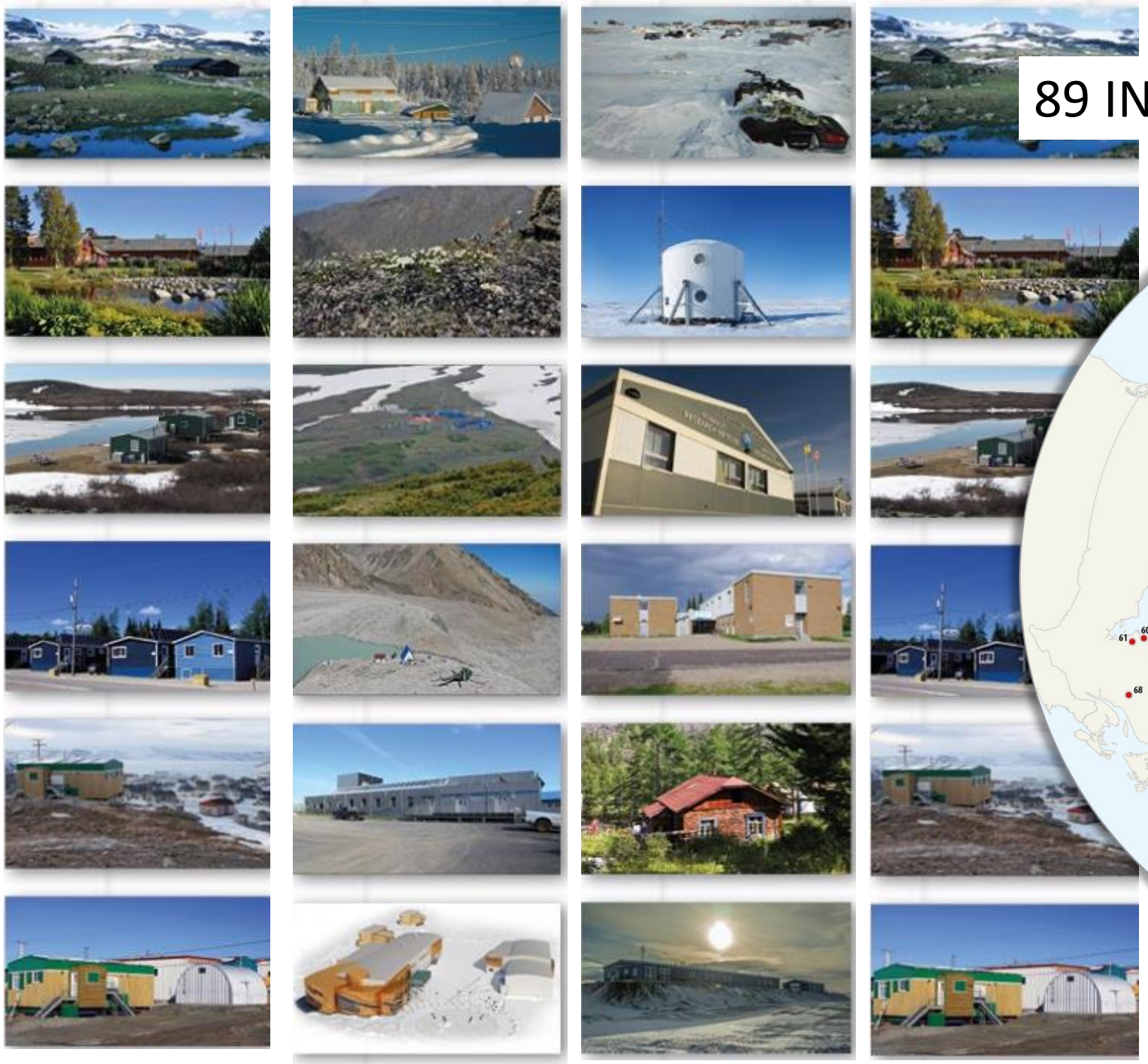
INTERACT – thoughts on future sustainable Arctic Observing System

