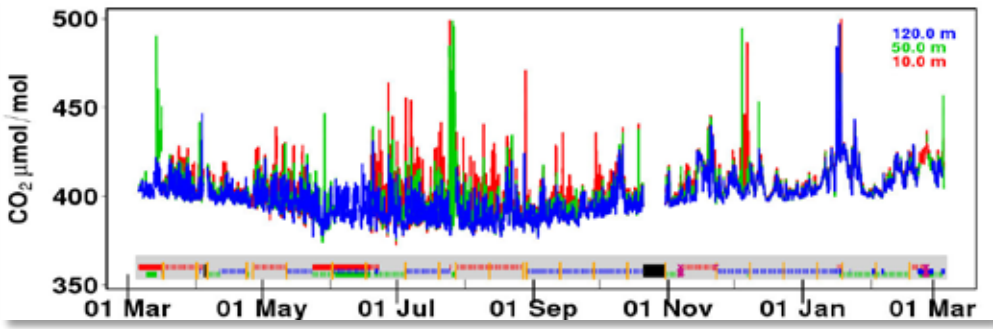
Flask sampler status (S. Baum)

- **Simulation of the whole electronic circuit** (and subcircuits) for avoiding malfunctions due to hardware errors
  - crucial since undetected hardware errors can not be easily detected during the debugging process of the controller software
- 1st small **software modules** programmed, are under testing (e.g. sensor interfacing)
- software will only be operating under Windows 7 since XP will not be longer supported by Microsoft from March 2014 (earlier was both XP & Win7)
- Intention to found a company this year for providing potential customers official **quotes**
- Here the software will provide **core functions** (e.g. periodic sampling). Other features will be later integrated (e.g. time weighted sampling, interfacing with other instruments) by providing customers software updates.
- Only 1 FTE on this project. Ambition is that the first instruments will be available mid of next year. **Interest in renewed expression of interest** from prospective customers and workshop participants.

WP 3: Enhanced operational capabilities of ICOS **atmospheric network**

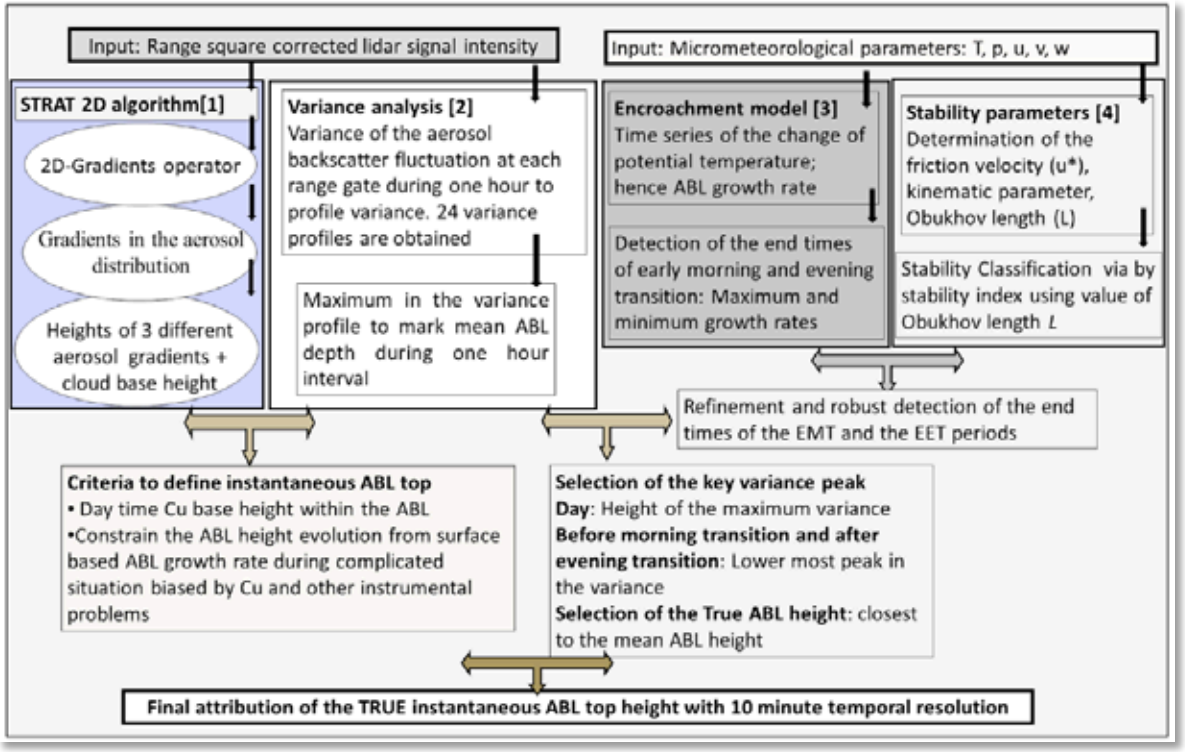
- Improved GHG concentration **data processing and distribution**
- **New variables**: BLH, total column (GISC requirements)
- Integration of data stream: in situ + total column
- ICOS GHG data transmission and data server for **GMES** services, compliant with **GEOSS data architecture**



