



# ICOS SWEDEN

## Annual Report 2019

**ICOS**

•••  
National  
Network  
Sweden





*The Board of ICOS Sweden endorsed this Annual Report 2019 on 20 March 2020. The report is complemented by other documents from ICOS Sweden, including the Operational Plan for 2020, the Strategic plan 2019-2024, and the ICOS Sweden user statistics for 2019.*

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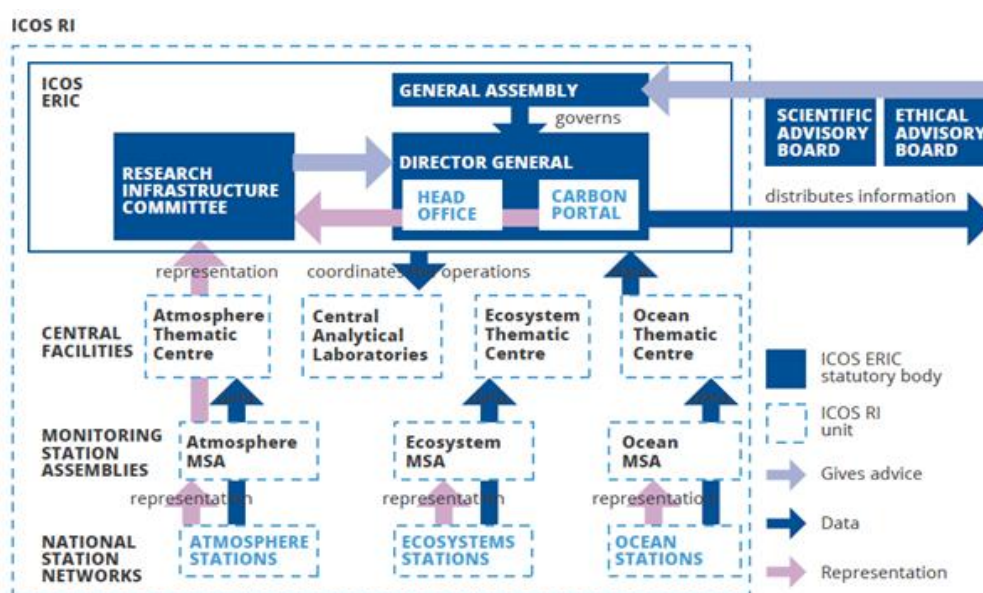


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## 1. Introduction to ICOS Sweden

ICOS - Integrated Carbon Observation System - is a European research infrastructure for quantifying and understanding the greenhouse gas balance of the European continent and of adjacent regions. The infrastructure is built up as a collaboration of nationally operated measurement stations in, at present, 12 European countries. ICOS Sweden is the Swedish contribution to this European effort. An ERIC (European Research Infrastructure Consortium) 'ICOS ERIC' has been established as a legal entity for ICOS data release as well as the coordination and integration of the whole research and measurement infrastructure, ICOS Research Infrastructure (RI), that includes the national networks, the measurement station assemblies and the central facilities (Fig. 1).



**Figure 1.** Outline of the ICOS RI organization. Sweden is a member of ICOS ERIC and ICOS Sweden is the Swedish node.

High-precision, standardized observations of the exchange of greenhouse gases and heat between the Earth's surface and its atmosphere form an essential basis for understanding not only our planet's present climate, but also past and future developments. It has also become clear that these studies must be secured beyond the lifetime of a typical research project. The aim of ICOS is therefore to construct, equip, and operate a network of standardized, long-term, high precision integrated monitoring stations for atmospheric greenhouse gas concentrations and fluxes. At the moment ICOS Research Infrastructure has more than 100 stations in 12 European countries. The current ICOS Atmosphere and Ecosystem Networks include more than 30 atmospheric and around 70 ecosystem stations located across Europe. The ICOS Ocean Network covers the North Atlantic and European marginal seas. The Ocean Observation System will consist of more than 20 facilities: Voluntary Observatory Ships, fixed stations and research vessels.