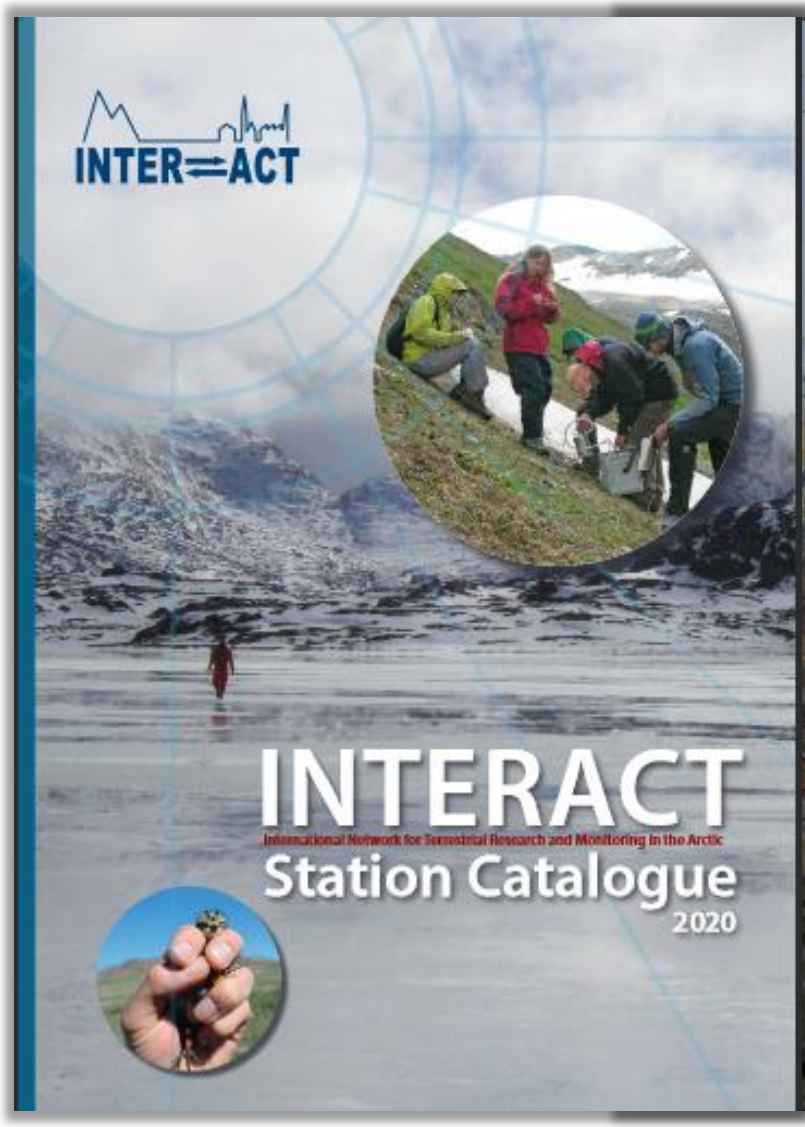
Margareta Johansson
Lund University

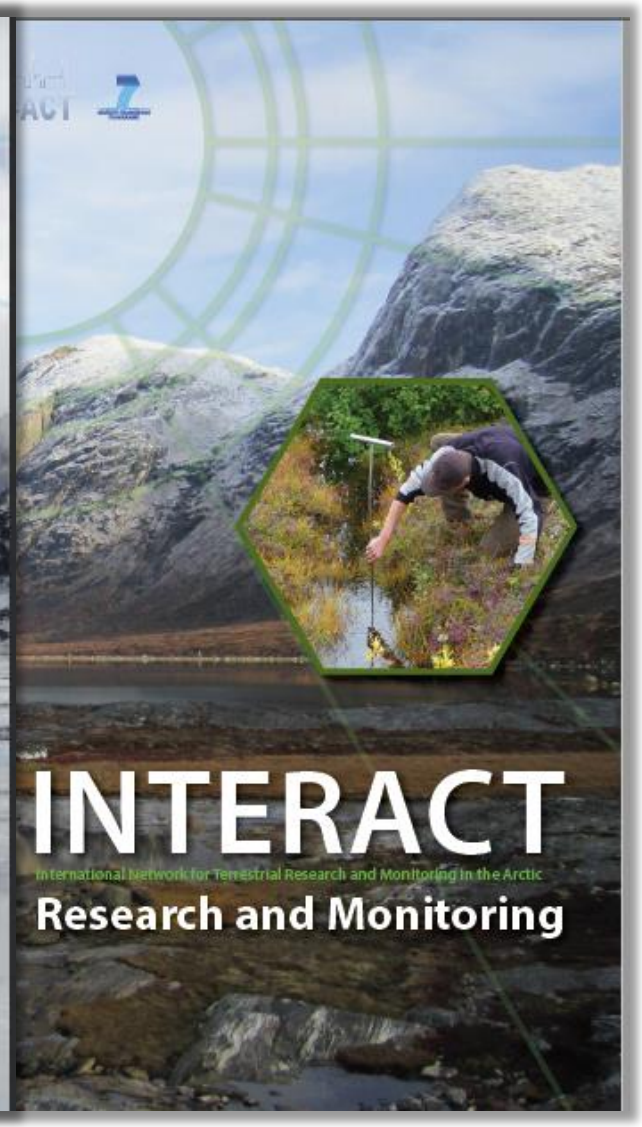
Photo: Juho Aalto

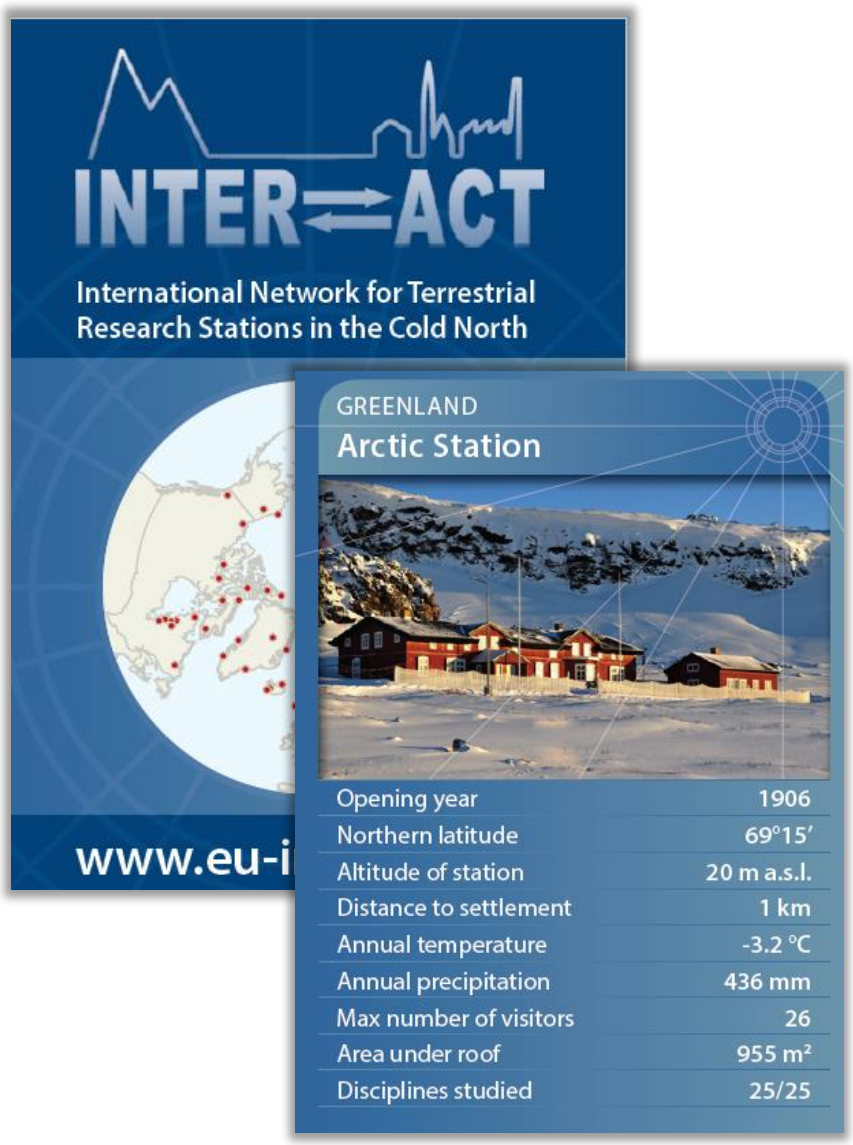
89 INTERACT Research Stations

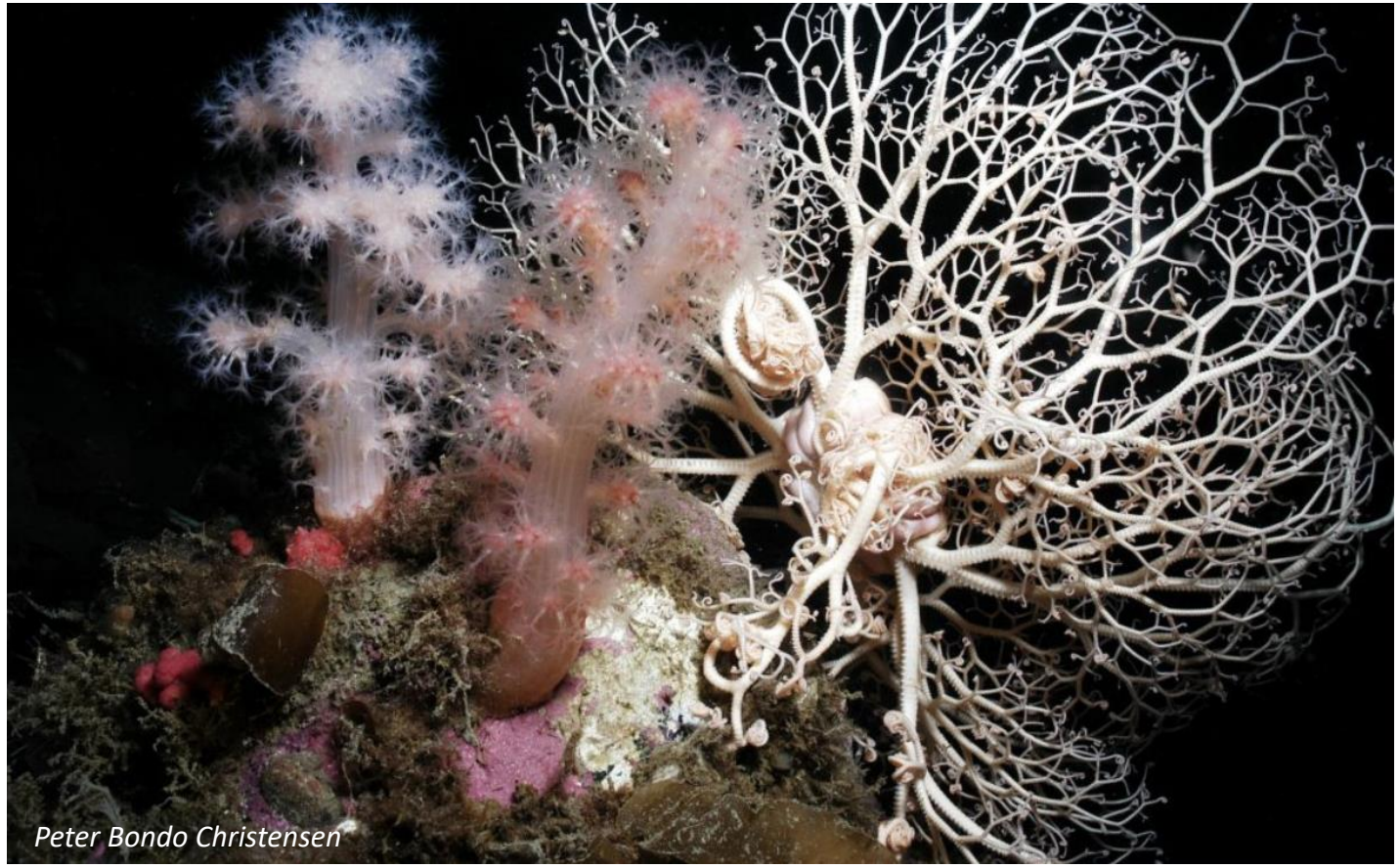


Learn more about the research stations and ongoing research





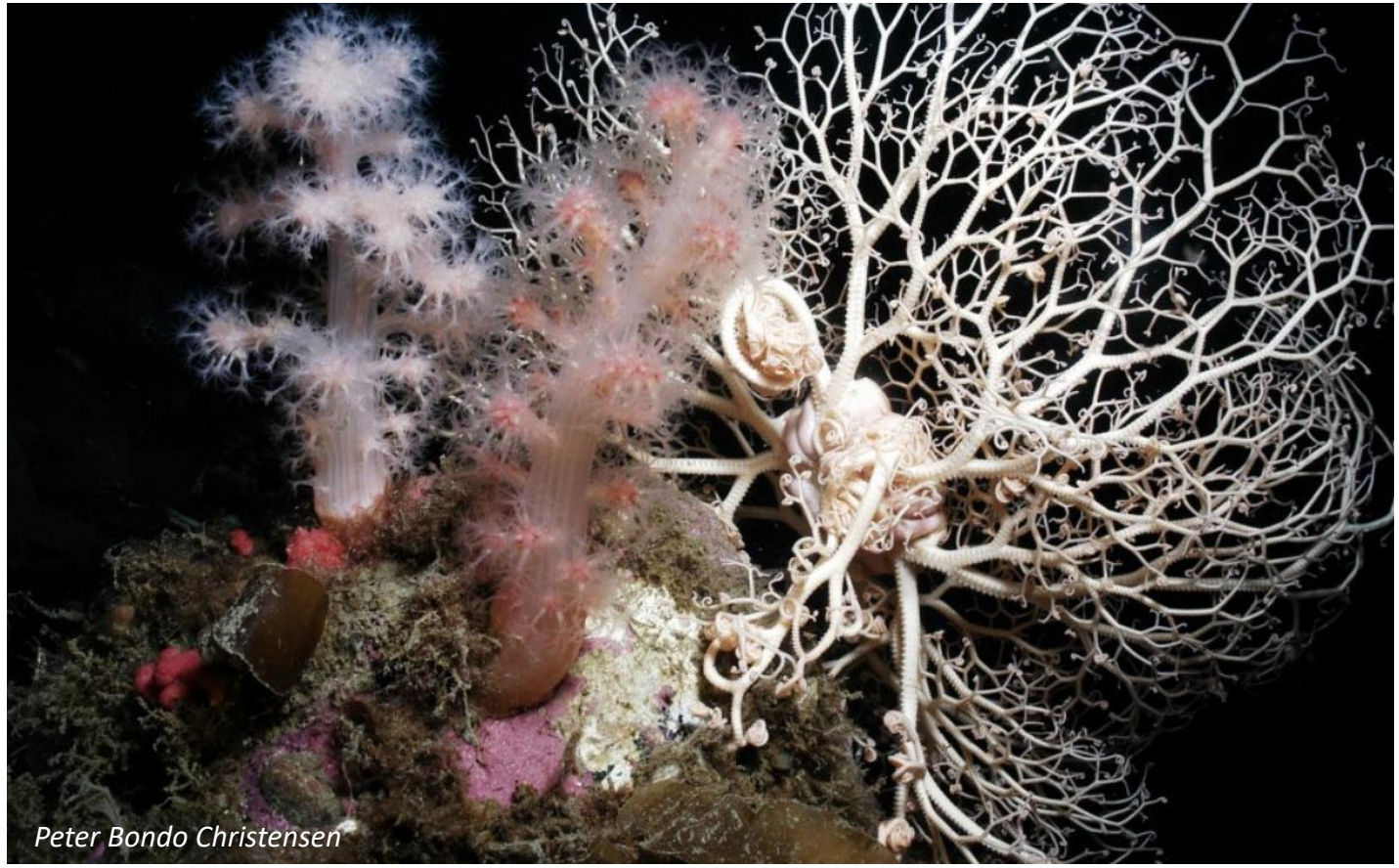




2nd Phase of INTERACT – an advanced community!

In a nutshell:

- 4 yr project in Horizon 2020
- Starting date 1 Oct 2016
- 47 partners from all Arctic countries
- Total budget 10 million EUR