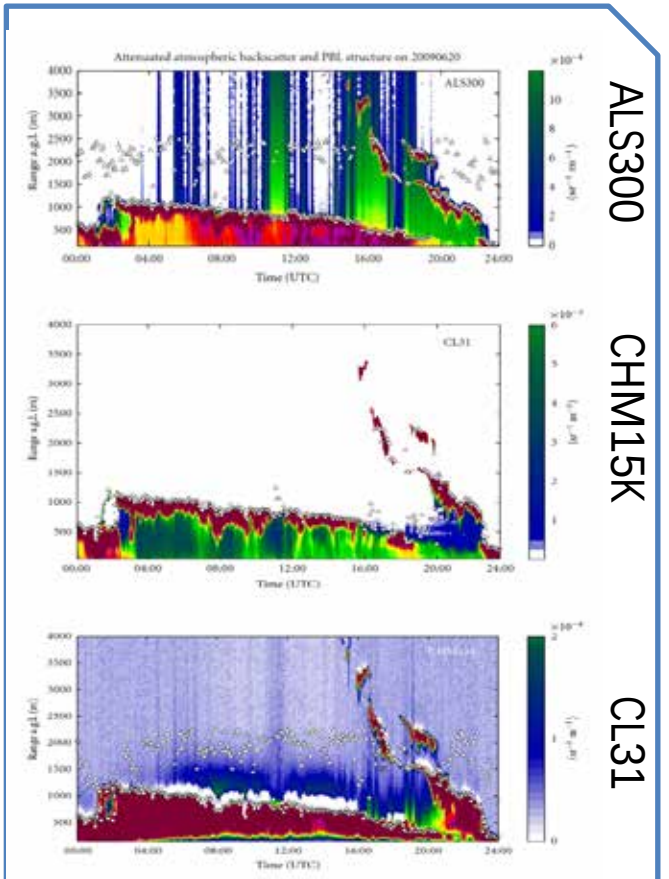


Currently, in-situ CO2, CH4 from 12 atmospheric sites are delivered in NRT to GMES (MACC-II).

WP3: Boundary layer height from LIDAR
Unified lidar preprocessing and BLH retrieval algorithm



Attribution technique with atmospheric stability indicators
Pal et al., JGR, 2013



20/6/2009, MHD campaign
Using different algorithms
Milroy et al., 2012

WP4: Autonomous GHG ecosystem sensor systems

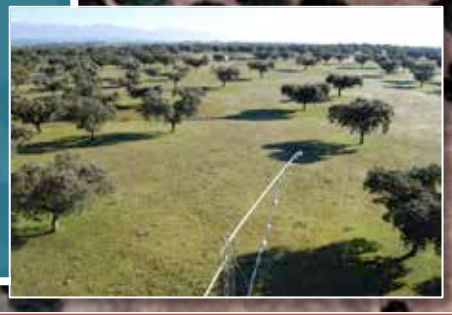
Report on initial 'heavy-duty' EC flu
sensors system design
Incl. recommendation, performan
requirements