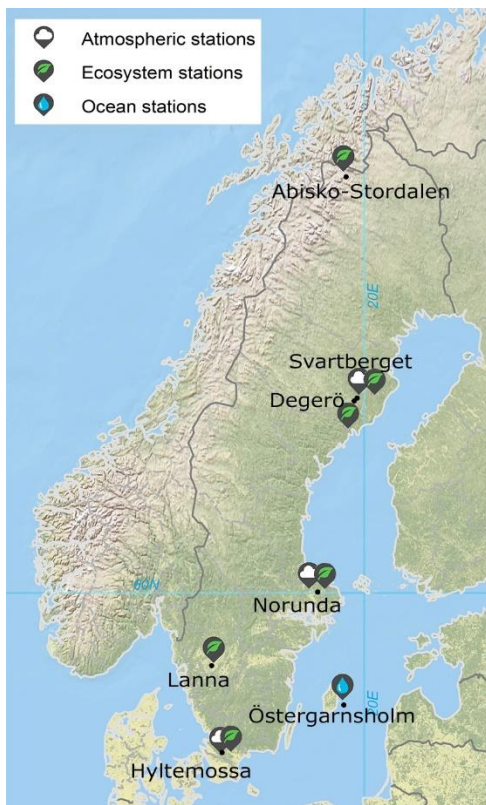
ICOS Sweden will be fully integrated with and plays an important role in the pan-European ICOS (ICOS RI). ICOS Sweden has been providing data, and that help to compile information on greenhouse gas exchange of typical northern ecosystems to the research community as well as Swedish stakeholders. ICOS Sweden will furthermore provide test sites for national inventory systems and sites and databases for advanced research.

Stations with ICOS RI are separated into 3 different classifications:

- **Class 1 station:** ICOS Ecosystem or Atmosphere Station with a complete equipment setup for measuring the full set of ICOS core variables.
- **Class 2 station:** ICOS Ecosystem or Atmosphere Station with a complete equipment setup for measuring ICOS core variables. Less variables are measured compared to the Class 1 station and ancillary data are determined less frequently.
- **Associated station:** The network of ecosystem sites in ICOS is enlarged to a set of Associated stations where the requirements in terms of variables collected and standards to follow are different from the Class 1 and Class 2 ICOS stations. Differently from Class 1 and Class 2 stations, already calculated fluxes and processed data at the final time resolution must be submitted (unless ICOS protocols are applied – see ETC services section).

## 2. Status of ICOS Sweden at the end of 2019

ICOS Sweden makes measurements from stations distributed across Sweden, from Abisko-Stordalen in the north to Hyltemossa in the south (Fig. 2). During the current funding period, there are three Atmosphere stations (AS) for measurement of concentrations of GHGs in the well-mixed boundary-layer, six Ecosystem stations (ES) for measurements of exchanges of GHGs between ecosystems and the atmosphere, and one Ocean station (OS) for observations of the coastal Baltic Sea.



**Figure 2.** Map with the ICOS Sweden stations. The stations represent the different climate zones found in Sweden. They are unique stations in the continental scale of ICOS RI.

The measurement stations are run by four universities and one institute. The framing of the cooperation is set by a formal agreement. The consortium partners of ICOS Sweden are the following:

**Lund University (LU)** is the host organization with overall responsibility for the coordination of ICOS Sweden, and for the operations of four ICOS stations: the Norunda forest Ecosystem and Atmosphere stations, and the Hyltemossa forest Ecosystem and Atmosphere stations.

**Swedish University of Agricultural Sciences (SLU)** operates three ICOS stations: Svartberget forest Ecosystem and Atmosphere stations, and the Degerö mire Ecosystem station.

**University of Gothenburg (UGOT)** is responsible for the operations at the agricultural Lanna Ecosystem station.

**Uppsala University (UU)** operates the Östergarnsholm Ocean station.

**Polar Research Secretariat (PFS)** runs the Abisko-Stordalen mire Ecosystem station.

**Stockholm University (SU)** who was involved in the Abisko-Stordalen mire station left the consortium in 2019.

The status of all measurement stations at the end of 2019 is summarized in Fig. 3. ICOS Sweden became, for most of the measurement systems, operational during 2014. In 2016, the labeling process procedures and the criteria for the different types of stations were specified by ICOS RI. In spring 2018, all three atmospheric stations (Svartberget, Norunda, Hyltemossa) were certified as Class 1 ICOS RI Atmosphere stations. Measurements and calibrations following the Atmosphere Thematic Centre's (ATC's) and the Central Calibration Facility's (CAL's) schedules are ongoing; data is transferred automatically to the ATC each night. The flask sampling system is not yet fully operable at all sites due to delays from the developer's side. The last final measurement data release by the ATC including data from ICOS Sweden stations was in July 2019. These data as well as near real time data from the atmospheric stations are now available for users via access through the Carbon Portal<sup>1</sup>.

