SWISS POLAR INSTITUTE

Open Forum

Part 1

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Bastien Ruols

University of Lausanne

UNIL | Université de Lausanne
SWISS POLAR INSTITUTE
FNSNF Swiss National Science Foundation

Bastien RUOLS et al.

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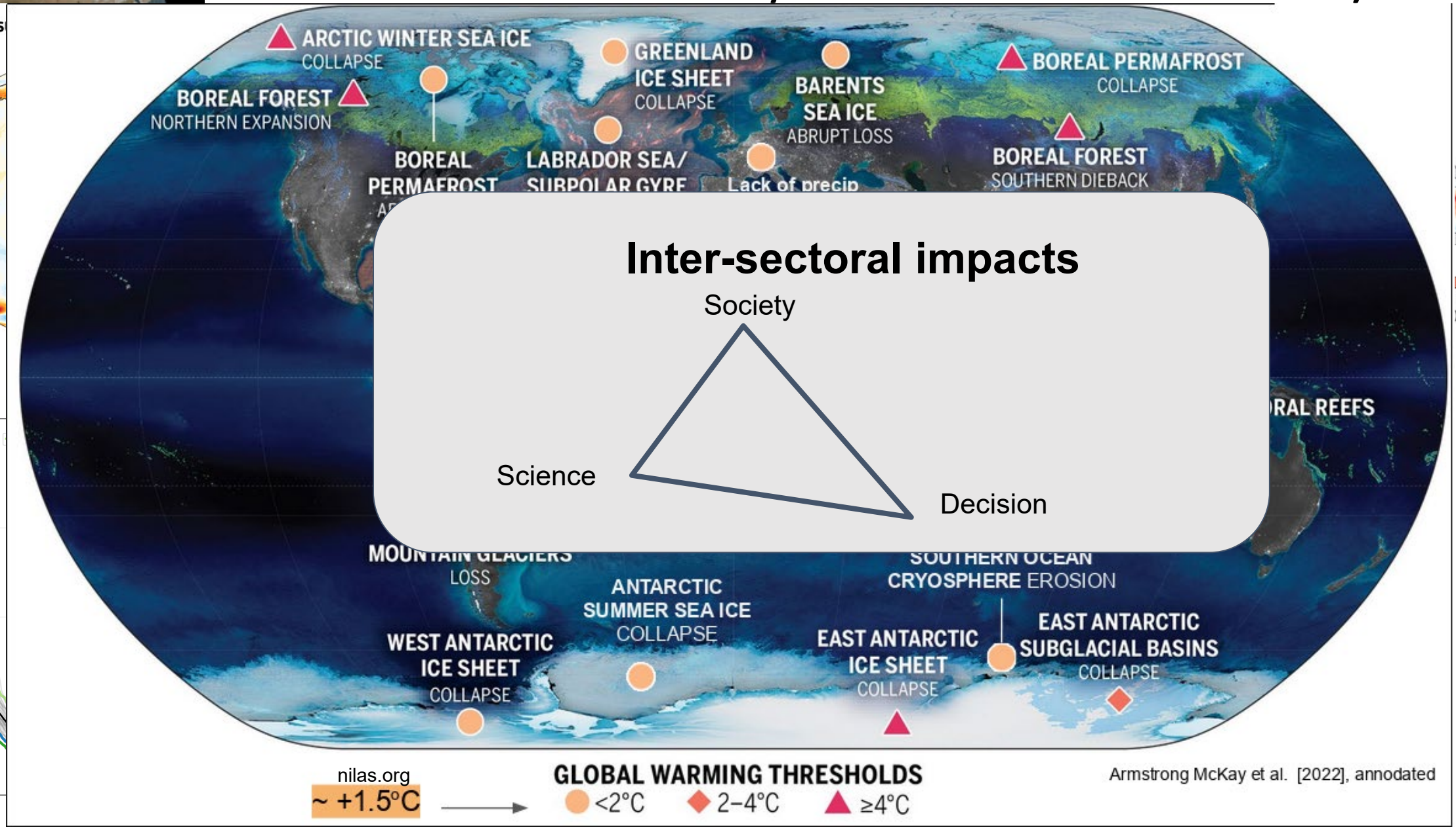
Petra Heil

University of Tasmania, visitor SLF/WSL

Petra Heil

Antarctica in the Earth System & Science to Society



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Stephane Aebischer

Forel Heritage Association

THE FOREL HERITAGE PROJECT

FOREL
RESEARCH PLATFORM

PROJECT GOALS

- Offer **Switzerland** and the **international community** a unique **oceanographic motor yacht** dedicated to **polar** and **sub-polar** research.
- Focus on **coastal** oceanographic research.
- **Train** young **sailors** and **scientists** to the challenges of the polar regions.