Improve EC system, wifi, power supply

Improve additionnal variables

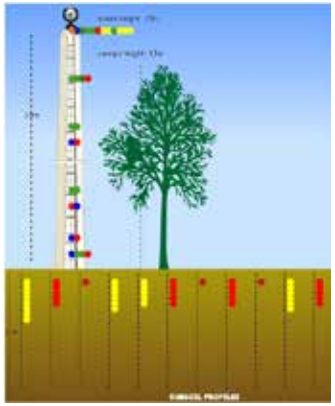
Standardization, incl. with WMO, FAO

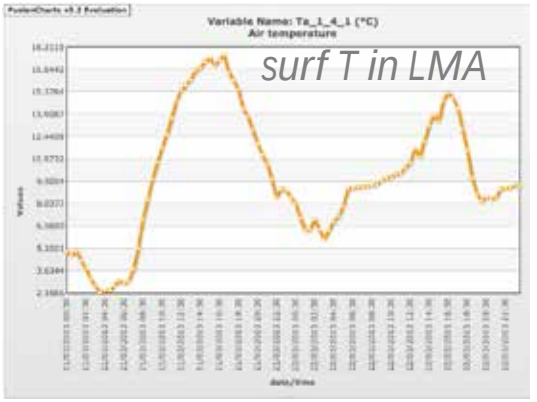
'Heavy-duty' EC sensors system tests at 3 harsh-condition stations, incl. accuracy and data continuity performances

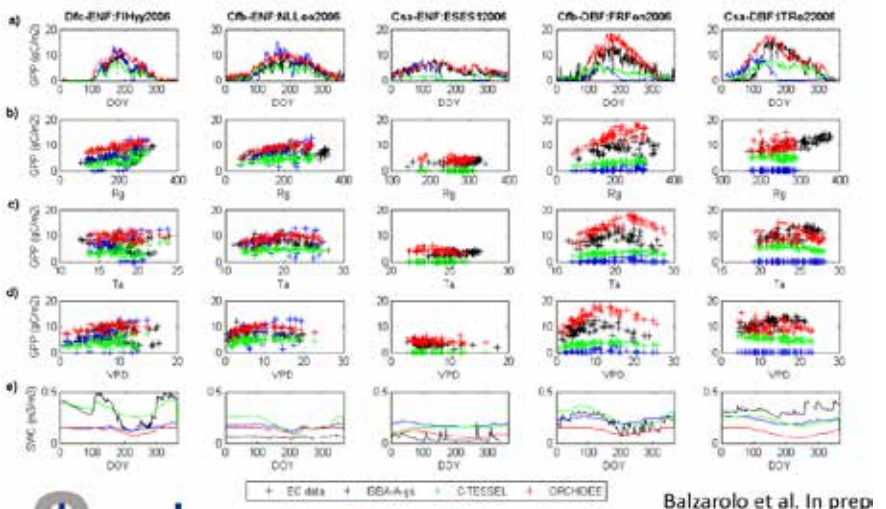


WP 5: Enhanced operational capabilities of ICOS **eddy covariance network**

- Key ecosystem **variables selection** for GMES Land Core Service Element
- NRT **data transmission and processing schemes** optimization
- ICOS ecosystem **database setup** refinement to serve GMES users & comply with **GEOSS data architecture**
- Definition of **metrics to evaluate ecosystem variable assimilation** in land surface models







