Research Networking Programmes

Science Meeting – Scientific Report

The scientific report (WORD or PDF file - maximum of seven A4 pages) should be submitted online within two months of the event. It will be published on the ESF website.

***Proposal Title**: ICOS-NEON greenhouse gas data training workshop*

Application Reference N°: 5586

This workshop is an initiative of the joint EU-US project COOPEUS[1] organised by ICOS[2] and NEON[3] sponsored by the European Commission and ESF activity 'Tall Tower and Surface Research Network for Verification of Climate Relevant Emissions of Human Origin' (TTORCH[4]).

1) Summary (up to one page)

In the frame of the COOPEUS (FP7) project the importance of securing the interoperability of distributed observatories across the Atlantic has received strong support. Carbon based greenhouse gases are observed by both the EU Integrated Carbon Observatory System (ICOS) and the US National Ecological Observatory Network (NEON). Even though ICOS and NEON have a certain number of common data products, the data products, algorithmic approaches, work and data flows and overarching mission are structured differently. NEON has adopted a cause and effect paradigm to estimate carbon biogeochemistry from the local to continental scales, and has imbedded these measurements as part of terrestrial and aquatic ecosystem functioning. ICOS, on the other hand is designed to constrain the carbon cycle at the regional scale, with coverage of fluxes over ocean and land. As with all networks, they also have inherently different constraints on their databases and associated informatics. Finally NEON is essentially funded by a single agency, the US National Science Foundation (NSF), whereas ICOS is a consortium of different, coordinated funding sources and joint governance by a number of agencies from several EU countries, and the European Commission.

[1] www.coopeus.eu
[2] www.icos-infrastructure.eu
[3] www.neoninc.org
[4] www.ttorch.org

Despite these factors of programmatic heterogeneity, there are more similarities and synergies between these two Observatories that present large opportunities in providing new scientific understanding by harmonizing joint approaches, removing barriers, documenting and supporting the joint workability of the data. As such, protocol harmonization, common vocabulary, data access services compatibility are required as both ICOS and NEON will be serving a number of users with a variety of expectations and needs.
We designed a workshop entitled “ICOS-NEON greenhouse gas data training workshop”, held in 2014, as a user-oriented curriculum intended to provide a cohort of early career scientists with the skills to use large-scale carbon data (e.g. NEON and ICOS data). The workshop was organized by ICOS and NEON under the ESFRI-NSF COOPEUS project. One goal of this workshop was to highlight emerging applications of carbon-cycle related data, such as that collected by ICOS and NEON, by bringing together senior and early-career scientists to document future data and service needs to guide the development of the research infrastructures. Workshop topics provided a detailed view of atmospheric and ecosystem monitoring carbon GHG measurements of carbon Infrastructures across the Atlantic and different networks This training workshop aimed at inspiring early career scientists dedicated to carbon and greenhouse gas research and training early adopters of the joint harmonized datasets. In addition, practical use cases and scientific hands-on approaches were conducted, focussed on emerging applications to raise the awareness and curiosity of participants for data fusion techniques across scale, thematic and regional boundaries.

This 6-day workshop brought together early-career scientists (including advanced PhD students and postdocs) and future data users interested in emergent issues and methods wishing to broaden and deepen their knowledge and to identify new research opportunities opened by the availability of measurements acquired by these new carbon research infrastructures. This was a group of diverse and deeply committed participants with equal gender distribution, representing 16 different nationalities, with most participants conducting research in a country different than their birth country. World-renowned speakers came from the US and several European countries. We held an open application process that was disseminated in the scientific communities by e-mail lists and webpage announcement.