FOREL

SHIP CHARACTERISTICS

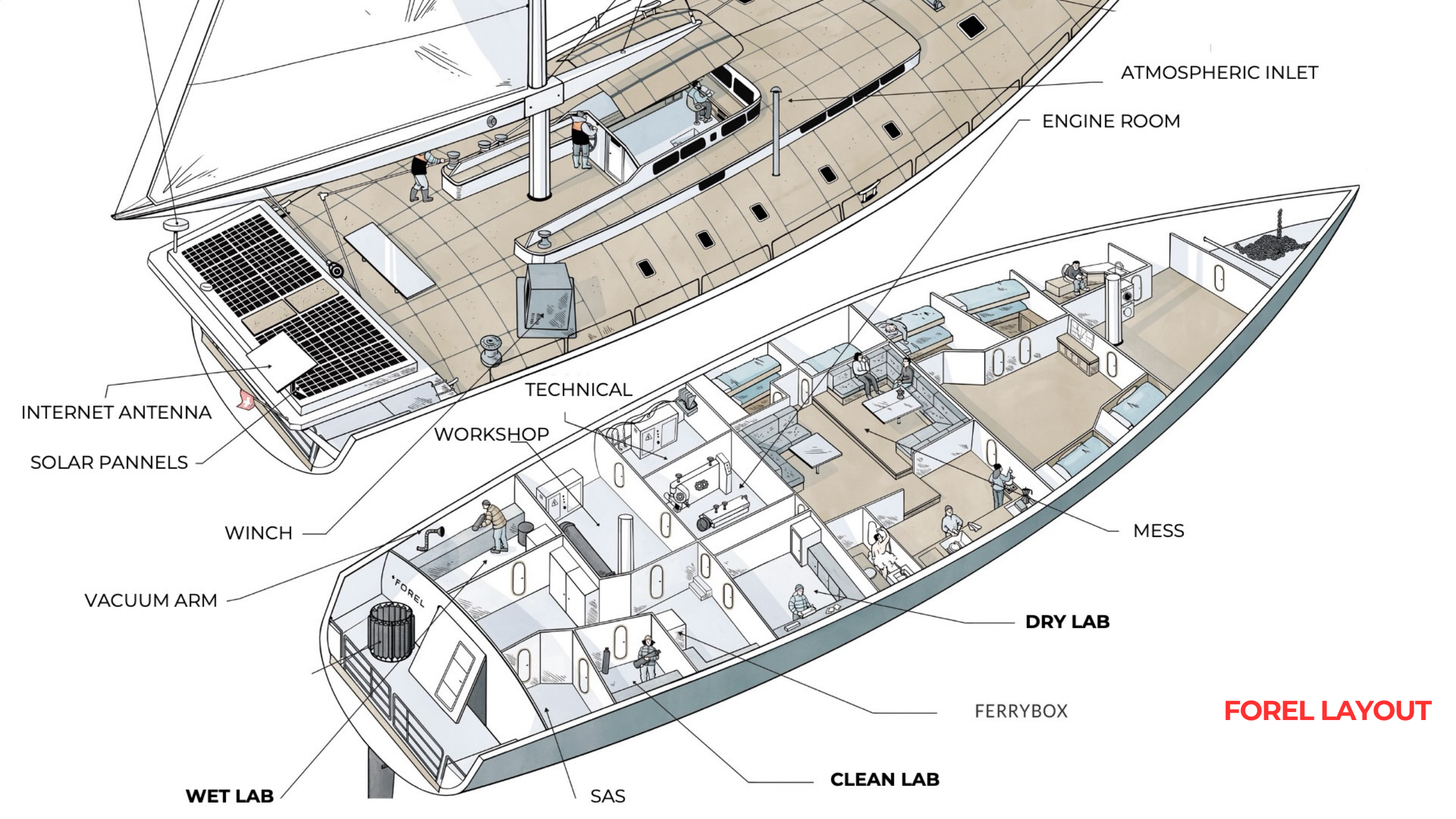
- Owner: Forel Heritage Association
- Flag: Switzerland
- Length: 28,6 m
- Width: 8,5 m
- Draught: 1.50 – 3.50 m
- Masts: 2x Aerorigs
- Propulsion: 2 x 400 HP
- Fuel tanks: 30’000 lit
- Berths: 12
- Hull: Aluminum

