

# SIOS's Earth observation and remote sensing activities toward building an efficient regional observing system in Svalbard

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# Svalbard Integrated Arctic Earth Observing System

An international research infrastructure for Arctic Earth System Science (ESS)

## Vision

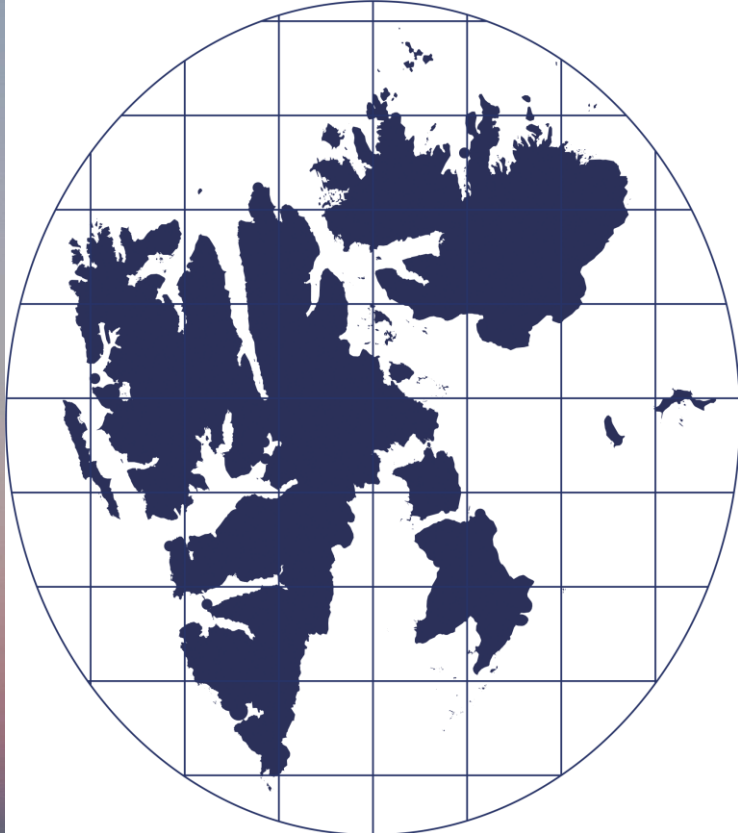
**We will be the leading long-term observing system in the Arctic to serve Earth system science and society**



# Mission

**An international partnership of researchers studying the environment and climate in and around Svalbard to**

- Develop an efficient observing system
- Share technology, experience and data
- Close knowledge gaps
- Decrease the environmental footprint of science





# SIOS – a Norwegian initiated international collaboration to create a regional observing system

## The Observing System

- A cooperating international research infrastructure for improved knowledge of environmental and climate change in the Arctic
- Focus to answer Earth System Science questions
- Systematic long term observations – stable over time, yet dynamic as new questions from society arise
- Minimizing environmental footprint, optimizing measurements and resources, new technologies, remote sensing, integration of data
- Open, free and harmonized data
- **Improving research conditions** for scientists working in ESS

## The regional scope

- The Norwegian archipelago Svalbard and surrounding waters



# The Svalbard Integrated Arctic Earth Observing System

- **A consortium** of institutions with research infrastructure in & around Svalbard

Independent organisation  
28 institutions from 10 countries



- **An observing system** for Earth System Science (ESS)