2) Description of the scientific content of and discussions at the event (up to four pages)

The workshop format included lectures, hands-on tool training and application, and guided and open discussions. The discussions and lectures included inversion approaches to constrain fossil fuel and biosphere attribution, carbon cycle data assimilation systems, machine learning techniques for data mining in large datasets, and surface carbon exchanges including methane. Frontier sciences including how ecological theory and philosophy can inform new approaches and understanding, use of research infrastructures to address questions of regional to global importance, using remote (satellite) sensing techniques to scale structure to larger landscapes, and hands-on activities. Practical use cases and scientific hands-on approaches have been offered, focusing on emerging applications for data fusion across scales and regional boundaries. The OHP ICOS France atmospheric station and the white oak observatory O3HP has been visited during the field trip.

Table 1 *Workshop program 2014*

Session 1. Overview *GHG measurements in the Atmosphere and Ecosystem, Remote Sensing, Global integration*	**Session 3.** Ecosystem approaches *Data mining, parameterization and validation of models, Bayesian Approach*
Session 2. Atmosphere approaches *Trend analysis, inverse modelling, data assimilation, Bayesian approaches*	**Session 4**. New frontiers of carbon science *Phosphorus cycle, using isotope measurements in flux estimations across scales, …*
Session 5. Project *Working on an individual challenge in a small group during the workshop.*	

Atmospheric approaches (Session 2)

ICOS and NEON provide atmospheric measurement of greenhouse gas concentration and other related meteorological parameters. When calibrated according to the international scale maintained for the World Meteorological Organization these measurements have the potential to be compared with each other. Gradients reveal fluxes that are accumulated and transported of the atmosphere. Atmospheric measurements performed at Mauna Loa since 1958 by C. Keeling revealed first the huge impact that human activity have on atmospheric composition in greenhouse gas like CO2, and hence climate. Gradients between latitudes lead to the possibility to attribute CO2 fluxes to large regions. Progressively, methods to use atmospheric measurements to infer or assess fluxes and changes in fluxes became available. The provision of long-term, homogeneous time series of atmospheric concentrations in greenhouse gas by infrastructures like ICOS and NEON respond to the current trend toward inference of fluxes at higher time and space resolution. Besides the model-based inference of fluxes, emerging application propose to use complementary tracers to directly retrieve fluxes from atmospheric measurements. Multi tracer analyses allow a finer attribution of fluxes to different potential sources (E.g. through their isotopic signature). These methods have the potential to ultimately support verification measures toward reductions in emissions, or carbon storage mechanisms.

Ecosystem approaches (Session 3)

Ecosystem approaches to advance our understanding of the carbon cycle follow several key avenues of study. To outline a few; i) understanding the role of communities and populations in carbon processes, ii) deriving functional relationships between abiotic drivers and carbon processes, iii) devolving the contributory processes e.g., respiratory processes, to the overall ecosystem carbon balance, iv) interactions with- and attribution of boundary-layer budgets of greenhouse gases, v) modelling the carbon cycle, and vi) exploring the frontiers in carbon cycle research, e.g., methane processes, urban carbon cycling, coastal carbon cycling, scaling processes.

Essential to all these studies are the methods to quantify carbon pools, stocks and fluxes across a range of ecosystem processes, structure and functions. We presented these collection and observation methods interactively to the user workshop. To effectively use these data (as with any data), the end-user must also know what they mean. We posed the epistemological question of “how to you know what you know?” Using data does not entirety rely on the data and the data formats. As such, we demonstrated traceable techniques to known quantities, national and international standards, first principles, and best community practices—and presented methods for constructing defensible, ISO-traceable, uncertainty budgets.

The methods to collect ecosystem measurements and build uncertainty budgets come together in Bayesian approaches where knowing uncertainties a priori are necessary to develop a prognostic capability. Here, we brought all these teachings along with data mining to demonstrate how data can be used in real-world studies that are at the frontier of carbon cycle research.

Carbon Cycle Data Assimilation System (CCDAS)

The ORCHIDEE[5] Data Assimilation Systems were designed at LSCE/IPSL in France in order to optimise the carbon, hydrology and energy-related parameters of the ORCHIDEE Land Surface Model, using various data sources (e.g. in situ flux measurements, satellite products, atmospheric CO2 measurements, carbon inventory data, etc.).