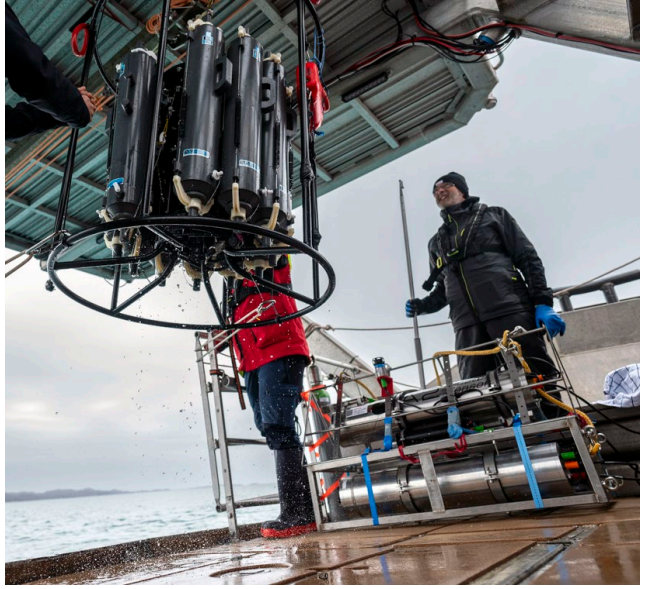
FOREL EQUIPMENT

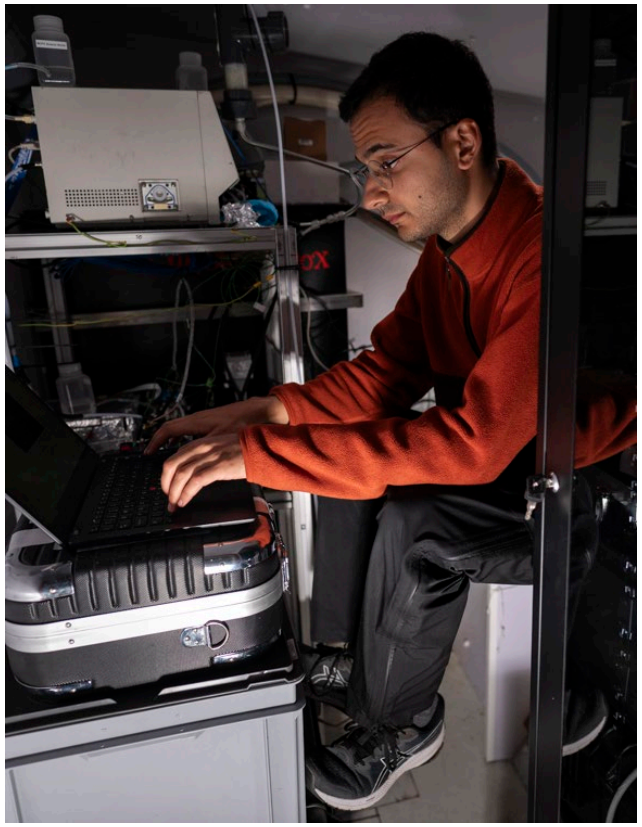
- Laboratories (clean, wet & dry), winch, etc.

SCIENTIFIC EQUIPMENT

- CTD, Rosette, Ferrybox, weather station, MQ, Filtration hoods, etc.