Focus on processes,  
eg. environmental and climate change

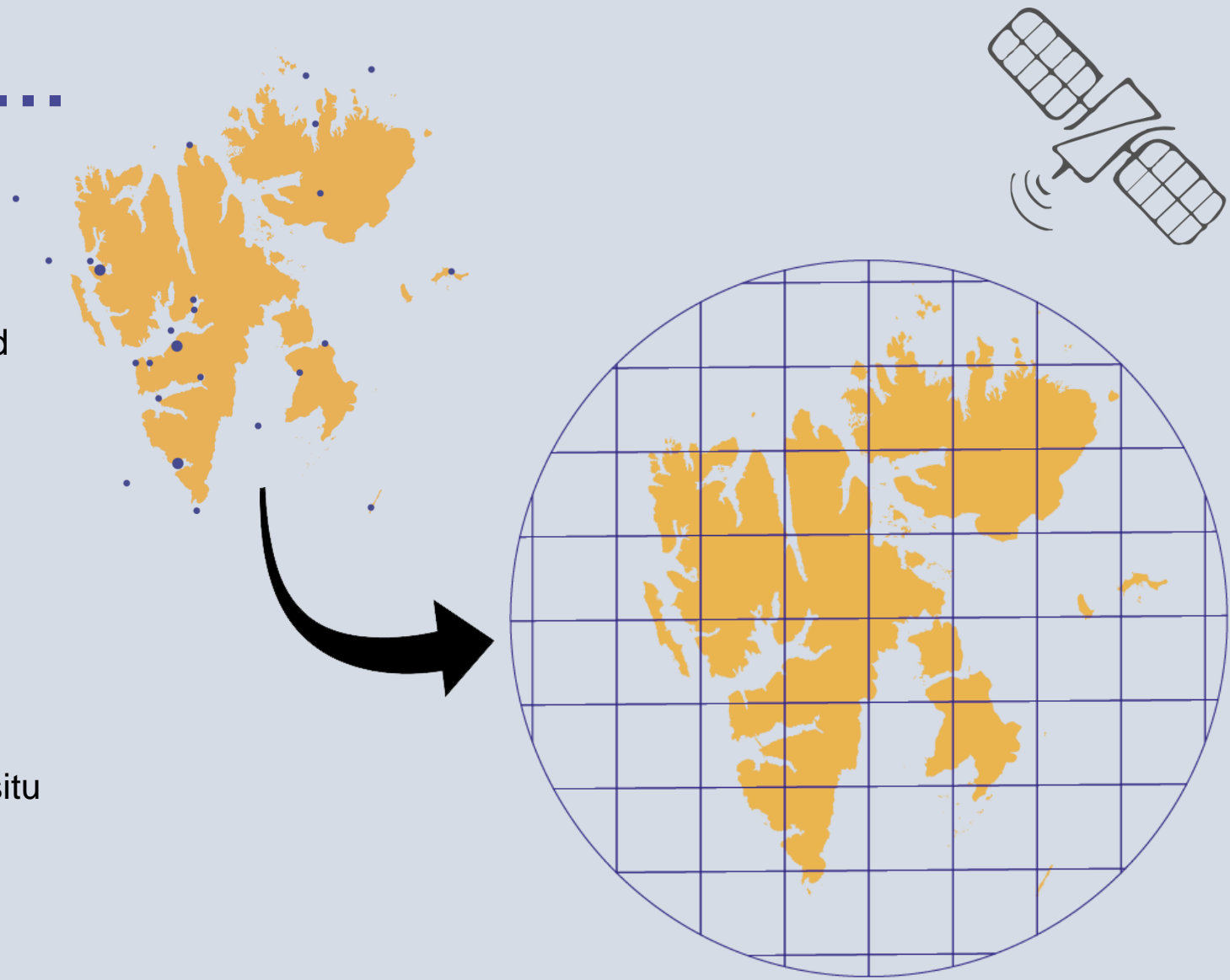


# Cooperation of international institutions



# SIOS works towards ...

- **Integration** of new & existing infrastructure and data
- A network of **systematic observations**
- **Better temporal and spatial coverage** of key observational data
- Reliable access to **long-term** monitoring data
- **Improved integration** of space-based and in-situ observations
- **Improving research conditions** for scientists working in ESS







## Remote Sensing Service

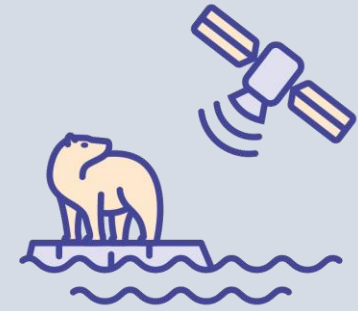


- **Single point of contact** for satellite information for Svalbard
- Information about **opportunities** and on **how to use** satellite data
- Streamlined **access to EC Copernicus** programme satellite data for Svalbard
- Working together with product users and providers **to improve the usability** of satellite data
- Providing **tools** for satellite data users
- Prioritized **geospatial product** generation