2nd Phase of INTERACT – an advanced community!

In a nutshell:

- 5 yr project in Horizon 2020
- Starting date 1 Oct 2016
- 47 partners from all Arctic countries
- Total budget 10 million EUR

3rd Phase of INTERACT – a super duper advanced community!

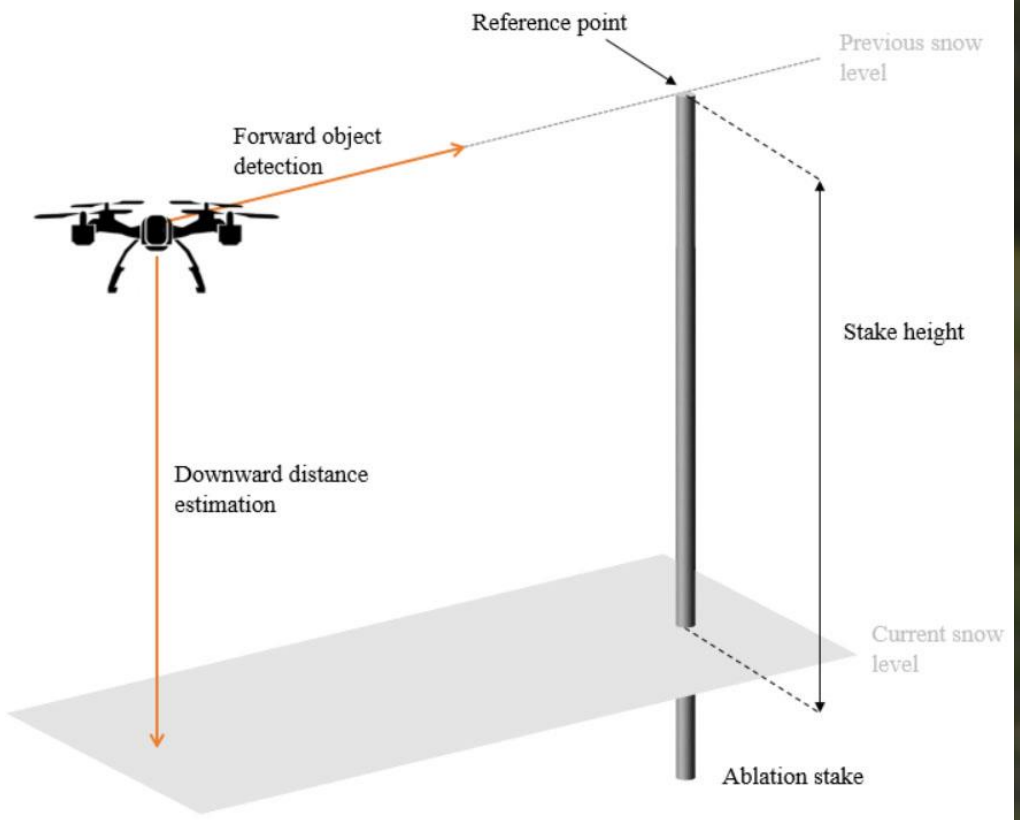
In a nutshell:

- 4 yr project in Horizon 2020
- Starting date 1 Jan 2020
- 63 partners from all Arctic countries
- Total budget 10 million EUR

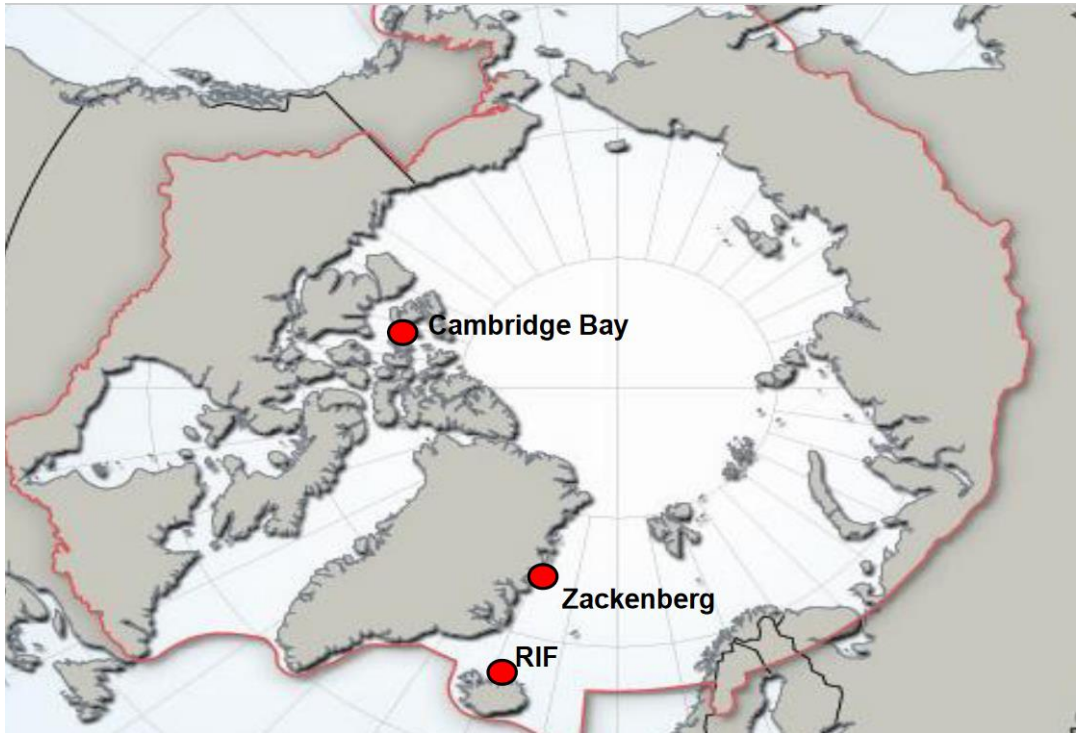
Requirements for observation/ technology development

Edward Hanna

How to use drones for observations?