ATMOSPHERIC INLET
ENGINE ROOM
INTERNET ANTENNA
SOLAR PANNELS
TECHNICAL
WORKSHOP
WINCH
MESS
VACUUM ARM
DRY LAB
FERRYBOX
CLEAN LAB
WET LAB
SAS
FOREL LAYOUT





GREENFJORD 2024

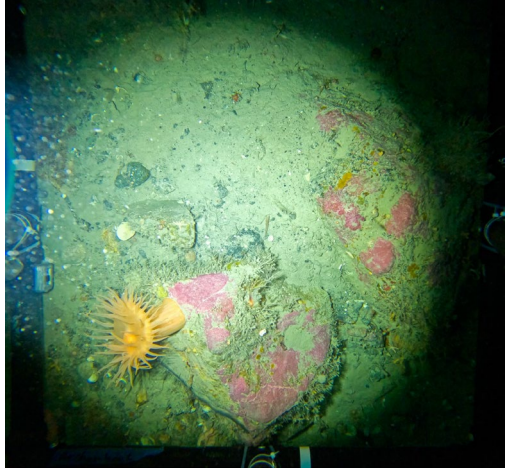
- 8 days expedition, Sermilik Fjord (GreenLand)

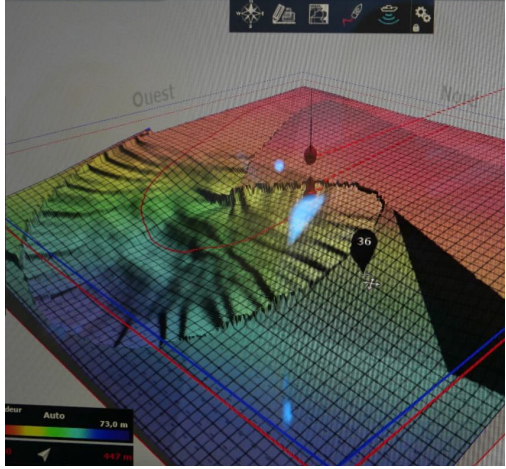
3 clusters on board FOREL

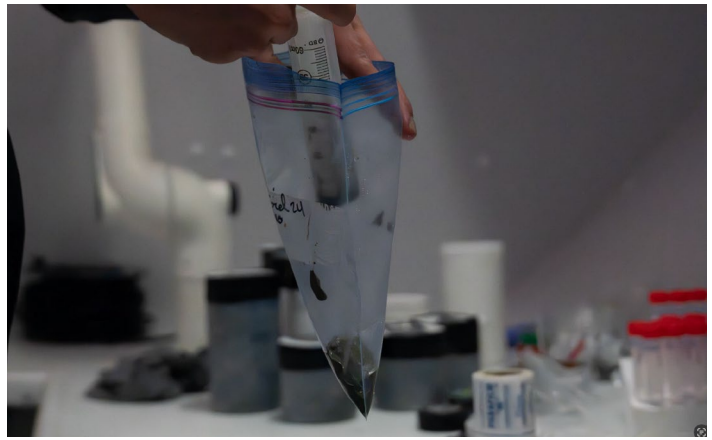
- Atmosphere (ponctual & autonomous sampling)
  - *PI: Julia Schmale*
- Biodiversity (plankton net & Rosette)
  - *PI: Loïc Pellissier*
- Ocean (Ferrybox, CTD, Rosette, subocean & peristaltic pump)
  - *PI: Samuel Jaccard & Jérôme Chappellaz*