# Remote Sensing Working Group



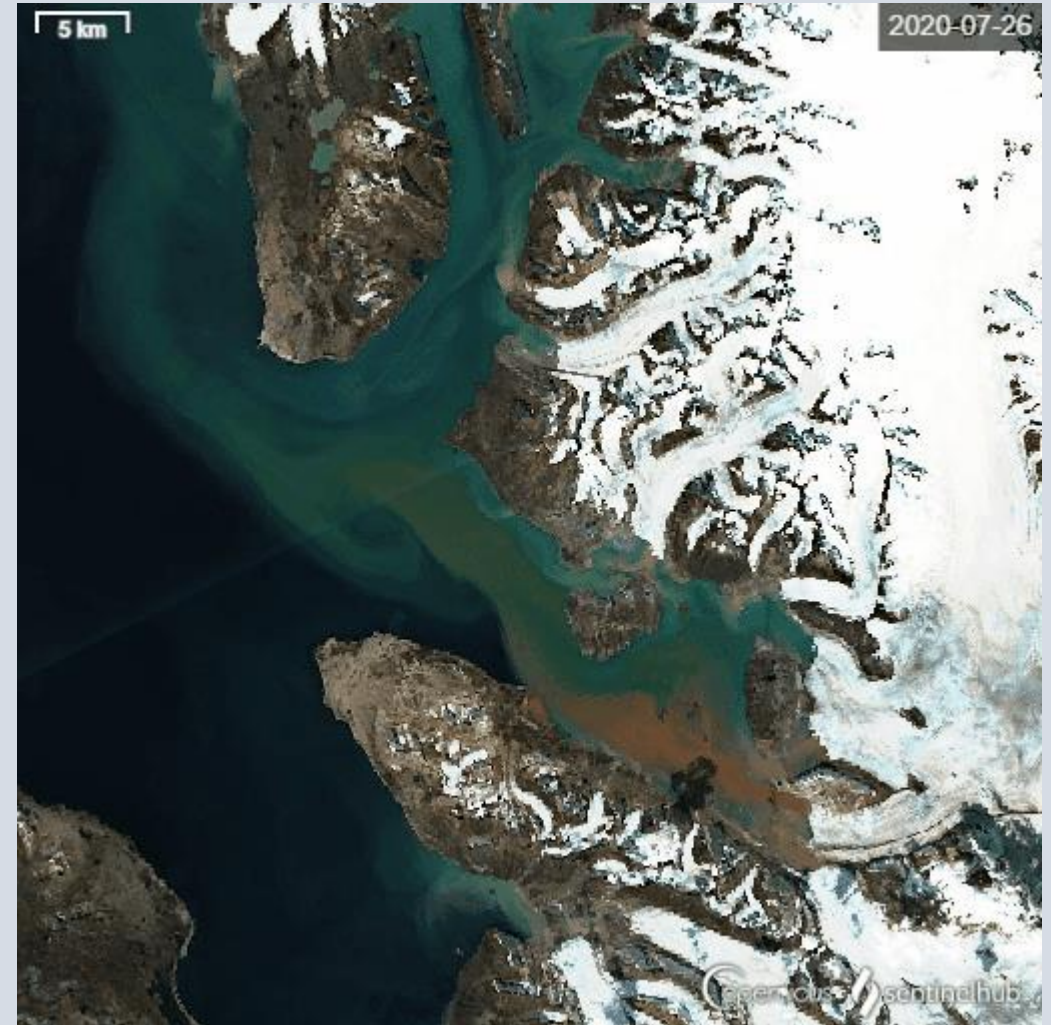
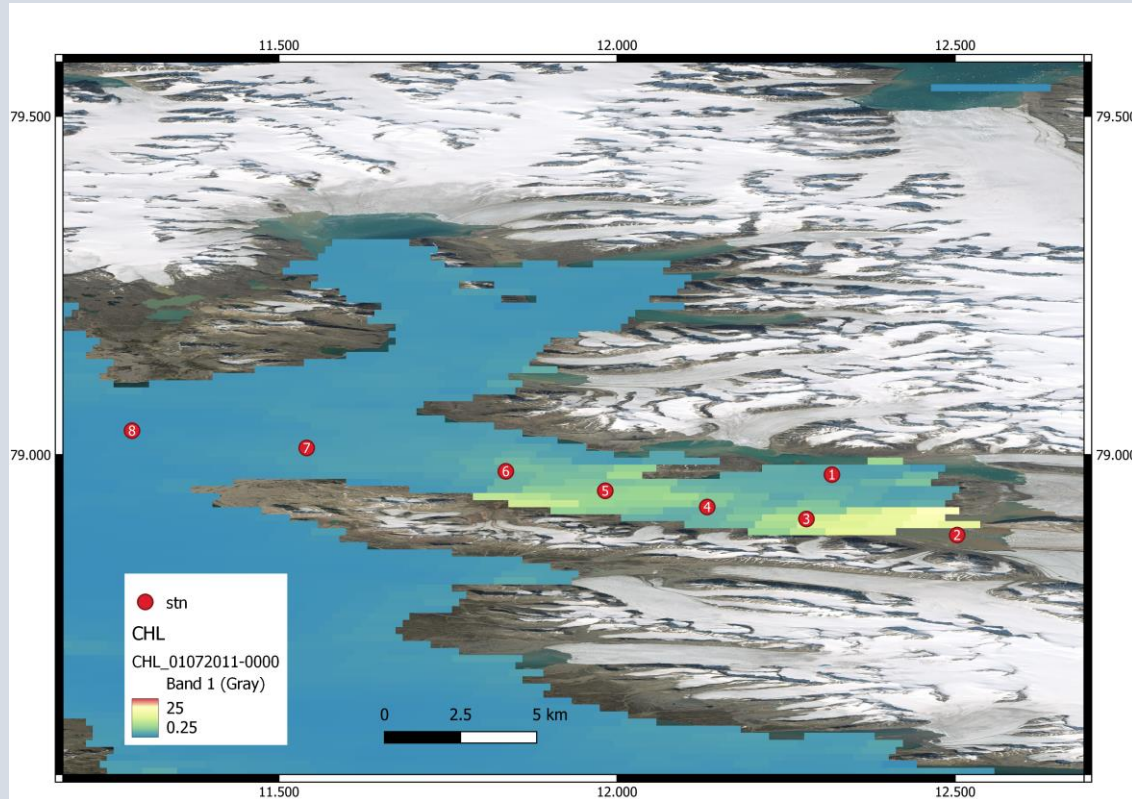
## 25 Members:

- 23 Institutional members from 15 SIOS member institutions
- 2 ECR observers

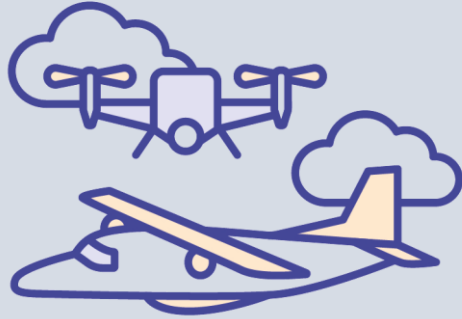


**RSWG meeting during Polar Night Week-2022**

# Integration and Cal/Val



# Airborne Remote Sensing Campaigns



## Sensors

- RGB camera and hyperspectral imager installed on Dornier aircraft stationed in Longyearbyen
- High resolution georeferenced images

## Opportunities

- First call in 2020 resulted in 25 flight hours for 10 projects
- Second call in 2021 resulted in 25 flight hours for 11 projects

**Data will be available eventually through SIOS Data Access Point**





# Airborne Remote Sensing Campaigns in Svalbard

## Campaigns 2020



10 projects, 25 flight hours

## Campaigns 2021



11 projects, 25 flight hours





# SIOS Training courses



**2017:** Training workshop on Copernicus Satellite

**2018:** ESA Advanced Cryosphere Training

**2019:** Marine Remote Sensing Training Course

**2020:** Terrestrial Remote Sensing Training Course

**2021:** Hyperspectral Remote Sensing Training Course



## The northernmost Copernicus Relay on the planet



Earth Observation (EO) & Geoinformation (GI)



Copernicus User Uptake



One-stop Copernicus Information Point



To promote Copernicus EO and GI



Sustainable source of full, free, open and reliable information



Benefits of EO data for domains not directly linked to space

The Svalbard Integrated Arctic Earth Observing System (SIOS) is a distributed international research infrastructure for Arctic Earth System Science, coordinating a regional observing system for long-term measurements in and around Svalbard.

SIOS became a Copernicus Relay in 2016. As a member of this network, SIOS is a bridge between Copernicus and the end-users of the programme.



Austfonna ice cap - Sentinel-1B's first data captured at 05:37 GMT on 28 April 2016. Photo: ESA-EC Copernicus.



- Map opportunities and needs for Satellite data
- Ensure streamlined access to EC Copernicus programme satellite data for Svalbard
- Encourage user uptake of satellite data through training activities
- Manage tailored-processing of satellite data by consortium partners
- Establish links to satellite owners and promote Svalbard as a Cal/Val site



Kongsfjorden 12 September 2017  
Contains modified Copernicus data

Contact us for your query on Copernicus products: [remotesensing@sios-svalbard.org](mailto:remotesensing@sios-svalbard.org)

[www.sios-svalbard.org](http://www.sios-svalbard.org)

# SIOS Hyperspectral Remote Sensing Training Course -2021

15 teachers

80 applications

35 selected participants

**17** PhD Students

**04** Masters/Bachelors Students

**06** Researchers

**06** Postdocs

**01** Educator

**01** Industry

25 institutions from 11 nations

292 lecture series participants

10 mini projects



**Manuscript:** Potential of hyperspectral sensors in Svalbard (under prep)

# #AI4Svalbard



# SIOS Webinar series

**An anchor point to a drifting world!**



## Why?

Cancelled field campaigns

Cancelled conferences

To provide a social experience to the Svalbard research community in difficult times

**13 Webinars**

**2 Online conferences**

**2 Online training courses**

**4 Panel discussions**





# SIOS webinars-2021



No.	Webinar Theme	Date	No. of attendees	Feedback (out of 10)
1	Radar Systems and their applications in Svalbard	29 October 2021	69	≈9
2	SIOS Online Remote Sensing Conference	8-10 June 2021	235	≈9
3	Terrestrial research in Svalbard	7 May 2021	79	≈8
4	International Women's day special webinar	8 March 2021	60	≈8
5	Projects in the frame of the SIOS Research Infrastructure Access Programme	12 February 2021	73	≈9
6	Environmental Impact of Research in Svalbard	3 December 2021	71	≈8

# First SIOS Online Conference

## Earth Observation, Remote Sensing and Geoinformation applications in Svalbard

4-5 June 2020

### Why?

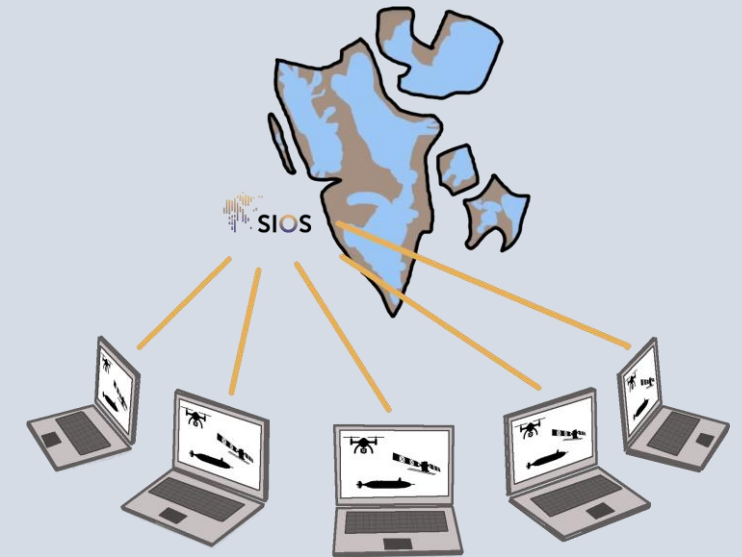
- to promote the PhD students, postdocs, researchers, and academicians to contribute in the **SIOS's special issue on EO/RS/GI**.
- to review the state-of-the-art EO/RS/GI applications in Svalbard and;
- to provide social experience to the Svalbard scientific community