Standardised biodiversity monitoring



Three CBMP reference stations:

- Test the Freshwater & Terrestrial Monitoring Plans in the field
- Identify existing biotic and abiotic monitoring
- Identify monitoring gaps
- Develop a data management plan for the Rif station
- Develop a user manual for implementing CBMP at INTERACT stations

Plans for observation campaigns

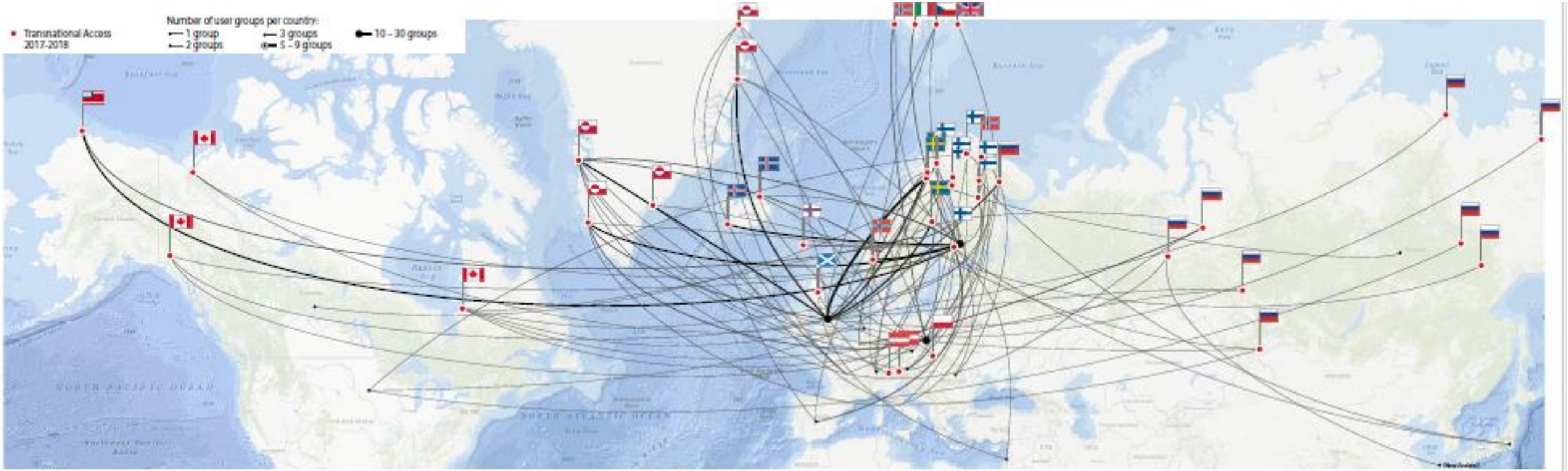
Liane G. Benning

Transnational Access INTERACT

- Free access to 53 research stations
- Transnational access – not to national infrastructures
- Max 90 days per user groups
- Annual call in Sept-Oct – decisions in Feb-March

LEGACY

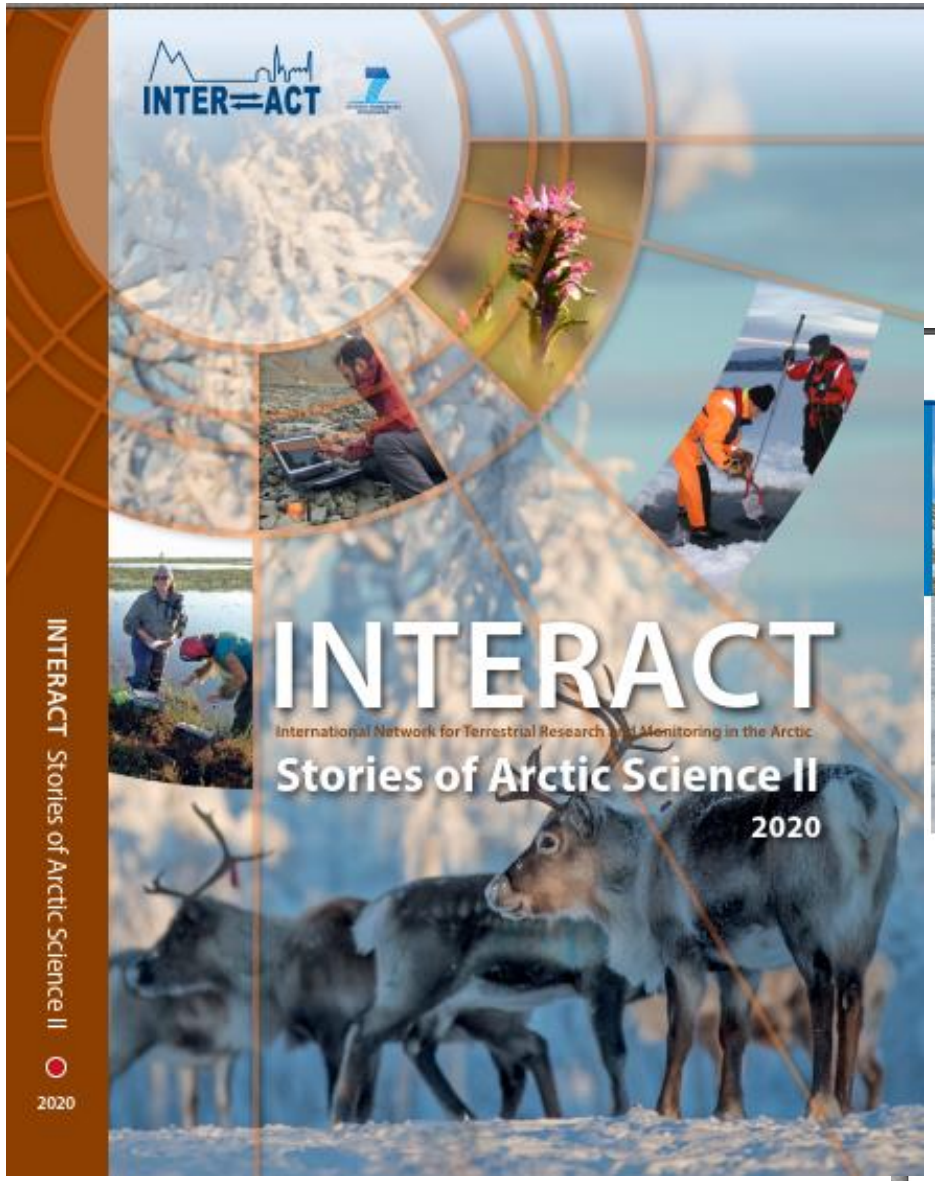
- More than 1 000 scientists have been awarded TA from INTERACT
- More than 250 peer review publications
- Science diplomacy
- Unique findings