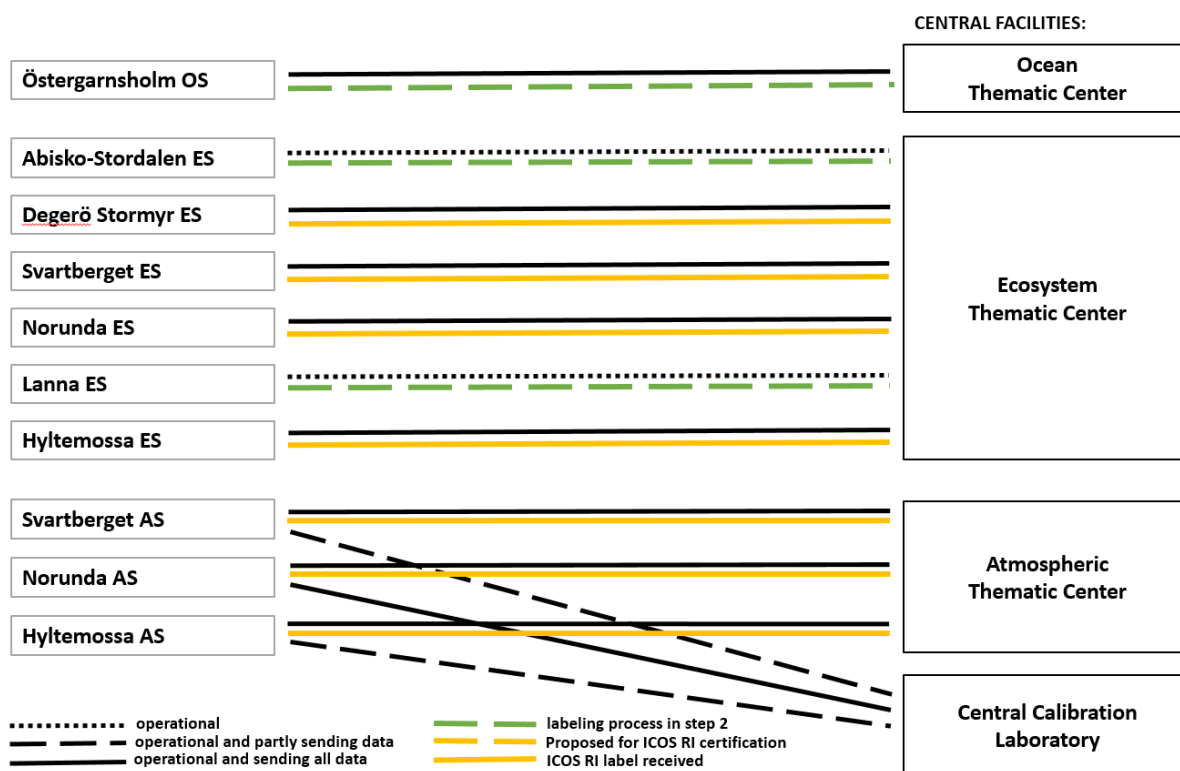
The three forest Ecosystem stations Hyltemossa, Norunda and Svartberget achieved the ICOS RI label as Class 2 Ecosystem station. The mire site Degerö received the label in November 2019. Measurements (manual for ancillary vegetation data and automatic data sampling) are ongoing following the instructions of the Ecosystem Thematic Centre (ETC), which are based on the elaborated protocols for Ecosystem station measurements<sup>2</sup> and data is automatically transferred to the ETC via the Carbon Portal each night. The labeling process of Abisko-Stordalen and Lanna was held by ICOS Sweden to wait for the outcome of the application for the coming funding period. Östergarnsholm is expected to become certified by ICOS RI in 2020; changes in the OTC protocols in 2019 delayed the original plan of receiving the label in 2019.

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<sup>1</sup> <https://data.icos-cp.eu/portal>

<sup>2</sup> [www.international-agrophysics.org/infopage/articles/y/2018/pub/1/issue/4](http://www.international-agrophysics.org/infopage/articles/y/2018/pub/1/issue/4)





**Figure 3.** The development status for the delivery of data and information to the Central Facilities from the ICOS Sweden measurement stations. Upper lines at all stations – development status for data delivery. Lower lines – status for getting ICOS labeled.

### 3. Highlights in science and management during 2019

#### 3.1 Preparation of the funding period 2021-2024

In the beginning of 2019, the station coordination group prepared the application for the next funding period (2021 to 2024), which was handed in to the SRC on February 19th. As discussed in the Strategic Plan (2019-24), the application includes a decrease of activities at the agricultural site Lanna and the introduction of the mire Mycklemossen, at the SITES station Skogaryd, as an ICOS class 2 site (Gothenburg University). Furthermore, the application included measurements conducted by SMHI on board the M/S Tavastland ship of opportunity (SOOP), covering the Baltic Sea including the Gulf of Bothnia twice every week as Class 1 Ocean station. This will fill a gap in the existing observation network. The station Abisko-Stordalen, with The Swedish Polar Research Secretariat as host, is suggested to be fully included as class 2 Site in the application. As part of the review process, the Scientific Coordinator together with the chair of the ICOS Sweden Board and the Dean of the Science Faculty at Lund University as representative for Lund University participated in an interview with representatives of SRC on 10th June 2019.