The aim of the different assimilation procedures is to minimise a misfit function that measures the mismatch between the model outputs and the various data streams, and a priori knowledge of the parameter values taking into account uncertainty of both components in a statistically robust framework. In this way, we combine our current understanding of the system (models) with the most up-to-date, detailed process information (observations), in order to provide the best estimate of the variables being studied.

Given this information, the ORCHIDEE Data Assimilation Systems allow the derivation of optimized posterior model parameter values and uncertainties. These uncertainties can be propagated through to any model state variable. Following different numerical approaches, few systems were designed to improve model simulations of past, current and future terrestrial energy, hydrological and carbon budgets. The optimised ORCHIDEE model will ultimately be used to diagnose the response of the terrestrial biosphere to climate, management and land use changes.

Satellite observations

Remote sensing is an essential component of current carbon observation assets, for detecting trends and variability in land components of the carbon cycle. Past studies in vegetation dynamics have had to rely on vegetation indices such as the normalized difference vegetation index (NDVI) using the Advanced Very High Resolution Radiometer (AVHRR) data since the 1980s, and MODIS, MERIS more recently. These data have been used i primarily for land cover, and cannot be used to quantify ecosystem state variables except by correlation. As satellite sensors have increased spectral and spatial resolution and stability of sensor calibration, biophysically based alternatives to vegetation indices have emerged (e.g. photosynthetic light-use efficiency; Hilker et al., 2011). In addition, new technologies (LiDAR, microwave, hyperspectral) instead of retrieving indices, can infer actual key ecosystem states such as leaf area, canopy architecture, foliar chemistry (nitrogen, photo- synthetic pigments), and other properties that govern photosynthesis, growth, and decomposition (P. Ciais et al., Biogeosciences, 11, 3547-3602, 2014).

Emerging applications in remote sensing selected for this workshop include assessment of the vegetation's structure from LiDAR and physiological parameter estimation at the ecosystem level.

[5] ORCHIDEE (Organising Carbon and Hydrology In Dynamic Ecosystems) - the land surface model, more info: http://labex.ipsl.fr/orchidee/

Research Infrastructures

Research infrastructures (RI) dedicated to the environment are emerging both in the Europe and the US. They structure networks of observatories dedicated to long term monitoring or experiments, and provide new insights into the mechanisms of the carbon cycle. Besides ICOS and NEON AnaEE was selected to illustrate another dimension offered by RIs: ecosystem experimentations.

AnaEE is a European research infrastructure for experimental manipulation of managed and unmanaged terrestrial and aquatic ecosystems. It will strongly support scientists in their analysis, assessment and forecasting of the impact of climate and other global changes on the services that ecosystems provide to society.

AnaEE will support European scientists and policymakers to develop solutions to the challenges of food security and environmental sustainability, with the aim of stimulating the growth of a vibrant bioeconomy. AnaEE will accomplish this mission by building permanent and substantial links among researchers, science managers, policy makers, public and private sector innovators, and citizens.

Projects

The participants were asked to work on an individual challenge in a small group during the workshop.

The concept:
We developed a lesson plan to develop the scientific and communication skills sets to response to a request for proposal, re. Grant Writing exercise. An imaginary International Research Funding Agency is opening an interesting ‘call for proposal’ for young scientists. The participants know their research ideas are relevant for this call and they need this support, so their team of 3 is considering to apply. However the deadline is very short (13 September!) and the proposals to be funded will be selected on the basis of short oral presentations by the candidates.
The presentations were foreseen to be held on Saturday morning. A 5 mins. slot plus 5 mins. for questions were reserved for each team. The time was given by a countdown. The jury has gathered and reviewed the projects directly afterwards. The feedback was given in a short presentation before lunch.