### Awards for Early Career Researchers:

Top 5 papers presented by ECRs (Masters, PhD, postdocs, within 7 years after PhD)

### Quick facts

- More than 350 registered participants
- 37 submitted abstracts
- More than 50 talks
- Presenters from  $\approx$  24 institutions in 12 countries



# Second SIOS Online Conference

## Earth Observation, Remote Sensing and Geoinformation applications in Svalbard

**08-10 June 2021**

- 39 submitted abstracts
- Around 50 talks

### Keynotes and invited talks

7 keynote talks

### SIOS sessions

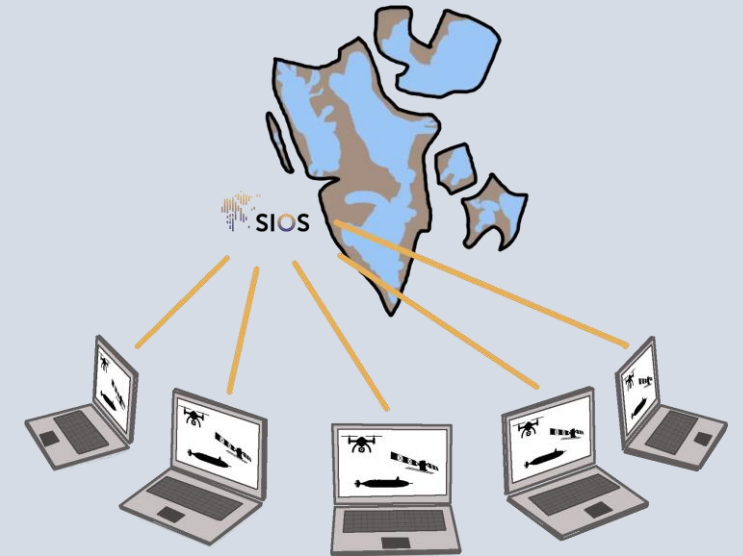
- SESS and InfraNor
- airborne campaigns in Svalbard
- Hack the Arctic Winners

### Online Networking events

**9<sup>th</sup> June:** Zoom Quiz

**10<sup>th</sup> June:** Gathertown

with EGU Cryosphere Division, EGU Atmospheric Sciences Division and EGU Ocean Sciences Division.