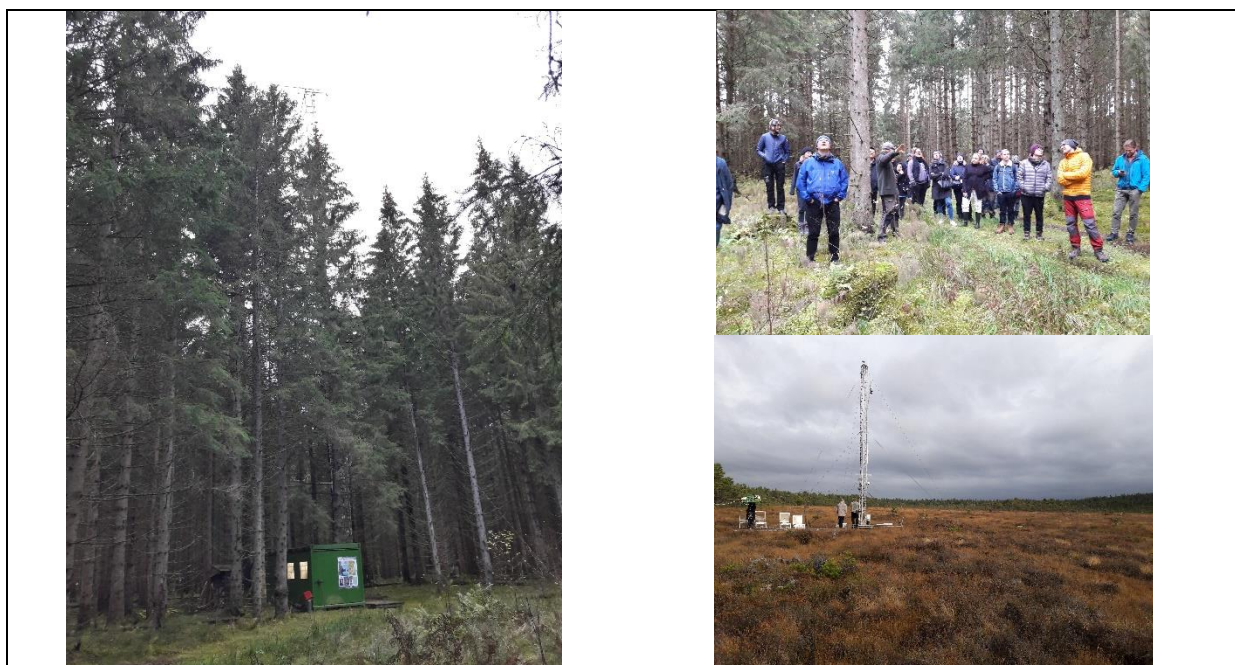
In September 2019, ICOS Sweden was granted funding from the Swedish Research Council of SEK 40 million over 4 years. The Committee's opinions showed excellent results. Since the grant, despite its size, meant a reduced budget compared to the application, the parties needed to consider this and started a renewed discussion about how the budget could be adapted for the best interests of the business. These discussions were conducted through the consortium's meeting, including SMHI, which is not yet a consortium member.

### 3.2. Station certification

All three certified Atmosphere stations delivered data for the mandatory variables to the Atmospheric Thematic Center throughout 2019; the certified Ecosystem stations delivered data for the mandatory variables to the Ecosystem Thematic Center throughout 2019. The mire station Degerö was certified as Class 2 Ecosystem stations in November 2019.