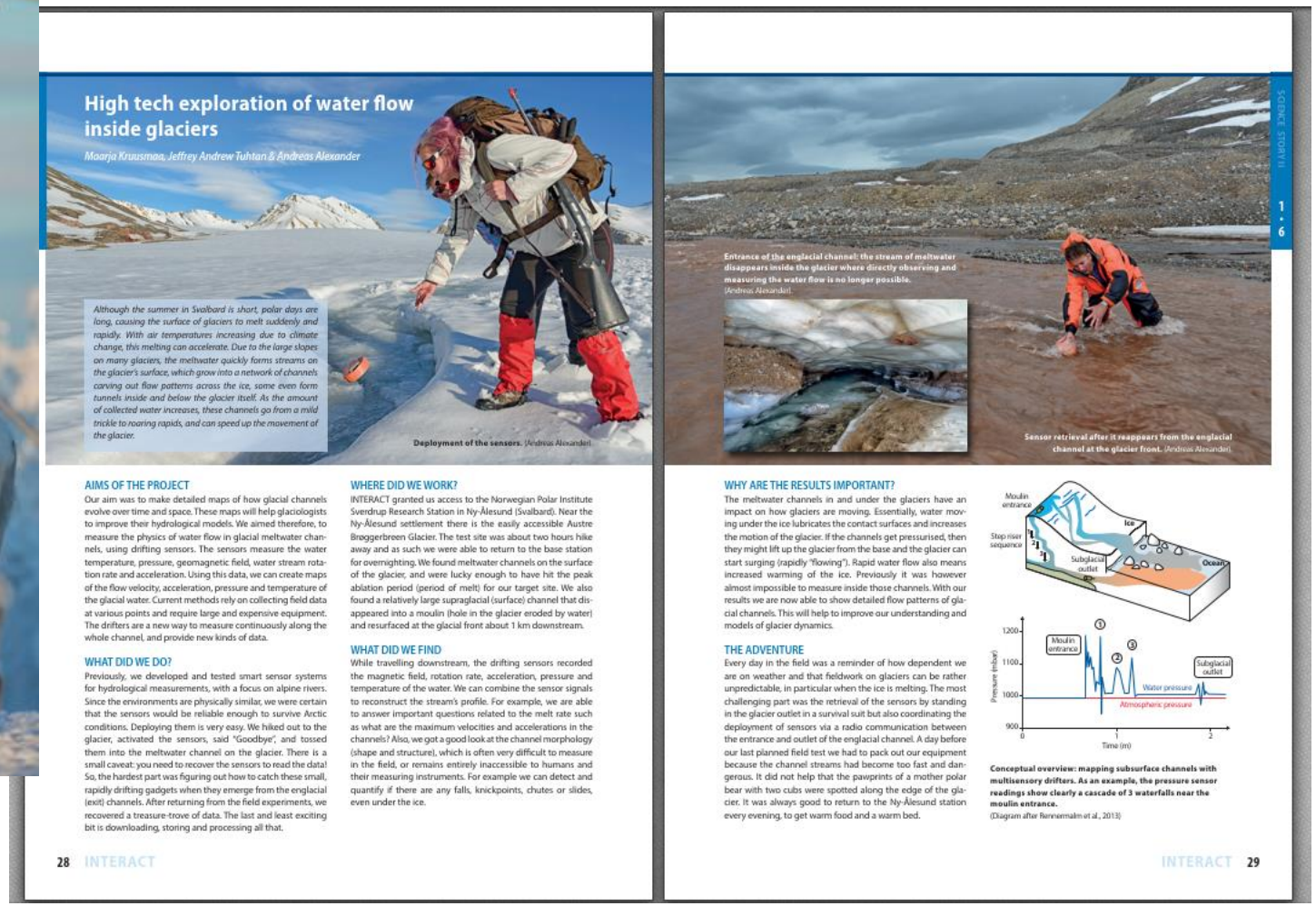


Bombus interacti

Photo: Pierre Rasmont

Examples of Transnational Access projects 2020!





High tech exploration of water flow inside glaciers

Maarja Kruusmaa, Jeffrey Andrew Tuhtan & Andreas Alexander

Although the summer in Svalbard is short, polar days are long, causing the surface of glaciers to melt suddenly and rapidly. With air temperatures increasing due to climate change, this melting can accelerate. Due to the large slopes on many glaciers, the meltwater quickly forms streams on the glacier's surface, which grow into a network of channels carving out flow patterns across the ice, some even form tunnels inside and below the glacier itself. As the amount of collected water increases, these channels go from a mild trickle to roaring rapids, and can speed up the movement of the glacier.

Deployment of the sensors. (Andreas Alexander)

AIMS OF THE PROJECT

Our aim was to make detailed maps of how glacial channels evolve over time and space. These maps will help glaciologists to improve their hydrological models. We aimed therefore, to measure the physics of water flow in glacial meltwater channels, using drifting sensors. The sensors measure the water temperature, pressure, geomagnetic field, water stream rotation rate and acceleration. Using this data, we can create maps of the flow velocity, acceleration, pressure and temperature of the glacial water. Current methods rely on collecting field data at various points and require large and expensive equipment. The drifters are a new way to measure continuously along the whole channel, and provide new kinds of data.

WHAT DID WE DO?

Previously, we developed and tested smart sensor systems for hydrological measurements, with a focus on alpine rivers. Since the environments are physically similar, we were certain that the sensors would be reliable enough to survive Arctic conditions. Deploying them is very easy. We hiked out to the glacier, activated the sensors, said "Goodbye", and tossed them into the meltwater channel on the glacier. There is a small caveat: you need to recover the sensors to read the data! So, the hardest part was figuring out how to catch these small, rapidly drifting gadgets when they emerge from the englacial (exit) channels. After returning from the field experiments, we recovered a treasure-trove of data. The last and least exciting bit is downloading, storing and processing all that.

WHERE DID WE WORK?

INTERACT granted us access to the Norwegian Polar Institute Sverdrup Research Station in Ny-Ålesund (Svalbard). Near the Ny-Ålesund settlement there is the easily accessible Austre Brøggerbreen Glacier. The test site was about two hours hike away and as such we were able to return to the base station for overnighting. We found meltwater channels on the surface of the glacier, and were lucky enough to have hit the peak ablation period (period of melt) for our target site. We also found a relatively large supraglacial (surface) channel that disappeared into a moulin (hole in the glacier eroded by water) and resurfaced at the glacial front about 1 km downstream.

WHAT DID WE FIND

While travelling downstream, the drifting sensors recorded the magnetic field, rotation rate, acceleration, pressure and temperature of the water. We can combine the sensor signals to reconstruct the stream's profile. For example, we are able to answer important questions related to the melt rate such as what are the maximum velocities and accelerations in the channels? Also, we got a good look at the channel morphology (shape and structure), which is often very difficult to measure in the field, or remains entirely inaccessible to humans and their measuring instruments. For example we can detect and quantify if there are any falls, knickpoints, chutes or slides, even under the ice.

Entrance of the englacial channel: the stream of meltwater disappears inside the glacier where directly observing and measuring the water flow is no longer possible. (Andreas Alexander)

Sensor retrieval after it reappears from the englacial channel at the glacier front. (Andreas Alexander)

WHY ARE THE RESULTS IMPORTANT?

The meltwater channels in and under the glaciers have an impact on how glaciers are moving. Essentially, water moving under the ice lubricates the contact surfaces and increases the motion of the glacier. If the channels get pressurised, then they might lift up the glacier from the base and the glacier can start surging (rapidly "flowing"). Rapid water flow also means increased warming of the ice. Previously it was however almost impossible to measure inside those channels. With our results we are now able to show detailed flow patterns of glacial channels. This will help to improve our understanding and models of glacier dynamics.

THE ADVENTURE

Every day in the field was a reminder of how dependent we are on weather and that fieldwork on glaciers can be rather unpredictable, in particular when the ice is melting. The most challenging part was the retrieval of the sensors by standing in the glacier outlet in a survival suit but also coordinating the deployment of sensors via a radio communication between the entrance and outlet of the englacial channel. A day before our last planned field test we had to pack out our equipment because the channel streams had become too fast and dangerous. It did not help that the pawprints of a mother polar bear with two cubs were spotted along the edge of the glacier. It was always good to return to the Ny-Ålesund station every evening, to get warm food and a warm bed.

Conceptual overview: mapping subsurface channels with multisensory drifters. As an example, the pressure sensor readings show clearly a cascade of 3 waterfalls near the moulin entrance.
(Diagram after Rennermalm et al., 2013)


Handling Data

Data Management Pocket Guide

Fieldwork

Before…

Data management already starts before data collection in the field. A **data management plan** (DMP) is a good way to think through and document the data life cycle, including a sampling strategy, anticipated data formats, possible storages for long-term preservation, a publishing strategy and a data backup plan during data collection and processing. Prepare standardized metadata sheets before going to the field. This will make it easier for you to integrate metadata documentation into your workflow.

During…

Fieldwork time is limited - thorough preparation pays off. Fieldwork is the phase of data collection, however already thinking about the next steps in the data life cycle can reduce workload and save extra work back home. Making use of **best practices** for sampling may help you to make your results comparable to already published research data. The usage of standardized metadata sampling sheets will prevent you from forgetting to document important information. Since it is easy to loose data in the field, a regular backup of all data (incl. field notes) and metadata is crucial.