Balzarolo et al. In prep

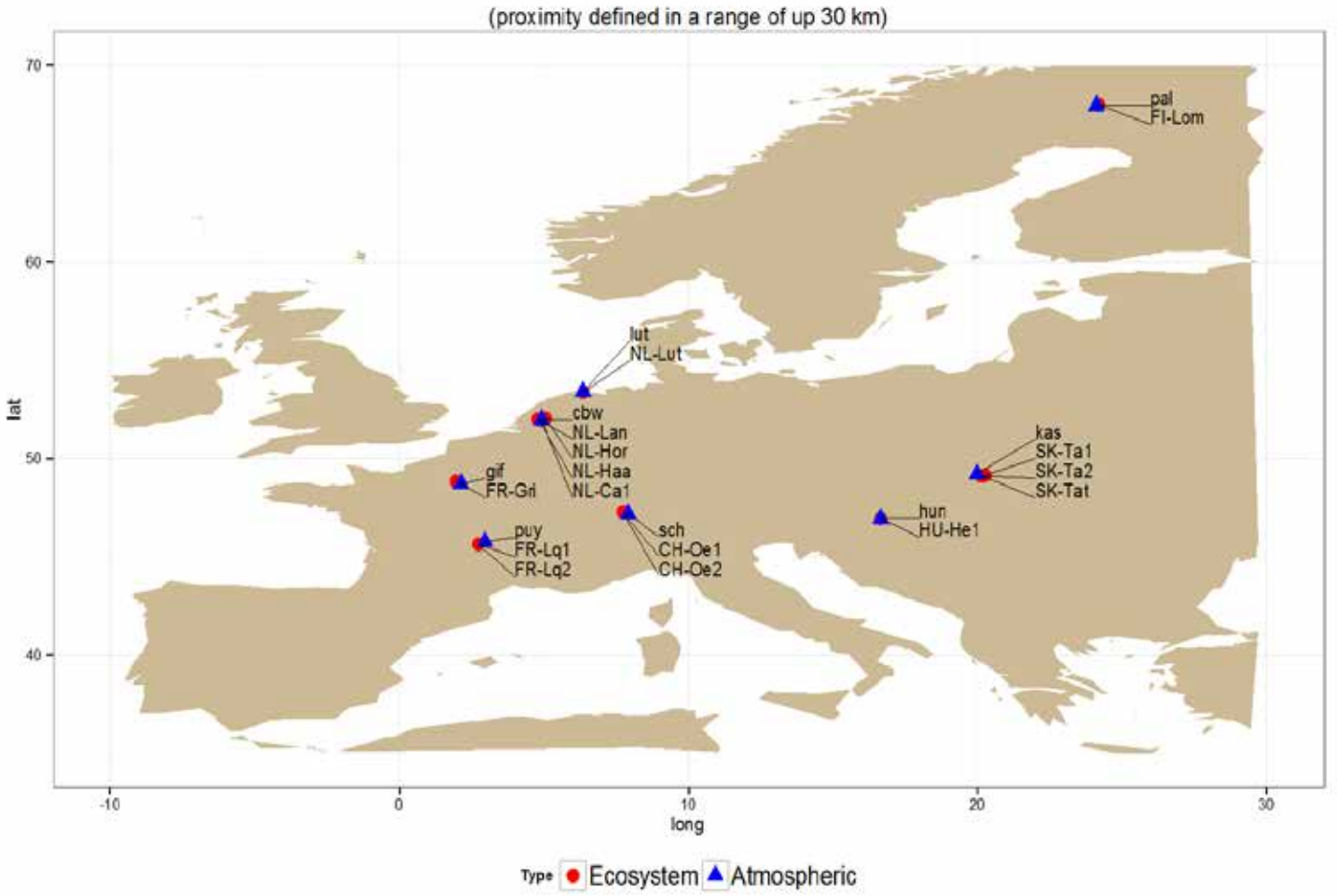
EC vs ISBA, ORCHIDEE, CTESSEL

geoland2

Max Planck Institute for Biogeochemistry · VU University Amsterdam · Università della Tuscia · University of Helsinki · CEAM · Lund University · Universität Bremen