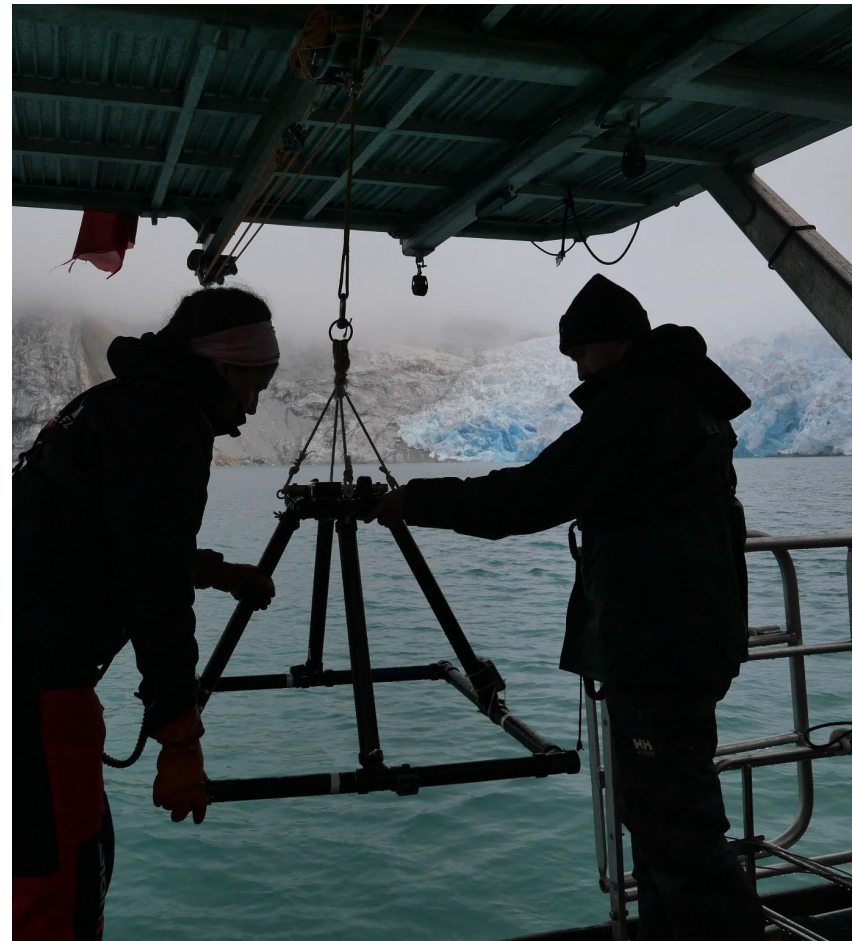
BENTHOS 2024

- 20 days expedition, SW Greenland
- *PI: P. Archambault, Ulaval, Canada*
- Marine vs. land terminated fjord (4 fjords)
  - Van Veen grab
  - Agassiz net
  - Dropcam
  - CTD / Rosette
  - FerryBox
- <u>Goal</u>:
  - Survey of benthic communities
  - Trophic web (C, N isotopes, lipids)