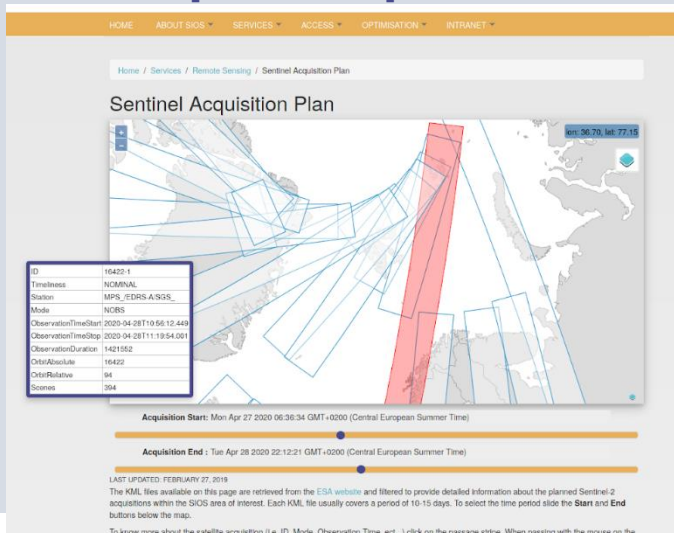


# Remote Sensing tools

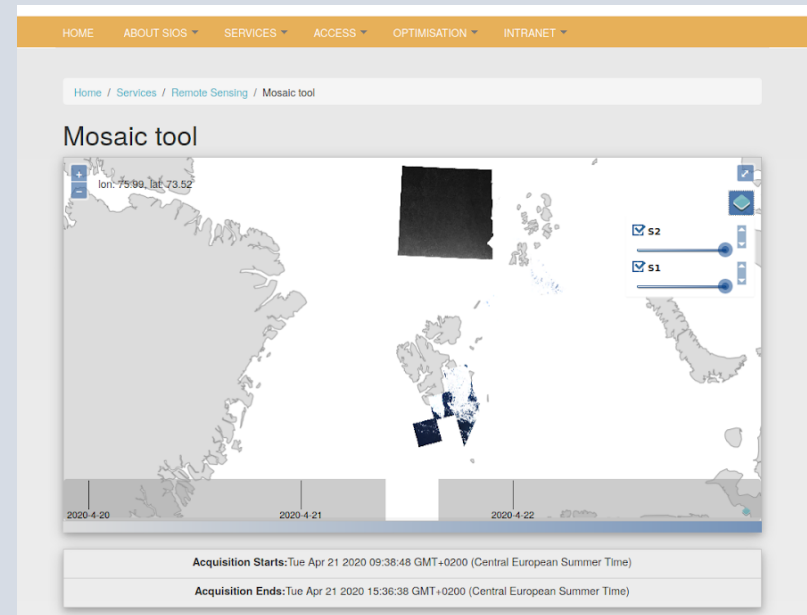
## SIOS Remote Sensing Tools



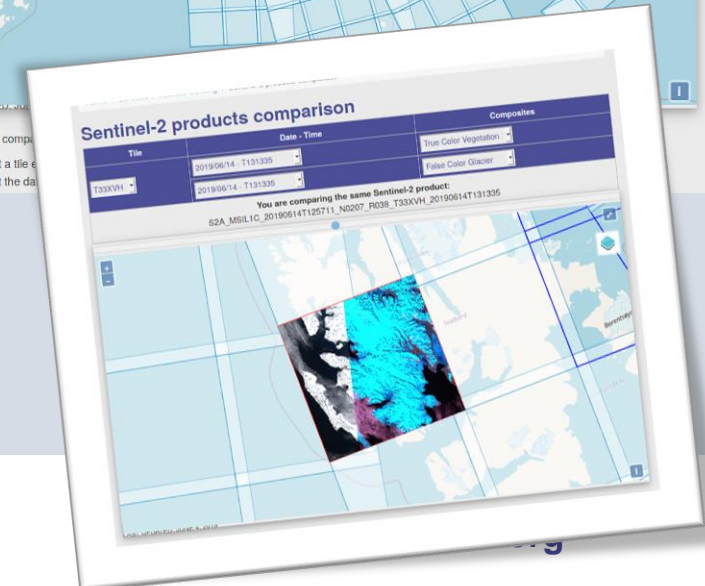
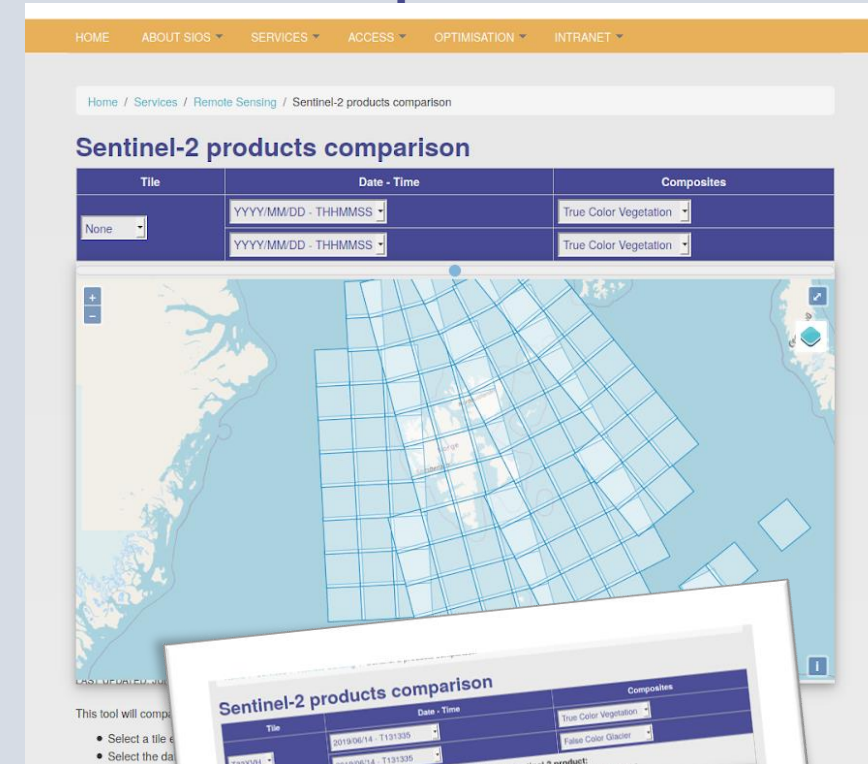
### Acquisition plans