### 3.3 Second Nordic ICOS Symposium

The Nordic ICOS Symposium is a bi-annual joint venture of the Nordic ICOS RI national networks ICOS Denmark, ICOS Finland, ICOS Norway and ICOS Sweden. The 2nd Nordic ICOS Symposium (<http://www.icos-sweden.se/NordicICOSsymp2019.html>) was successfully hosted by ICOS Sweden in Gothenburg from 24 October to 25 October 2019, with an excursion to the future ICOS Sweden mire site Mycklemossen, which is placed in the SITES Skogaryd catchment run by Gothenburg University on 23 October (Fig. 4). Nearly 100 attendees listened to more than 27 presentations, 9 of which were delivered by invited speakers and discussed 23 poster presentations. They covered the categories ‘Users views on the societal relevance of ICOS data’, ‘Extreme weather conditions in 2018 and its implications for ecosystem processes’, ‘Ecosystem-atmosphere process studies as a tool to assess the GHG fluxes’, ‘New methods and development of air-sea gas exchange studies’ and ‘Assessing landscape to regional scale fluxes’. Poster prizes for the best student poster with respect to Scientific Excellence at the 2<sup>nd</sup> Nordic ICOS Symposium and for the best student poster with respect to Scientific Communication were awarded to Patryk Łakomic and Julia Kelly, respectively. The winners were selected by a jury made up of members of the ICOS ERIC and the ICOS Sweden Scientific Advisory Board.



**Figure 4.** Impressions from the excursion to the future ICOS Sweden mire site Mycklemossen, which is placed in the SITES Skogaryd catchment run by Gothenburg University on 23 October.

### 3.4 Contribution to Drought Initiative

The year 2018 was considered to be a drought year in large parts of Europe. ICOS Sweden actively contributed to the European wide Drought Force which was initiated by ICOS RI. Ecosystem flux data as well as meteorological data from 2014 to the end of 2018 was prepared by the station PIs and submitted for central gap-filling by the Ecosystem Thematic Center from all affected stations. Data from this initiative was released via the ICOS Carbon Portal in the standardized FLUXNET format which has often been requested by users of ICOS Sweden stations. Furthermore, scientists involved in ICOS Sweden actively took part or even took the lead in the writing of publications on the effects of the 2018 drought on ecosystems in the north. The manuscripts have been submitted and will, after having passed the peer-review process, be part of a special issue in Philosophical Transactions of the Royal Society B.

### 3.5 New Nordic collaboration initiative

NordForsk issued a call for proposals for Nordic research Infrastructure Hubs in summer 2019. Nordic ENVRI submitted a joint application to continue and deepen an earlier NordForsk supported collaboration project (Nordic ENVRI project no 69145) with an application for a Nordic ENRVI Hub as a competence center for RI education, training, and knowledge sharing. All present ICOS Sweden partners are involved as partners in the application.

## 4. Financial outcomes 2019

A summary of the financial outcomes for 2019 for all sites are given in Table 1 below.

**Table 1.** Financial outcomes 2019 for each partner and in total (kSEK). For acronyms, see Appendix 3.

	LU	SLU	GU	UU	Polar	SU	TOTAL
<b>Initial balance</b>	<b>2,951</b>	<b>2,700</b>	<b>16</b>	<b>998</b>	<b>0</b>	<b>75</b>	<b>6,741</b>
<b>Incomes</b>							
Incomes SRC	3,304	1,896	970	770	0	0	6,940
Co-financing	4,471	3,615	1,243	1,301	496	135	11,262
<b>Sum</b>	<b>7,775</b>	<b>5,511</b>	<b>2,213</b>	<b>2,071</b>	<b>496</b>	<b>135</b>	<b>18,202</b>
<b>Costs</b>							
Salaries	4,249	2,910	1,008	1,482	314	83	10,046
Consumables	2,345	2,367	567	613	94	61	6,048
Travels	0	0	0	0	0	0	0
OH	2,383	873	810	662	72	52	4,850
Technical Support	513	449	193	128	0	0	1,283
Investments	712	635	0	155	16	0	1,519
<b>Sum</b>	<b>10,201</b>	<b>7,234</b>	<b>2,578</b>	<b>3,041</b>	<b>496</b>	<b>196</b>	<b>23,746</b>
<b>Difference</b>	<b>-2,426</b>	<b>-1,723</b>	<b>-364</b>	<b>-970</b>	<b>0</b>	<b>-61</b>	<b>-5,544</b>
<b>Closing balance</b>	<b>525</b>	<b>977</b>	<b>-348</b>	<b>28</b>	<b>0</b>	<b>14</b>	<b>1,196</b>

It should be noted that this is a liquidity budget, using incomes and expenses and no depreciation costs, which means that the difference between the total incomes and total expenses represent the amounts available. The closing balance corresponds to the accumulated amount available since 2010, following the contributions by SRC and the partners in the consortium agreement.