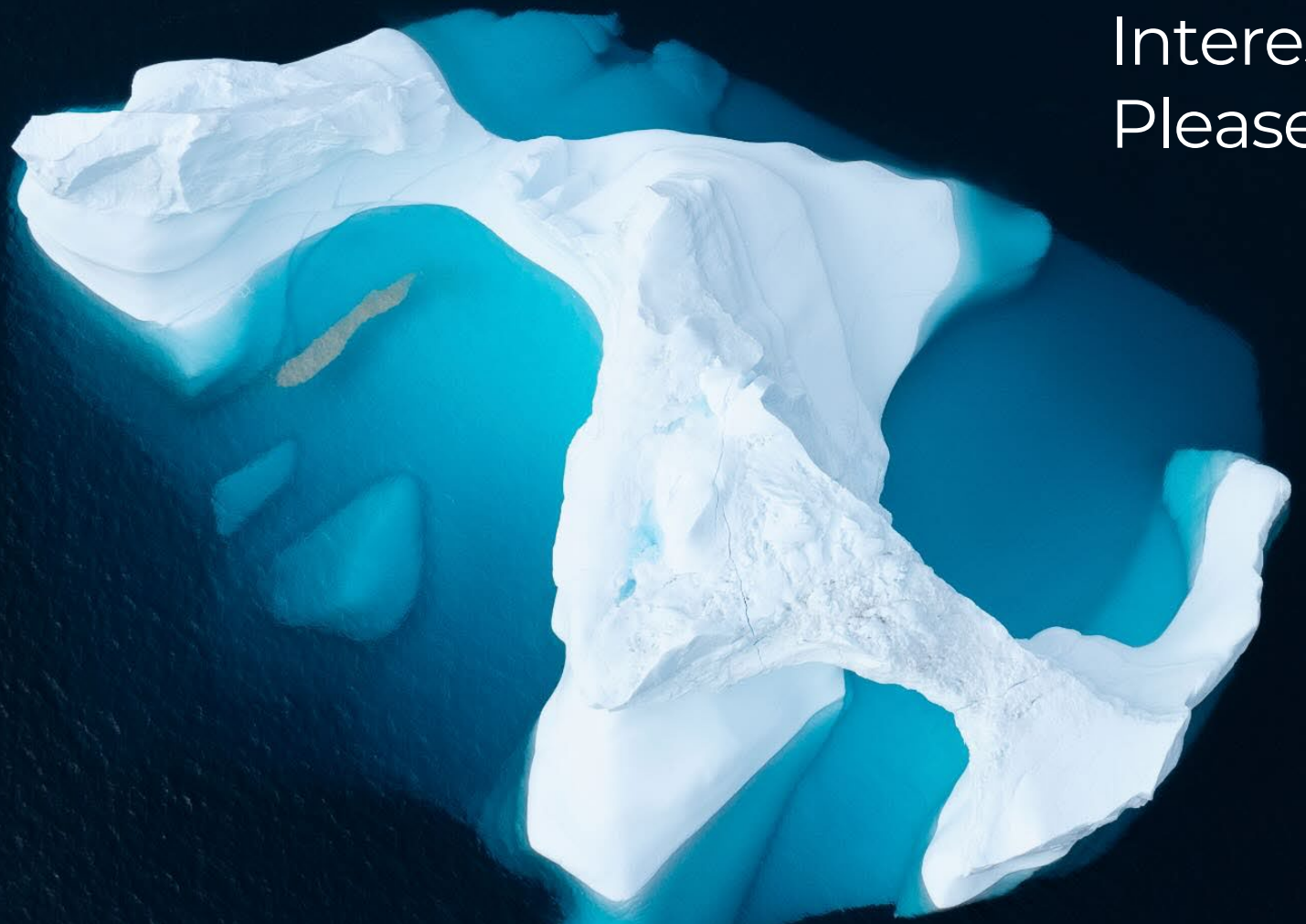








EXPEDITIONS 2025-2026



Interested to collaborate ?
Please contact us

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contact@forel-heritage.org

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Geunwoo Lee

University of Bern