### Sentinel mosaic

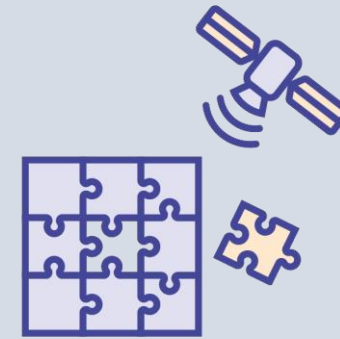
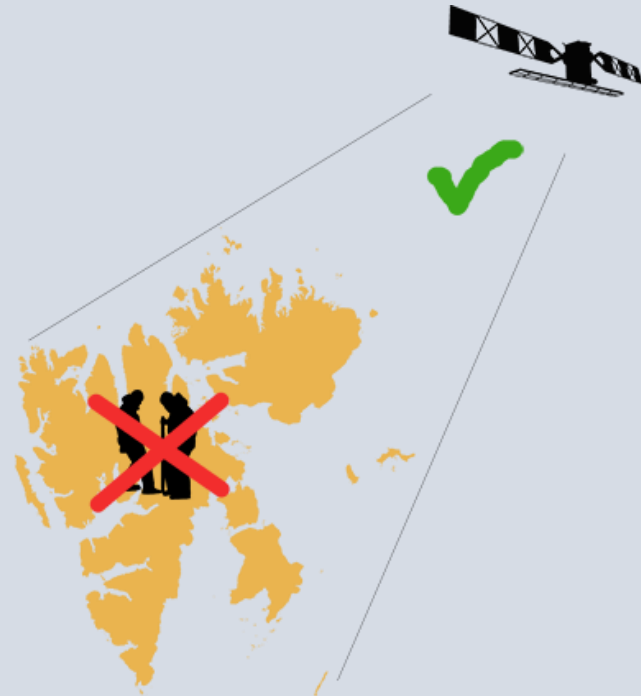


### S2 comparison tool





# Patch up your field data gaps with remote sensing



Most of our members had to cancel planned field campaigns to Svalbard since March 2020 leading to further gaps in observations.

Some of these data gaps can be filled with remote sensing observations.

Mapping the needs of researchers and evaluate the possibilities to provide remote sensing observations in the absence of field campaigns in Svalbard.



**Fill application here:** [https://sios-svalbard.org/RS\\_patches-FirstSurvey](https://sios-svalbard.org/RS_patches-FirstSurvey)

[www.sios-svalbard.org](http://www.sios-svalbard.org)

# SIOS Earth observation and Remote Sensing user requirement survey

**We need your feedback!**

This survey aims to collect information on Earth Observation and Remote Sensing based data, geospatial products, information, and training requirements by the diverse Arctic science community.



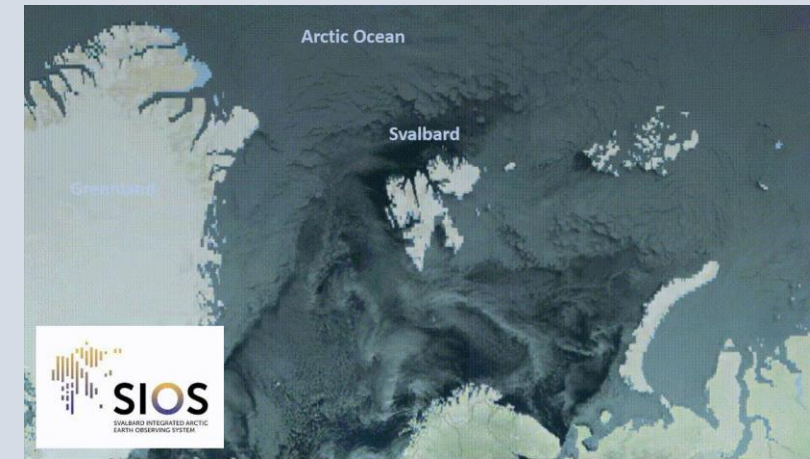
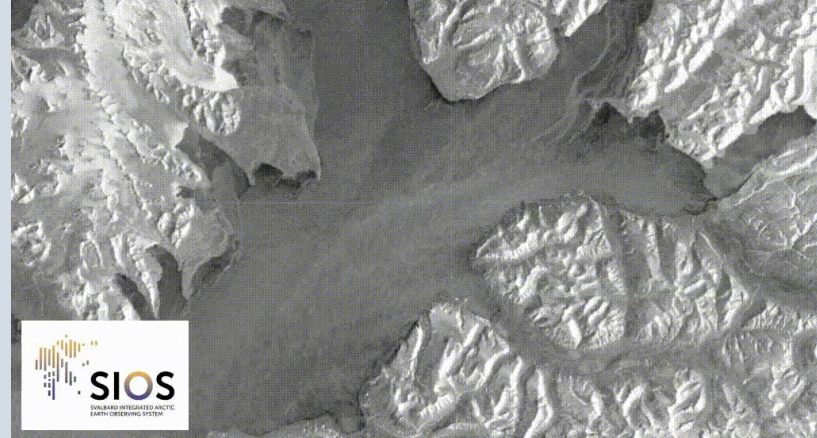
**Encourage your colleagues to respond!**



Participate here

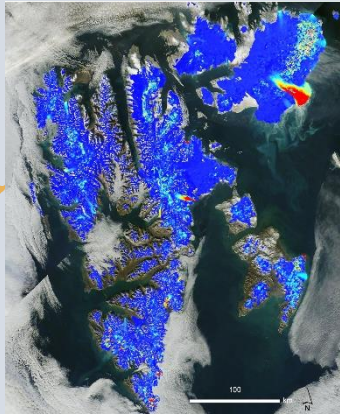


# RSWG Outreach: Image of the week!





# SIOS Special Issue



## Special Discount on Article Processing Charge (APC)

**50% discount** for manuscripts

○ from SIOS activities, e.g. [InfraNor](#), [SESS report](#), and [SIOS Access Projects](#).