Costs have increased over the latest years, which are explained by increased activities at stations during step 2 of the labeling process and after the stations have become certified. This concerns both an increase in work tasks and increased costs for instrumentation. Most investments needed for certified stations are now done. University of Gothenburg (GU) has a negative closing balance, which will be compensated with lower costs during 2020. The Abisko-Stordalen station run by The Swedish Polar Research Secretariat is still on low budget but running and producing data. The station is put on hold in the labeling process until next funding period starts. Stockholm University left the consortium in September 2019 and the small positive closing balance will be transferred to the Coordination Office and used for the Abisko-Stordalen Station PI station visit during 2020.

## **Appendices**

## **Appendix 1: List of personnel during 2019**

### **Total amount of FTEs: 14.5**

#### **Coordination Office:**

Maj-Lena Linderson, coordinating director, 50%  
Janne Rinne, science director and ICOS Sweden SE for Lund University, 20%  
Jutta Holst, scientific secretary 20%, scientific and technical station support, 80%  
Meelis Mölder, scientific and technical station support, 70%

#### **Measurement stations:**

##### **Abisko-Stordalen:**

50% split into research engineers Erik Lundin,  
Alexander Meire, and Niklas Rakos  
Janne Rinne, station PI and SE, 10%

##### **Degerö and Svartberget:**

Per Marklund, AS station PI, research engineer, 100%  
Paul Smith, research engineer, 75%  
Pernilla Löfvenius, research engineer, 75%  
Guiseppe de Simon, research engineer, 75% (part time parental leave)  
Rowan Dignam, 50%  
Tommy Andersson, 2 months  
Mats Nilsson, station PI and SE, 10%  
Matthias Peichl, ES station PI, 10%

##### **Norunda:**

Irene Lehner, research engineer, 100%  
Anders Båth, research engineer, 90%  
Meelis Mölder, station PI, research engineer, 30%  
Natascha Kljun, SE

##### **Östergarnsholm:**

Anna Rutgersson, station PI and SE, 35%  
Marcus Wallin, research engineer, 50%  
Erik Nilsson, research engineer, 45%  
Hans Bergström, research engineer, 5%

##### **Lanna:**

Per Weslien, station PI, research engineer, 75%  
Bengt Liljeblad, research engineer, 25%  
Leif Klemedtsson, SE, 20%

##### **Hyltemossa:**

Tobias Biermann, research engineer, 100%  
Michal Heliasz, station PI, research engineer, 100%  
Thomas Holst, research engineer, 20%

**Appendix 2: List of measurement variables and instruments/systems**

**Table 2.1 ICOS Sweden Ecosystem station parameters**

Ecosystem stations	Hyltemossa (SE-Htm)	Norunda (SE-Nor)	Svartberget (SE-Svb)	Lanna (SE-Lnn)	Degerö (SE-Deg)	Abisko-Stordalen (SE-Sto)	
Scientific PI	Michal Heliasz, LU	Meelis Mölder, LU	Matthias Peichl, SLU	Per Weslien, UGOT	Mats Nilsson, SLU	Janne Rinne, LU	
ecosystem type	forest	forest	forest	agricultural	mire	palsa mire	
Latitude	56°06'N	60°05'N	64°10'N	58°20'N	64°11'N	68°21'N	
Longitude	13°25'E	17°29'E	19°47'E	12°06'E	19°33'E	19°03'E	
Height a.s.l.	115 m	46 m	270 m	81 m	270 m	360 m	
climate zone (Köppen classification)	marine west-coast (Cfb)	humid continental (Dfb)	sub-arctic (Dfc)	marine west-coast (Cfb)	sub-arctic (Dfc)	sub-arctic (Dfc)	
biome	temperate	hemi-boreal	boreal	hemi-boreal	boreal	tundra	
Dominating species	Picea abies	Picea abies, Pinus sylvestris	Pinus sylvestris, Picea abies	Avena sativa, Hordeum vulgare, Triticum	bog mosses: Sphagnum papillosum Lindb., Sphagnum lindbergii Schimp., Sphagnum balticum (Russow) C.E.O. Jensen	Sphagnum spp. Eriophorum spp. Carex spp, ericacious shrubs	
Mean tree height/ age	19 m	25 m	20 m	-	-	-	
Mean stand age	35 yrs	120 yrs	100 yrs	-	-	-	
Understorey and ground vegetation	mosses	Vaccinium myrtillus L., Vaccinium oxycoccos, mosses, flowers	Vaccinium vitis-idaea L., Vaccinium myrtillus L.		Eriophorum, dwarf-shrubs: Vaccinium oxycoccos, Andromeda polifolia, Trichophorum cespitosum	Empetrum nigrum, Vaccinium vitis-idaea L., Rubus chamaemorus; Cyperaceae, Eriophorum	
mean annual temperature	7.0 °C	5.6 °C	1.8 °C	6.4 °C	1.2 °C	-0.1 °C	
mean annual precipitation	830 mm	544 mm	614 mm	709 mm	523 mm	332 mm	
<b>Continuous measurements</b>							
Turbulent fluxes	CO <sub>2</sub>	27 m	36 m	34.5 m	2.2 m	2.1 m	CO <sub>2</sub>
	H <sub>2</sub> O	27 m	36 m	34.5 m	2.2 m	2.1 m	2.2 m
	CH <sub>4</sub>	-	-	-	2.2 m	2.1 m	2.2 m
	Momentum	27 m	36 m	34.5 m	2.2 m	2.1 m	2.2 m
	Sensible heat	27 m	36 m	34.5 m	2.2 m	2.1 m	2.2 m
	Latent heat	27 m	36 m	34.5 m	2.2 m	2.1 m	2.2 m
Radiative fluxes	Incoming short-wave	150 m, 50 m	101.5 m, 55 m	2 x 50 m	4 m	4 m	2.2 m
	Outgoing short-wave	50 m	55 m	50 m	4 m	4 m	5 m
	Incoming	50 m	55 m	50 m	4 m	4 m	5 m