Elemental analysis of Antarctic ice cores

Geunwoo Lee
University of Bern

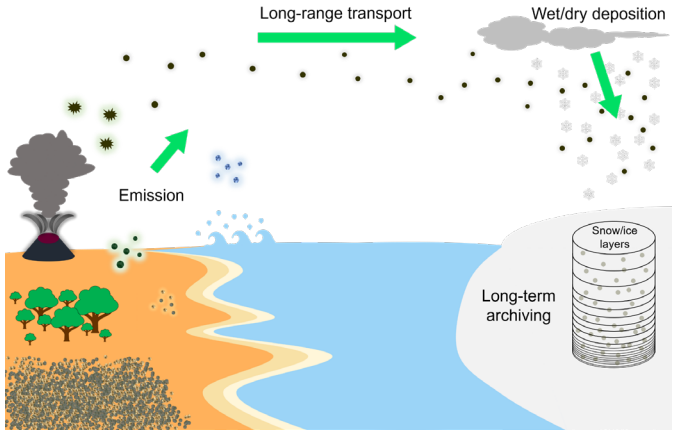


Fig. 1. Aerosols archiving in ice

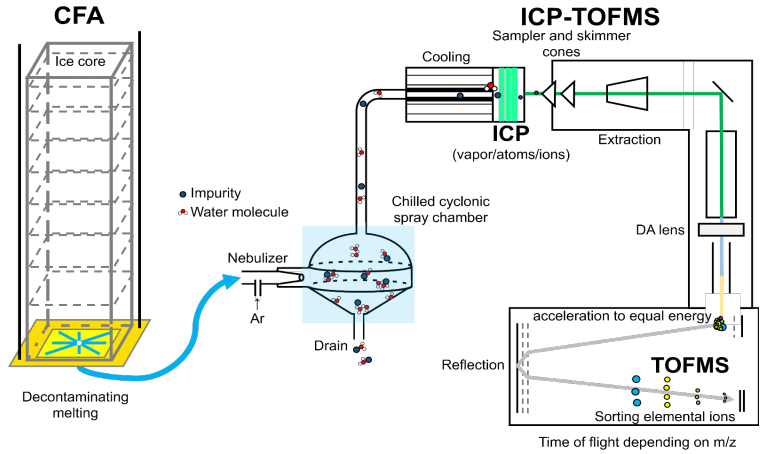
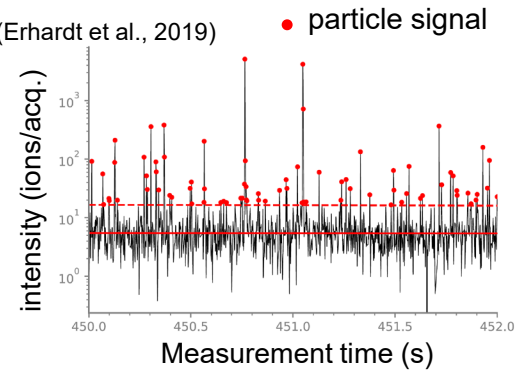
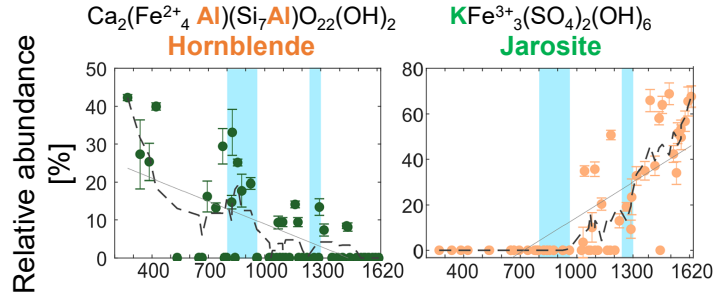