Expected challenges:

- Team building: taking advantage of your respective points of view and backgrounds.
- Finding the right level of detail: be convincing in a synthetic way, storytelling
- Matching your great research ideas with practical aspects (budget, resources, time, know-how)
- Take the opportunity of question time to strengthen your proposition
- Taking risks

Field trip

Three measurement sides located within walking distance on the property of OHP have been visited during the field trip on Wednesday.

1. ICOS-France atmosphere station (explained by Irène Xueref-Remy)
2. Oak Observatory O3HP (explained by Jean-Philippe Orts)
3. Ozone Sondes (explained by Irène Xueref-Remy)

Team-building event: Telescope visite

The OHP was established in 1937 as a national facility for French astronomers. That time, the site was chosen for an observatory because of its generally very favourable observing conditions. On average, 60% of nights are suitable for astronomical observations; with the best seasons are summer and autumn.

During the team building event on Monday evening, the 0.80m telescope has been visited by the participants and explained by the associate professor Dr. Julie Patris.

The 0.80 m was moved to OHP in 1945 and is equipped with CCD cameras allowing high quality observations to be made using it, but unlike the other telescopes on site which have computer-controlled pointing systems, the 0.80 m telescope must still be pointed manually, using setting circles. The workshop participants learnt in teams the manual usage of the telescope.

3) Assessment of the results and impact of the event on the future directions of the field (up to two pages)

The ICOS-NEON Carbon workshop took place in the facilities of the Observatoire Haut-Provence in South France from 7-13 September 2014. Overall, the 6-day course has reached and exceeded our objectives: we have built a platform offering high-level presentations and specific training on RI data handling for 24 early career scientists including advanced PhD students, postdocs, and Junior Faculty representing 16 different nationalities (see participants list in the attachments).

The intention of the workshop was to train early-career scientists how to use in-situ data to address emerging issues in carbon cycle science including atmospheric science, biogeochemistry and ecosystem science. The secondary motivation was to promote the understanding and use of ‘big data’ from the ICOS and NEON networks of observatories while exploring the frontiers of carbon science and identifying new research opportunities.

The participants have been trained in various disciplines: Practical use cases and scientific hands-on approaches have been offered in interdisciplinary research methods, e.g. focusing on emerging applications for data fusion across scales and regional boundaries. In addition, the participants were familiarized with other aspects of the day-to-day work of researchers, as writing proposals in a short time period and big data usage.
The workshop format included lectures, hands-on tool training and application, and guided and open discussions. The discussions and lectures included atmospheric and ecosystem measurements techniques and approaches as performed in ICOS and NEON, inversion approaches to constrain fossil fuel and biosphere attribution, carbon cycle data assimilation systems, machine learning techniques for data mining in large datasets, and surface carbon exchanges including methane. Frontier sciences including how ecological theory and philosophy can inform new approaches and understanding, use of research infrastructures to address questions of regional to global importance, using remote (satellite) sensing techniques to scale structure to larger landscapes, and hands-on activities. Practical use cases and scientific hands-on approaches have been offered, focusing on emerging applications for data fusion across scales and regional boundaries. The OHP ICOS France atmospheric station and the White Oak Observatory O3HP have been visited during the field trip.

During the workshop, the group of diverse and deeply committed participants with equal gender were able to broaden and deepen their knowledge and to identify new research opportunities opened by the availability of measurements acquired by these new carbon research infrastructures. In addition, they could network with scientists and had time to discuss scientific questions during the week, not only with the experts but also with colleagues from different fields forced to work together for the projects.

The workshop has demonstrated that ICOS and NEON, research infrastructures from different continents, have brought European and American perspectives together and started to collaborate successfully not only in data interoperability and harmonisation, but also in training activities for early career scientists in using these data. In addition, we had the opportunity to gain feedback on data usage from the scientists.

The workshop gave a detailed view of atmospheric and ecosystem monitoring carbon GHG measurements of carbon Infrastructures across the Atlantic and different networks. The ICOS-NEON Carbon workshop was the first version of a workshop concept, which we would like to establish as a series in the community. If the funding situation permits, it is foreseen to hold the Carbon workshop yearly, and next time in summer 2015.