After…

Back home, data processing and analysis are the next steps. At this stage, sharing data with your colleagues from your research project and converting the data in **open data formats** (formats which can be read without a proprietary software) will enhance their usability and usage. Do not forget to set up a backup system and use versioning while processing data.

Long-term data preservation and data publication are the last two major steps. Data repositories assign persistent identifiers to published datasets, which allow tracking the use of your data. The relevance and value of your data might rise enormously when used by your colleagues and further researchers. Embedded in a different scientific context, your research data may help answering scientific questions well beyond the scope of the initial research project.

Buzzwords and services

FAIR	Findable, Accessible, Interoperable, Reusable
DCC	Digital Curation Centre
DMP	Data Management Plan
DOI	Digital Object Identifier
OpenAIRE	European Open Research Data Pilot
RDA	Research Data Alliance
Re3data	Searchable online catalogue for data repositories

Cartoons by Auke Herrema
CC by www.mgenry.com/www.aukeherrema.nl
Photo by: Stephan Bernberg, Aarhus University
CC-BY-NC-SA

Links and References

Digital Curation Centre (DCC): http://www.dcc.ac.uk/resources/how-guides/develop-data-plan

DCC checklist for a data management plan: http://www.dcc.ac.uk/sites/default/files/documents/resource/DMP/DMP-checklist-flyer.pdf

European Commission (EU-C) (2016): Guidelines on FAIR Data Management in Horizon 2020: https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

FAIR data: Wilkinson, M., et al., 2016: The FAIR guiding principles for scientific data management and stewardship. Nature Scientific Data, 3: 160018, DOI: 10.1038/sdata.2016.18. https://www.nature.com/articles/sdata201618

INTERACT: www.eu-interact.org

OpenAIRE: https://www.openaire.eu/

Research Data Alliance (RDA): http://rd-alliance.github.io/metadata-directory/standards/

Re3Data: https://www.re3data.org

DCC EU-C FAIR data INTERACT OpenAIRE RDA Re3data

INTER⇄ACT

Pocket Guide

Data Management

WHAT it is, WHY we need it, HOW to do it

Anna Irrgang[1], Esther Hemmens[1] & Øystein Godøy[2]

[1] Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Potsdam, Germany

[2] Norwegian Meteorological Institute, Norway

AWI

Norwegian Meteorological Institute

Data Management Pocket Guide

Data management is needed in each research project in order to keep track of data handling, modification and storage. Data evolution in a project is commonly described as the **Data Life Cycle**.

Data Life Cycle

The **Data Life Cycle** describes the different stages of data within a research project. Data practices should be guided by the **FAIR data principles**, meaning that the data is Findable, Accessible, Interoperable and Re-usable (Wilkinson et al., 2016).

The **FAIR data principles** are acknowledged by scientists all over the world as guidelines for data handling.

Already in the **Planning** phase of your research project, it is helpful to think through the life cycle of your data, starting from how to collect them and ending on how to preserve and publish them. You can do this by creating your own **Data Management Plan (DMP)**. It will help you to organize your data in advance and keep track of them during the course of the project. Guidance material for making a DMP is provided for example by the Digital Curation Centre, which also provides a **checklist for creating a DMP**.

During data **Collection or Creation**, it is important that you thoroughly describe your data by creating metadata. Metadata are data describing data. The diversity of data collected at INTERACT stations is very high. The **best practices** for data collection and metadata standards differ with respect to the data type and scientific discipline .

Data **Processing** implies its modification and quality control. Processing steps need to be documented in the metadata so that you keep track of data evolution. We recommend to use a **self-explanatory versioning system**, to make the alteration of the data transparent.

A **regular data backup** during processing is crucial. This should include storing the data on two independent systems (e.g., PC and institutional server).

The **Preservation** of your research data is a decisive step in the data life cycle. The best practice is to store your data and metadata in a **trusted data repository**. **Re3data** is a search engine for data repositories which could help you find a suitable repository for preserving and publishing your data.

Data **Publication** is the key to make your data accessible for the public. You can either publish your data and its corresponding metadata, or just the metadata. Use **open data formats** (formats which can be read without a proprietary software) and follow **metadata standards** to ensure the findability, accessibility, interoperability and reusability of your data. Embargos and licensing give you control over data access and usage. Publishing your data makes your research more trustworthy and may help increase your scientific reputation. Data publication will not only help others to find your data but it will also help you to find the final version of your data after your research project ends!

For the **Reuse** of data, you need to make them findable, accessible, interoperable and document them in a self-explanatory way. Having **rich and standardised metadata** increases the value of your data and the likelihood of its reuse.

Providing access to your data keeps them relevant beyond the scope of your project and will help to exploit their full potential.

Data management within INTERACT

INTERACT is a Horizon2020 project and thus funded by the EU. Horizon2020 projects comply to the Open Data Pilot called **OpenAIRE**. Thus, by default all scientists using INTERACT stations are obliged to provide **free and open access to data collected/created within the framework of the INTERACT** network, or at least to research data which validate the results in scientific publications. If you can provide solid reasons for keeping these data closed, you can opt out of this obligation.

The European Commission released some additional guidelines on FAIR data management in Horizon 2020.

What are Metadata?

Metadata provide the context for data and contain descriptive information about the dataset (e.g., author, location, time, method of data collection, processing steps, etc.). To ensure findability and reusability of data, it is important to use established data and metadata standards (e.g., ISO 19115 compliant). The used metadata standard depends on the data type and the scientific discipline. You will be requested to provide metadata during the data submission process to a trusted data repository.

A list of general and discipline specific metadata standards are provided by the **Research Data Alliance**.

How to find a trusted repository

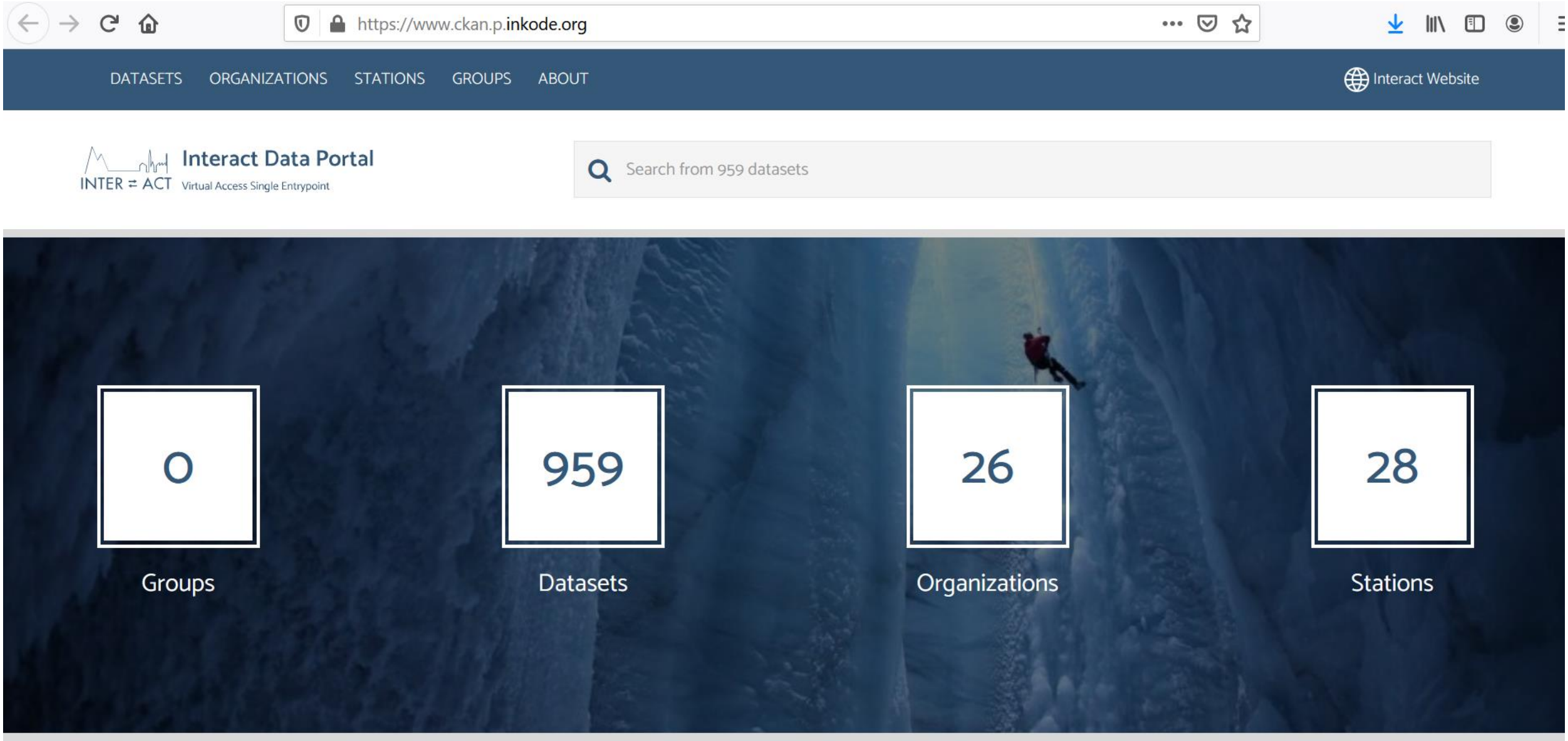
The search for a trusted data repository usually starts with exploring the repository of your institution or data repositories used by your research community. You can use the Re3data platform to search for a suitable data repository for long-term storage and publishing of your data. Re3data is a searchable online catalogue with entries for more than 2000 data repositories.