19 submissions

14 published

05 rejected

Hard deadline: 30<sup>th</sup> June 2022



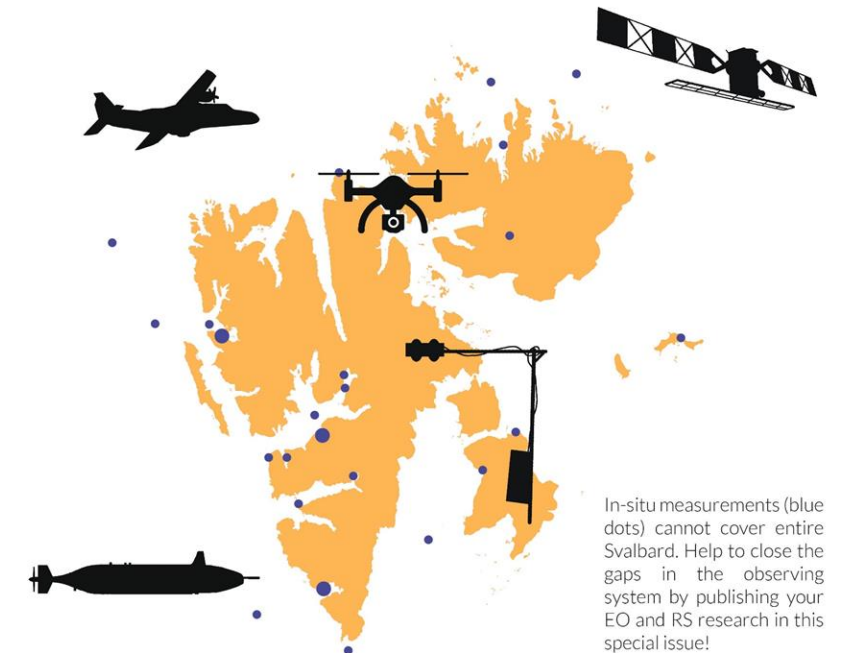
remote sensing



SIOS's special issue on  
Earth Observation (EO), Remote Sensing (RS) and Geoinformation (GI)  
applications in Svalbard

Open for submission!  
1 March 2020 - 31 December 2021

Up to 50% discount for  
SIOS related manuscripts!



Check our website for details:  
[www.sios-svalbard.org/SpecialIssueRemoteSensing](http://www.sios-svalbard.org/SpecialIssueRemoteSensing)





# First ECR observer in the SIOS working group



University of  
St Andrews

**William D. Harcourt**



@will\_harcourt



[www.williamharcourt.co.uk](http://www.williamharcourt.co.uk)

## Funders



Engineering and  
Physical Sciences  
Research Council



Geological Alliance for Geoscience, Environment and Society



**ECR Observer to  
the Remote  
Sensing Working  
Group (RSWG) of  
SIOS**

Develop a unified platform  
for satellite data availability  
across Svalbard

Encouraging the  
participation of ECRs in  
SIOS activities

Meet the Early Career  
researchers active in



**PhD Student,  
University of  
St Andrews**

“The application of  
millimetre-wave radar to the  
study of the cryosphere”

**SIOS Access  
Project**

Radar Monitoring of  
Calving at Hansbreen  
(RaMoCH)



www.sios-study.org

# Second ECR observer in the SIOS working group



**Sara Aparício**



@\_SaraAparicio\_



saraaparicio/

**ECR Observer to  
the Remote  
Sensing Working  
Group (RSWG) of  
SIOS**

Support to outreach  
activities of SIOS  
Support to course  
development

**Earth observation  
data scientist,  
Solenix for ESA**

Support ESA on EO and AI-  
related activities

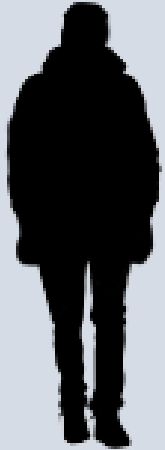
**PhD Student,  
NOVA University**

“Multi sensor and AI-based  
approach to sea ice climate  
change retrievals”

Meet the Early Career  
researchers active in



# You can be the next ECR observer in the SIOS working group



**ECR Observer to  
the Remote  
Sensing Working  
Group (RSWG) of  
SIOS**



# Upcoming activities

- Unified platform for satellite data availability for Svalbard
- EO and RS researcher's forum to facilitate dialogue and collaboration between field scientists and remote sensing experts
- Citizen science project model for supporting satellite Cal/Val activities
- RSWG surveys on user requirements, product inventory and citizen science project



# Opportunities for Svalbard researchers

- Annual RS Training course
- Annual RS ECR observer
- Use of Dornier and drones: regular calls and data
- SIOS RS tools: open to use for everyone
- SIOS Online conference: ECR awards
- SIOS webinar series: welcome to participate
- Patch up your field data with RS

**An international partnership of researchers studying the environment and climate in and around Svalbard to**

- Develop an efficient observing system
- Share technology, experience and data
- Close knowledge gaps
- Decrease the environmental footprint of science