We have already started to outline a potential programme of next year. Several modifications will be implemented in the program of 2015 based on the evaluation report 2014. The idea exists to create a simple ICOS-NEON data set for education purpose for the next issue. Also the ICOS Carbon Portal should be built up by that time and could use the workshop to promote ICOS data products.

The registration page (http://coopeus2014ss.sciencesconf.org) still exists and will be updated soon. A dokuwiki workshop page (https://carbon-workshop.lsce.ipsl.fr) has been created to build up a communication platform for the workshop participants as well as the speakers and organiser. Through this page, the information exchange can be secured and it gives an opportunity to discuss, e.g. scientific questions.

4) Annexes 4a) and 4b): Programme of the meeting and full list of speakers and participants

Annex 4a: Programme of the meeting

COOPEUS 07-13/09/2014 — ICOS-NEON Carbon workshop 2014 — status: 02/10/2014 17:03
OHP, France — schedule
1/2

TIME	DURATION	#	TITLE		INSTRUCTORS / RESPONSIBLE PEOPLE	LOCATION
SUNDAY, September 7th						
11:40			Meeting Point Marseille Airport			
12:00	00:45		Bus departure Marseille Airport		all	Marseille Airport
12:25			Meeting Point Aix-en-Provence			
12:45	01:15		Bus departure Aix-en-Provence TGV		all	Aix-en-Provence TGV
14:00	01:00		Arrival OHP and check in			
15:00			Coffee and Tea		all	meeting room
15:00	00:15	0.1	Welcome, Orga, Agenda		Nadine Schneider and Jean-Daniel Paris	meeting room
15:15	00:20		Introduction to site and ICOS site		Irène Xueref-Remy	meeting room
15:35	02:00	0.2	Introduction round by participants	Soapbox, 4 mins each participant	Moderation: Hank	meeting room
17:35	00:20		Discussion and Q&A		Jean-Daniel Paris and Nadine Schneider	meeting room
17:55	00:45	4.1	Introduction: Project competition	Definition of teams	JD	
18:40			Icebreaker			
19:00	01:00		DINNER		all	Maison Jean Perrin
20:00			Free time and organisers/speakers meeting (informal)			
MONDAY, September 8th						
07:45	00:45		BREAKFAST		all	Maison Jean Perrin
09:00	00:10		Introduction COOPEUS		Hank and Lindsay	meeting room
09:10	00:20		Introduction NEON		Hank and Lindsay	meeting room
09:30	00:45	1.3	Ecosystem measurements		Bert Gielen	meeting room
10:15	00:30		Coffee and Tea		all	meeting room
10:45	01:00	1.3	Ecosystem measurements (2)		Hank Loescher	meeting room
11:45	01:45		LUNCH		all	Maison Jean Perrin
13:30	01:00	1.4	Monitoring of the station by remote sensing at global scale		Frédéric Baret	meeting room
14:30	00:30		Introduction ICOS		Jean-Daniel Paris	meeting room
15:00	00:45	1.2	Atmospheric measurements		Felix Vogel	meeting room
15:45	00:15		Interoperability		Hank Loescher	meeting room
16:00	00:15		Coffee and Tea		all	meeting room
16:15	01:30		Split work on project in groups			
17:45	01:00	0.4	Computer check			
18:45			Free time			
19:00	01:00		DINNER		all	Maison Jean Perrin
20:00			Open sky astronomy and visit of the telescope		Julie Patris	meet at Maison Jean-Perrin
TUESDAY, September 9th						
07:45	00:45		BREAKFAST		all	Maison Jean Perrin
08:30	01:45	2.1	ATM: trend analysis		Martina Schmidt	meeting room
10:15	00:15		Coffee and Tea		all	meeting room
10:30	01:45		ATM: trend analysis (2)		Martina Schmidt	meeting room
12:15	01:30		LUNCH		all	Maison Jean Perrin
13:45	02:00	2.2	ECO: Data mining of in land-atmosphere fluxes.		Miguel Mahecha and Jakob Zscheischler	meeting room
15:45	00:45		Coffee and Tea		all	meeting room
16:30	02:00		ECO: Data mining of in land-atmosphere fluxes (2)		Miguel Mahecha and Jakob Zscheischler	meeting room
18:30			Free time			
19:00	01:00		DINNER		all	Maison Jean Perrin
20:00			Project time			