The data repository of your choice should fulfill the following criteria:

- Complies to the FAIR guiding principles
- Supports relevant metadata standards and data formats
- Provides persistent identifiers (e.g., DOI)
- Uses data licensing (e.g., creative commons)
- Ensures long-term data preservation.

READ MORE ABOUT INTERACT AND DATA MANAGEMENT AT:
www.eu-interact.org

Virtual Access – Access to data



https://interact-gis.org

INTER ⇄ ACT GIS

Stations Research Publications Application About

Welcome to INTERACT GIS

INTERACT GIS provides information regarding approxima
situated under arctic or sub-arctic conditions, whether in
altitudes elsewhere in the northern hemisphere. INTERAC
different types of web-based services, whereof one is ope
regarding stations and their associated landscape charac
functionalities offered by INTERACT GIS, a search for sta
research, educational, and/or monitoring criteria is enable
examining Arctic field-stations is provided.

The second type of web-based service offered by INTER
that may be acquired under the above SIGN UP symbol.
INTERACT GIS may be used for automated management of station visitors, activities, and publications. An accumulating record of station's activities is thereby captured, stored, and disseminated at real-time pace, providing decision support for collective planning of Arctic research, education, and/or monitoring activities.

With INTERACT GIS offering truly spatial on-line capabilities, like combining geo-referenced station's information with streamed map-services, it is per definition a web-based Geographic Information System. As an example, the collective record of research publications stored and disseminated with INTERACT GIS is geo-referenced via station activities onto visualisations that utilise streamed map-services.

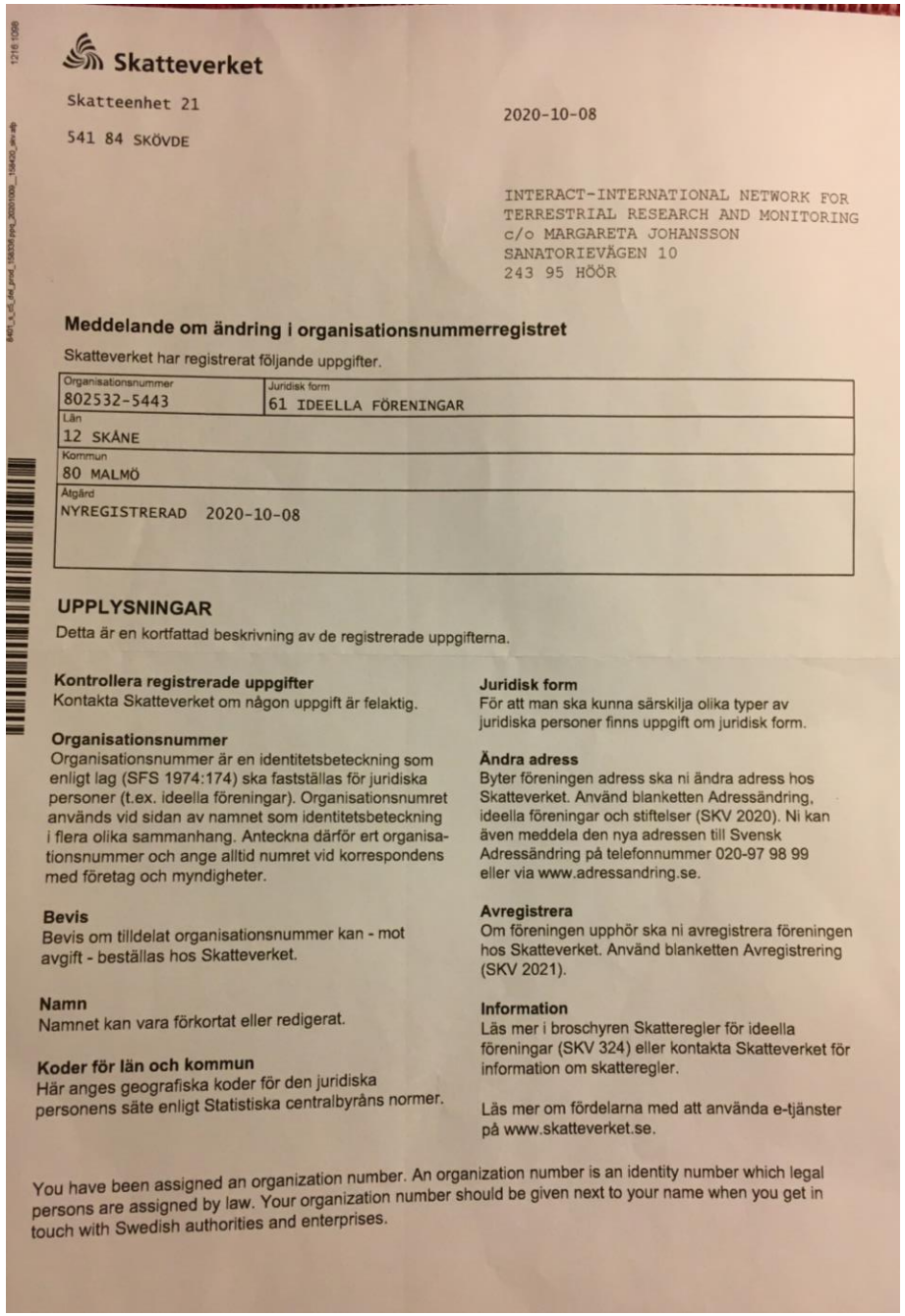
INTERACT GIS is offered to field-stations affiliated with the INTERACT and SITES infrastructures, and all usage may be filtered with respect to organisational affiliation; please explore the above Organisations menu for accessing the filtering functionalities.

As part of its basic functionality, INTERACT GIS captures and processes personal data that fall within the framework of EU's General Data Protection Regulation (GDPR); please explore the above GDPR menu for further information.

INTERACT GIS is the intellectual property of the Swedish University of Agricultural Sciences SLU; please explore the above Copyright menu for reference information.

Sustainability

Blair Fyffe



Skatteverket

Skatteenhet 21

541 84 SKÖVDE

2020-10-08

INTERACT-INTERNATIONAL NETWORK FOR
TERRESTRIAL RESEARCH AND MONITORING
c/o MARGARETA JOHANSSON
SANATORIEVÄGEN 10
243 95 HÖÖR

Meddelande om ändring i organisationsnummerregistret

Skatteverket har registrerat följande uppgifter.

Organisationsnummer	Juridisk form
802532-5443	61 IDEELLA FÖRENINGAR
Län: 12 SKÅNE	
Kommun: 80 MALMÖ	
Åtgärd: NYREGISTRERAD 2020-10-08	

UPPLYSNINGAR

Detta är en kortfattad beskrivning av de registrerade uppgifterna.

Kontrollera registrerade uppgifter
Kontakta Skatteverket om någon uppgift är felaktig.

Organisationsnummer
Organisationsnummer är en identitetsbeteckning som enligt lag (SFS 1974:174) ska fastställas för juridiska personer (t.ex. ideella föreningar). Organisationsnumret används vid sidan av namnet som identitetsbeteckning i flera olika sammanhang. Anteckna därför ert organisationsnummer och ange alltid numret vid korrespondens med företag och myndigheter.

Bevis
Bevis om tilldelat organisationsnummer kan - mot avgift - beställas hos Skatteverket.

Namn
Namnet kan vara förkortat eller redigerat.

Koder för län och kommun
Här anges geografiska koder för den juridiska personens säte enligt Statistiska centralbyråns normer.

Juridisk form
För att man ska kunna särskilja olika typer av juridiska personer finns uppgift om juridisk form.