Seventh Framework Programme

Identification of colocated atm and eco sites for land service users

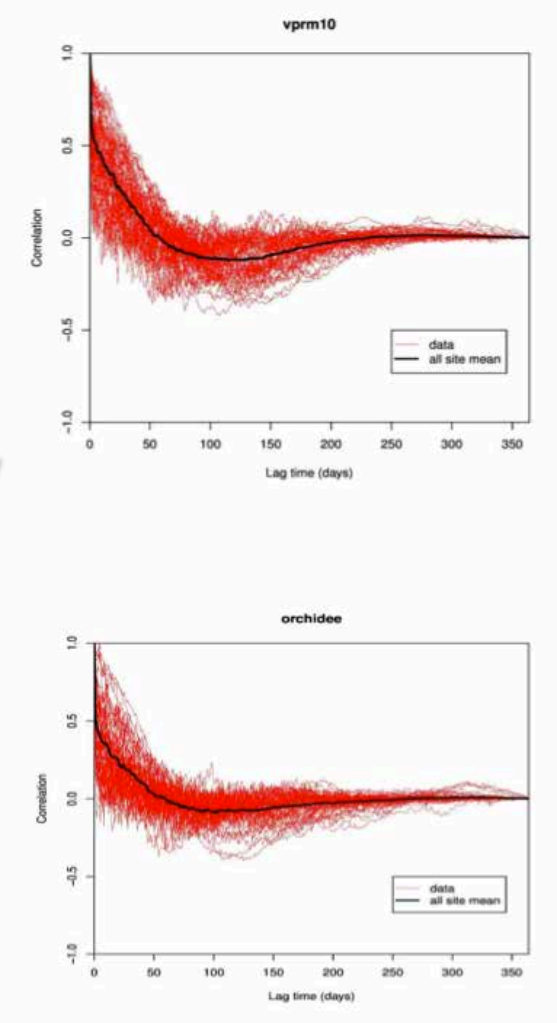


D5.1

WP6: Towards interoperability between ICOS and other GHG networks

Objectives:

- To assess the **compatibility requirements** of different GHG atmospheric networks, using high resolution inverse modeling tools
- Atmospheric **network design** assessment over Europe, toward maximum reduction of flux uncertainties
  - Assessment of a priori error structure done
- Ensure **network compatibility** with other networks incl. TCCON and flux networks
- Validate the use of ICOS+TCCON data for spaceborne sensor validation with ESA GHG CCI



Wrap up

- ICOS-INWIRE seeks to better connect ICOS with its VIP users in GMES/Copernicus,
  - Organizes an ICOS user meeting for MACC-II and land services users in Copernicus 25 nov.
- By design, ICOS-INWIRE benefits to ICOS by
  - Contributing to developping more robust stations,
  - Establishing and implementing key methods for data transmission and processing at TC, measurement protocols,
  - Furthering the development of specific aspects:
    - Eco: power supply, wifi inside the stations, …
    - Atm: flask sampler, BLH from LIDAR, …
  - Ensuring interoperability with other networks
- Project just started and will last for 3 years

http://www.icos-inwire.lsce.ipsl.fr

Thank you

The project consortium

Commissariat à l'Energie Atomique et aux Energies Alternatives-LSCE *Coordination, atmospheric system design, test, data distribution, link with space*	France
Max-Planck-Gesellschaft *Atmospheric system design, boundary layer height*	Germany
VU University Amsterdam *Ecosystem system design, methodology*	Netherlands
Università degli Studi della Tuscia *Ecosystem system design, data distribution, link with space*	Italy
Helsingin Yliopisto *Heavy-duty, extreme conditions instrument test*	Finland
Fundación Centro de Estudios Ambientales del Mediterráneo *Heavy-duty, extreme conditions instrument test*	Spain
University of Lund *Heavy-duty, extreme conditions instrument test*	Sweden
University of Bremen *Atmospheric remote sensing, link with space, data provision*	Germany