COOPEUS 07-13/09/2014 — ICOS-NEON Carbon workshop 2014 — status: 02/10/2014 17:03
OHP, France — schedule
2/2

TIME	DURATION	#	TITLE		INSTRUCTORS / RESPONSIBLE PEOPLE	LOCATION
WEDNESDAY, September 10th						
08:00	01:00		BREAKFAST		all	Maison Jean Perrin
09:00	01:30	3.2	using isotopes measurements in fluxes estimation across scales		Felix Vogel	meeting room
10:30	00:30		Coffee and Tea		all	Gérard Mégie Station
11:00	00:30	Field trip	Introduction to ozone probes principle		Irène Xueref-Remy	Gérard Mégie Station
11:30	00:30		balloon filling and launching		OHP operators	Gérard Mégie Station
12:00	01:30		LUNCH		all	Maison Jean Perrin
13:30	00:15		walk to the ICOS tower and O3HP field			
13:45	01:30	Field trip	Visit ICOS tower / O3HP oak field		Irène Xueref-Remy / Jean-Philippe Ors	O3HP
15:15	00:15		Coffee and Tea		all	O3HP
15:30	01:30	Field trip	Visit ICOS tower / O3HP oak field		Irène Xueref-Remy / Jean-Philippe Ors	O3HP
17:00	00:15		walk to the meeting room			
17:15	01:00	3.5	Overview of ANAEE and the role of large-scale experiments		Abad Chabbi	meeting room
18:15			Free time			
19:00	01:00		DINNER		all	Maison Jean Perrin
20:00			Discussion round		Hank Loescher and JD Paris	Maison Jean Perrin
THURSDAY, September 11th						
07:45	00:45		BREAKFAST		all	Maison Jean Perrin
08:30	01:45	2.4	ECO: Data assimilation and Bayesian approach in ecosystem models		Marcel van Oijen	meeting room
10:15	00:15		Coffee and Tea		all	meeting room
10:30	01:45		ECO: Data assimilation and Bayesian approach in ecosystem models (2)		Marcel van Oijen	meeting room
12:15	01:30		LUNCH		all	Maison Jean Perrin
13:45	02:00	2.5	Carbon cycle data assimilation system		Philippe Peylin	meeting room
15:45	00:45		Coffee and Tea		all	meeting room
16:30	02:00		Carbon cycle data assimilation system (2)		Philippe Peylin	meeting room
18:30			Free time			
19:00	01:00		DINNER		all	Maison Jean Perrin
20:00			Project time			
FRIDAY, September 12th						
07:45	00:45		BREAKFAST		all	Maison Jean Perrin
08:30	01:45	2.6	Estimation of ECVs from remote sensing observations		Frédéric Baret	meeting room
10:15	00:15		Coffee and Tea		all	meeting room
10:30	01:45		Estimation of ECVs from remote sensing observations (2)		Frédéric Baret	meeting room
12:15	01:30		LUNCH		all	Maison Jean Perrin
13:45	01:00		tbd		Philippe Ciais	meeting room
14:45	01:00		tbd		Philippe Ciais	meeting room
15:45	00:15		Coffee and Tea		all	meeting room
16:00	02:00	3.3	Lidar remote sensing of forest and biomass + lidar presentation		Phil DeCola	meeting room
18:00	00:30	3.4	ICOS Carbon Portal		Alex Vermeulen (via Skype)	meeting room
18:30	00:20	0.3	Wrap-up + Closing (Organisation, Feedback, FAQ)		ICOS and NEON	meeting room
18:50			Free time			
19:00	02:00		WORKSHOP DINNER		all	Maison Jean Perrin
21:00			Get together			
Saturday, September 13th						
08:00	00:30		BREAKFAST		all	Maison Jean Perrin
08:30	01:45	4.2	Project presentation	Approx. 10 mins./group	participants	meeting room
10:15	00:15		Coffee and Tea		all	meeting room
10:30	00:45	4.3	Jury gather		Jury and participants	meeting room
11:15	00:30	4.4	Jury award & review		Jury	
11:45	01:00		LUNCH, bags packed		all	Maison Jean Perrin
13:00	02:00		Bus departure OHP		all	