Ändra adress
Byter föreningen adress ska ni ändra adress hos Skatteverket. Använd blanketten Adressändring, ideella föreningar och stiftelser (SKV 2020). Ni kan även meddela den nya adressen till Svensk Adressändring på telefonnummer 020-97 98 99 eller via www.adressandring.se.

Avregistrera
Om föreningen upphör ska ni avregistrera föreningen hos Skatteverket. Använd blanketten Avregistrering (SKV 2021).

Information
Läs mer i broschyren Skatteregler för ideella föreningar (SKV 324) eller kontakta Skatteverket för information om skatteregler.

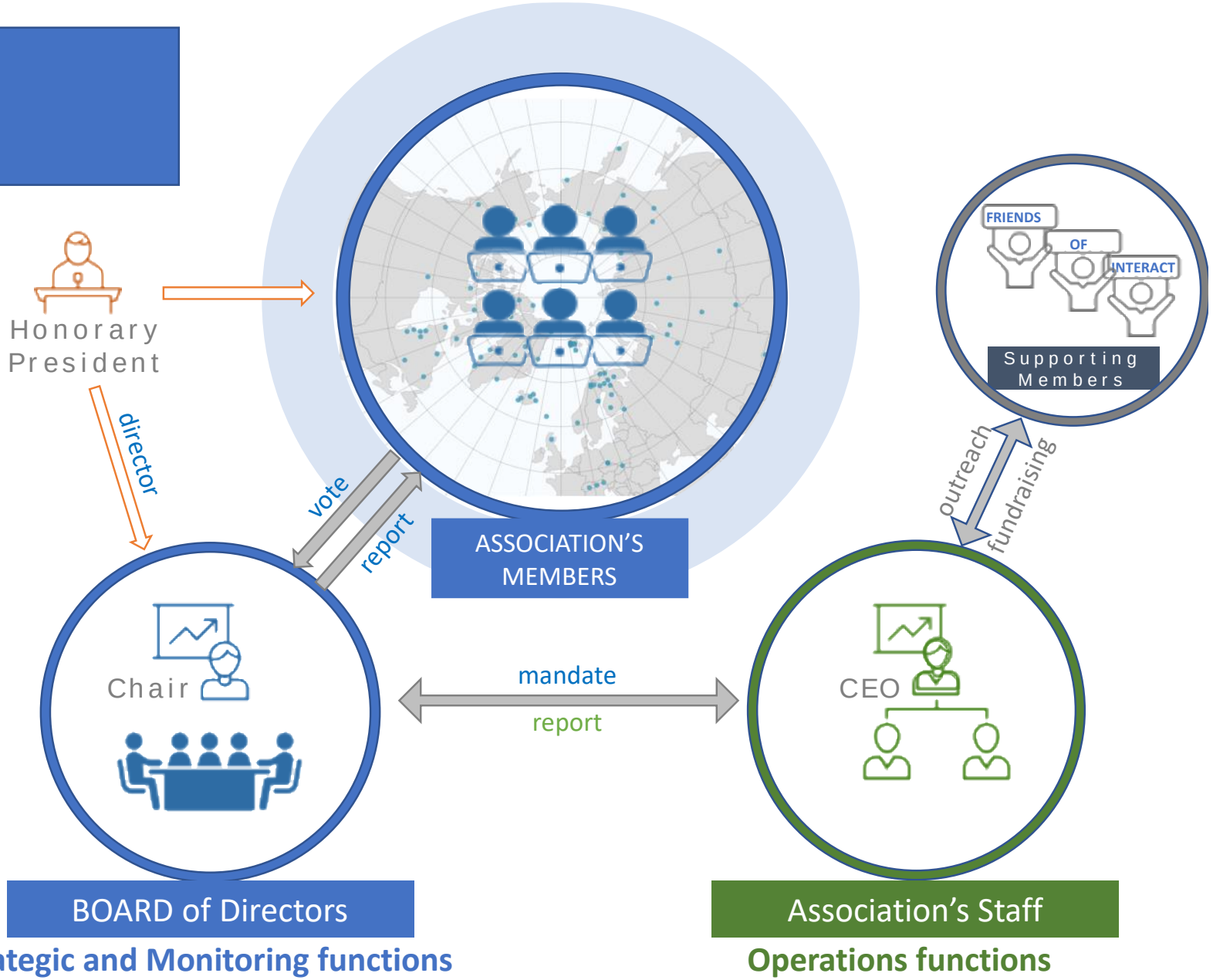
Läs mer om fördelarna med att använda e-tjänster på www.skatteverket.se.

You have been assigned an organization number. An organization number is an identity number which legal persons are assigned by law. Your organization number should be given next to your name when you get in touch with Swedish authorities and enterprises.

INTERACT Non-Profit Association (INPO)

- Legal Entity
- Complement EU funding
- Apply for funding as a unit
- Enable us to establish sustainable, standardized monitoring

Governance


Honorary President
director
vote
report
ASSOCIATION'S MEMBERS
FRIENDS
OF
INTERACT
Supporting Members
outreach
fundraising
Chair
mandate
report
CEO
BOARD of Directors
Strategic and Monitoring functions
Association's Staff
Operations functions

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ABOUT FIELD SITES COLLABORATIONS NEWS OUTREACH DELIVERABLES CONTACT US PUBLICATIONS Search

INTER ⇄ ACT

ACCESSING THE ARCTIC MANAGING STATIONS HANDLING DATA RISING ARCTIC AWARENESS

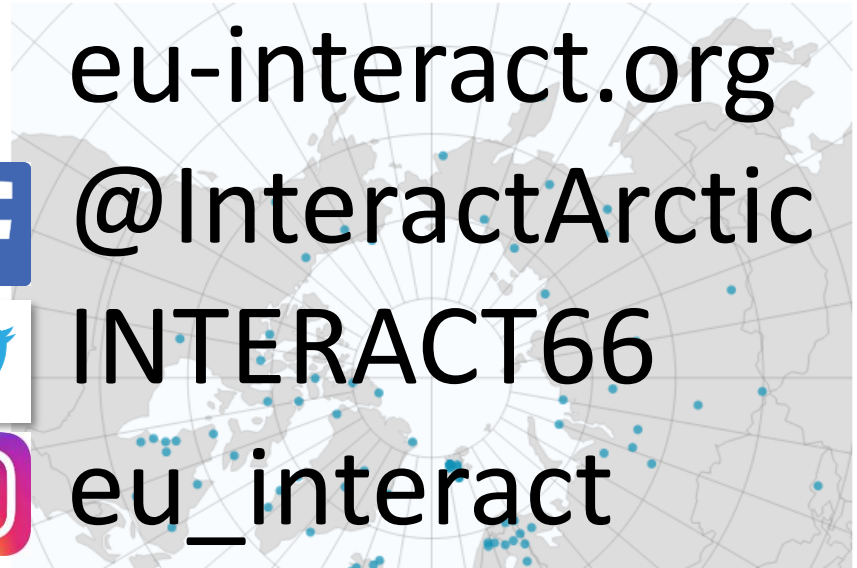
COPING WITH CHANGE | MANAGING RISKS | USING DRONES | TRACKING BIODIVERSITY | TOURISM | POLLUTION | ARTIFICIAL INTELLIGENCE | TRANSPORT AND COMMUNICATION | EXTREME WEATHER

Welcome to INTERACT – International Network for Terrestrial Research and Monitoring in the Arctic

INTERACT is an infrastructure project under the auspices of SCANNET, a circumarctic network of currently 89 terrestrial field bases in northern Europe, Russia, US, Canada, Greenland, Iceland, the Faroe Islands and Scotland as well as stations in northern alpine areas. INTERACT specifically seeks to build capacity for research and monitoring all over the Arctic, and is offering access to numerous research stations through the Transnational Access Program.

Read more

› FIELD SITES



› NEWS

January 25, 2021
› KEPLER ONLINE WORKSHOP

17-18th February 2021, KEPLER is giving an online workshop that is open for students and early career scientists within Earth Observation and who use data ...

January 21, 2021
› SPARC 2021 – STUDENTS IN POLAR AND ALPINE RESEARCH CONFERENCE

The 7th annual Students in Polar and Alpine Research Conference – SPARC 2021 will be held in Brno, Czech Republic, on the 3-4 May 2021, ...

January 19, 2021
› ASM3 WEBINAR SERIES

On the 20th January 2021, 16: 00-17: 00 UTC, the next webinar in the ASM3 webinar series will be held. Please register here if you ...

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