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	long-wave						
	Outgoing long-wave	50 m	55 m	50 m	4 m	4 m	5 m
	Net radiation (from 4 components)	50 m	55 m	50 m	4 m	4 m	5 m
	Incoming PAR	150 m, 50 m	55 m	50 m	4 m	4 m	5 m
	Diffuse incoming PAR	150 m	55 m	50 m	4 m	4 m	5 m
	Outgoing PAR	50 m	55 m	50 m	4 m	4 m	5 m
	PAR below canopy	4 x 4 transects	4 x 4 transects	4 x 4 transects	-	-	5 m
	Spectral reflectance	100 m	55 m	50 m	4 m	4 m	-
Soil fluxes	Soil heat flux	4 x -0.05 m	4 x -0.05 m	4 x -0.05 m	4 x -0.05 m	4 x -0.05 m	5 m
State variables	Air temperature profile	14 levels	14 levels	14 levels	5 levels	5 levels	4 x -0.05 m
	CO2 profile	14 levels <sup>1</sup>	14 levels <sup>1</sup>	14 levels <sup>1</sup>	5 levels	5 levels	5 levels
	H2O profile	14 levels	14 levels	14 levels	5 levels	5 levels	5 levels
	CH4 profile	-	-	-	5 levels	-	5 levels
	Relative humidity	24 m, 27 m	37 m, 29 m	32.5 m	2.2 m	2.0 m, 2.2 m	2.5 m
	Wind speed/direction (sonic)	30 m	36 m	34.5 m	2.2 m	2.1 m	2.2 m
	Air pressure	3.5 m	1.5 m	2 m	1 m	1.2 m	1.7 m
	Soil temperature profile	4 x 5	4 x 5	4 x 5	4 x 5	4 x 5	4 x 5
	Soil moisture profile	4 x 5	2 x 5	4 x 5	4	4	4
	Ground water level	4	2	4	4	4	4
	Snow depth	1	1	1	1	1	1
	Precipitation	2	2	2	2	2	2
	Tree trunk surface temperature	4 x 4 x 3	4 x 4 x 3	4 x 4 x 3	-	-	-
	Canopy IR temperature	50 m	55 m	50 m	4 m	4 m	5 m
Ground height	-	-	-	2 m	2 m	1.5 m	
Periodic measurements							
soil	soil carbon stocks	1 / 10 years	1 / 10 years	1 / 10 years	1 / 10 years	1 / 10 years	1 / 10 years
trees	GAI (hemispherical pictures)	6/year	6/year	6/year	-	-	-



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	above ground biomass (AGB)	1/ 3 years	1/ 3 years	1/ 3 years			
	Nutrient analysis and Leaf Mass Area (foliar sampling)	1/year	1/year	1/year			
	Woody debris	1/year	1/year	1/year			
mosses	GA (percentage cover)	2/year			2/year	2/year	2/year
	NPP (yearly net change in biomass)	1/year			1/year	1/year	1/year