Annex 4b: Full list of speakers and participants

Speakers list

#	LASTNAME	FIRSTNAME	Institution	Country
1	Baret	Frederic	INRA	FR
2	Ciais	Philippe	CEA/LSCE	FR
3	Chabbi	Abad	INRA	FR
4	DeCola	Philip	Sigma Space Corporation	US
5	Mahecha	Miguel	Max Planck Institute for Biogeochemistry	DE
6	Peylin	Philippe	LSCE	FR
7	Schmidt	Martina	University of Heidelberg	DE
8	Van Oijen	Marcel	Centre for Ecology & Hydrology (CEH-Edinburgh)	GB
9	Vogel	Felix	LSCE	FR
10	Zscheischler	Jakob	Max Planck Institute for Biogeochemistry	DE

Participation list

#	LASTNAME	FIRSTNAME	Institution	Country
1	Almagro	María	Institute of Agronomy, Genetics and Field Crops Catholic University of the Sacred Heart	IT
2	Avilov	Vitaly	A.N. Severtsov Institute of Ecology and Evolution RAS (IEE RAS)	RU
3	Berhanu	Tesfaye	University of Bern	CH
4	Choi	Hyun-Ah	Korea University	KR
5	Cisowska	Iwona	Centre for Ecology and Hydrology	GB
6	Damien	Martin	National University of Ireland	IE
7	Dobor	Laura	Eötvös Loránd University	HU
8	Nicolini	Giacomo	CMCC	IT
9	Harris	Eliza	Empa	CH
10	Helbig	Manuel	Département de géographie, Université de Montréal	CA
11	Horemans	Joanna	University of Antwerp	BE
12	Järveoja	Järvi	Univerity of Tartu	EE
13	Macálková	Lenka	Global Change Research Center	CZ
14	Martinez	Alberto	Centre for Ecology and Hydrology (CEH), UK	GB
15	McRobert	Andrew	Lund University	SE
16	Moreno	Adam	University of Natural Resources and Life Science, Vienna	AT
17	Pappas	Christoforos	ETH Zurich	CH
18	Pullens	Jeroen	Fondazione Edmund Mach	IT
19	Reinsch	Sabine	Centre for Ecology and Hydrology	GB
20	Schrader	Frederik	Thünen Institute of Climate-Smart Agriculture	DE
21	Senapati	Nimai	INRA, Lusignan, Poitou-Charentes	FR
22	Siebicke	Lukas	Universitaet Goettingen	DE
23	Vendrame	Nadia	University of Padua	IT
24	Watts	Jennifer	University of Montana	US

Organisers committee

#	LASTNAME	FIRSTNAME	Institution	Country
1	Bert	Gielen	ICOS ETC	BE
2	Loescher	Hank	NEON Inc.	US
3	Papale	Dario	ICOS ETC	IT
4	Paris	Jean-Daniel	ICOS ATC	FR
5	Powers	Lindsay	NEON Inc.	US
6	Schneider	Nadine	ICOS ATC	FR
7	Taylor	Jeff	NEON	US
8	Xueref-Remy	Irène	ICOS ATC	FR

Group picture in front of the 8m telescope