**Table 2.2 ICOS Sweden Atmosphere station parameters**

Atmospheric stations	Hyltemossa	Norunda	Svartberget
coordinates	56°06'N, 13°25'E	60°05'N, 17°29'E	64°10'N, 19°47'E
Scientific PI	Michal Heliasz, LU	Meelis Mölder, LU	Per Marklund, SLU
<b>Continuous Measurements</b>			
gas concentrations: CO, CO <sub>2</sub> , CH <sub>4</sub> , H <sub>2</sub> O	30 m, 70 m, 150 m	32 m, 58 m, 100 m	35 m, 85 m, 150 m
PBL/cloud base height	1	1	1
Wind speed/direction, air temperature/humidity	30 m, 70 m, 150 m	32 m, 58 m, 100 m	35 m, 85 m, 150 m
Turbulent fluxes	Ecosystem station	Ecosystem station	Ecosystem station
<b>Periodic sampling</b>			
Flask sampling: CO, CO <sub>2</sub> , CH <sub>4</sub> , H <sub>2</sub> O, SF <sub>6</sub> , H <sub>2</sub> , <sup>12/13</sup> CO <sub>2</sub> , <sup>12/13</sup> CH <sub>4</sub>	150 m	100 m	150 m
Sampling of radiocarbon <sup>14</sup> C	150 m	100 m	150 m

**Table 2.3 ICOS Sweden Ocean station parameters**

Marine stations	Östergarnsholm	
Scientific PIs	Anna Rutgersson, UU	
<b>Continuous measurements</b>		
Turbulent fluxes	CO <sub>2</sub>	1
	H <sub>2</sub> O	1
	Momentum	3
	Sensible heat	3
Radiative fluxes	Global radiation	2
Water measurements	Temperature profile	4
	Salinity profile	4

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	Surface CO <sub>2</sub>	1
	Surface Oxygen	1
	Surface Temperature	
	Chlorophyll fluorescence	
	Turbidity	
	Phycocyanin fluorescence	
	CDOM fluorescence	
	Surface salinity	
State variables	Air temperature profile	5
	CO <sub>2</sub> profile	4
	H <sub>2</sub> O profile	4
	Wind profile	5
	Relative humidity	1
	Precipitation	1
<i>Periodic sampling</i>		
Water sampling	Nitrogen	x
	Phosphorous	x
	Silica	x
	Salinity	
	Alkalinity	

## **Appendix 3: List of abbreviations and acronyms**

### ***ICOS RI (European level)***

ATC – Atmospheric Thematic Center  
AS – Atmospheric stations  
CAL – Central Analytical Laboratory  
CFs – Central facilities (ETC, ATC, OTC and CAL)  
CP – Carbon Portal  
ES – Ecosystem station  
ETC – Ecosystem Thematic Center  
ERIC – European Research Infrastructure Consortium  
ESFRI - European Strategy Forum on Research Infrastructures  
HO – Head office  
ICOS RI – Integrated Carbon Observation System Research Infrastructure  
ICOS PP – ICOS Planning Project (sometimes also Preparatory Phase)  
ISIC – ICOS Stakeholder Interim Council  
OS – Ocean station  
OTC – Oceanic Thematic Center

### **ICOS Sweden**

CO – ICOS Sweden's Coordination Office  
SAC – ICOS Sweden's Scientific Advisory Committee  
SCG – ICOS Sweden's Station Coordination Group  
SPI – ICOS Sweden Station Principal Investigator

### **ICOS Sweden partners**

LU – Lund University  
GU – Gothenburg University  
SU – Stockholm University  
SLU – Swedish University of Agricultural Sciences  
PFS - Swedish Polar Research Secretariat

### **Other infrastructures and organizations**

ACTRIS - Aerosols, Clouds, and Trace gases Research Infrastructure network (<http://www.actris.net>)  
ANAEE – Analysis and Experimentation on Ecosystems ([www.anaee.com](http://www.anaee.com))  
GMES - Global Monitoring for Environment and Security (now called Copernicus, <http://www.copernicus.eu>)  
DEFROST – A Nordic Centre of Excellence with the aim to understand how climate change induced changes in the cryosphere influence the ecosystem/geosphere processes which directly affect climate (<http://www.ncoe-defrost.org>)  
INTERACT – International Network for Research and Monitoring in the Arctic (<http://www.eu-interact.org>)

NORDFROST - A Nordic researcher network supporting the study of greenhouse gas and energy exchange in sub-arctic and arctic ecosystems (<http://www.nateko.lu.se/nordfrost>)

WCRP – World Climate Research Programme (<http://www.wcrp-climate.org>)

SITES – Swedish Infrastructure for Ecosystem Research (<http://www.fieldsites.se/>)

**Other**

CWG – contract working group

GHG – greenhouse gas

NORA – The Marie Skłodowska Curie Initial Training Network "Nitrous Oxide Research Alliance"

SMHI –Swedish Meteorological and Hydrological Institute

SRC –Swedish Research Council (in Swedish VR – Vetenskapsrådet)