Fig. 2. Continuous elemental analysis



Particulate and dissolved elements

Large mass range
^{23}Na – ^{238}U



(Baccolo et al., 2021)

Antarctic Ice Core Sample

- Long (2~3km)
- Continuous high resolution
- High contamination risk

Continuous Flow Analysis (CFA)

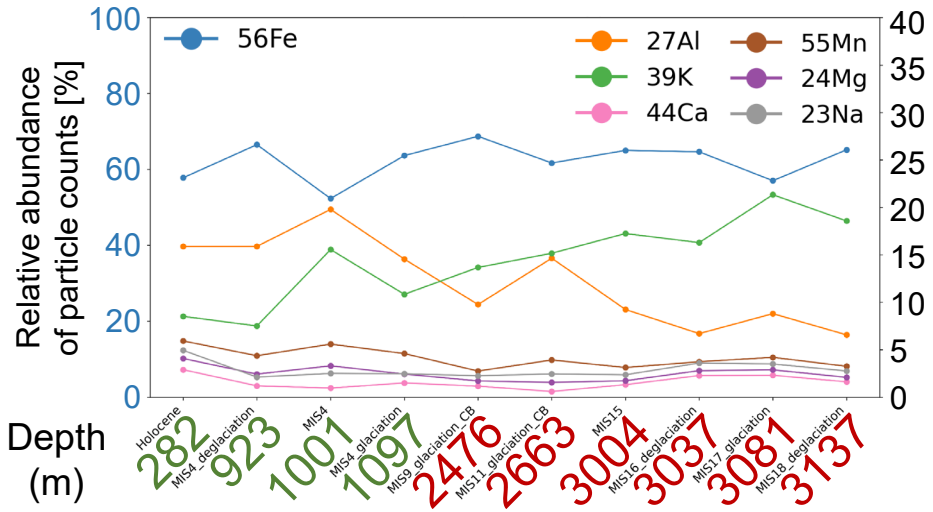


Fig. 3. Relative abundance of elemental particles

Next step

Source identification of mineral dust using elemental information

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Grace Marsh

EPFL

SOIL MICROBIAL DYNAMICS AND GREENHOUSE GAS EXCHANGE IN GREENLANDIC GLACIAL OUTWASH PLAINS

GRACE MARSH, PHD
MACE, IIE, EPFL

SWISS POLAR INSTITUTE

ECO-PLAINS

MACE Microbiome Adaptation to the Changing Environment

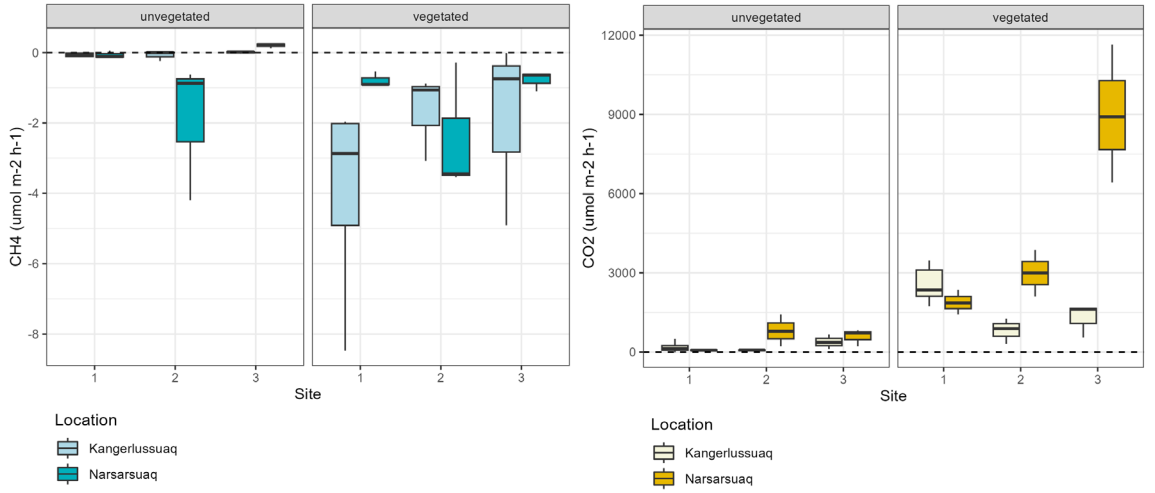

Figure 1. CH_4 and CO_2 soil gas flux from Narsarsuaq and Kangerlussuaq glacial outwash plains, sites from the glacier terminus (1) to the fjord (3).

Glacial retreat driving outwash plain development

- Microbial colonisation and activity contribute to soil development
- Unknown effects of microbial activity and succession on soil greenhouse gas (GHG) production/uptake in these developing environments.

Soil uptake and production of GHGs

- Soil CH_4 flux of ~ 0.21 to -4.05 µmol m^{-2} h^{-1}
- Soil CO_2 emissions of ~ 61.11 to 8995.67 µmol m^{-2} h^{-1}

Microbial dynamics in developing soil

- Microbial community structure via 16S rRNA analysis.
- Metagenomic analysis of microbial functional potential relating to microbially mediated CH_4 uptake and CO_2 production.

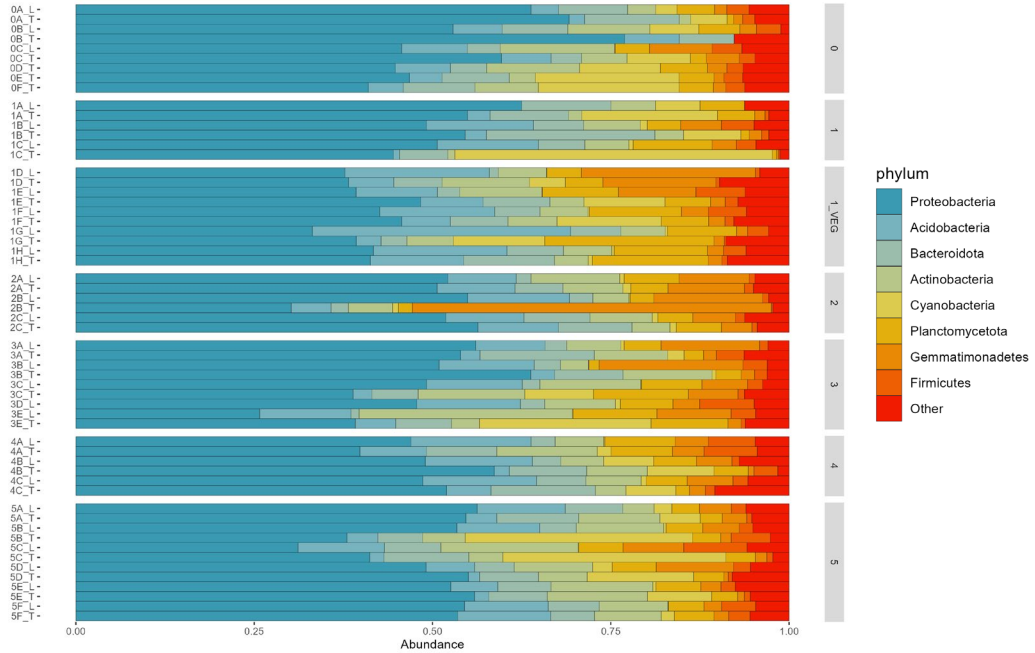

Figure 2. Bacterial phyla composition of Narsarsuaq glacial outwash plain soil via 16S rRNA analysis.

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Sara Rohr

University of Bern

PhD-Project: Performing Inuit Sovereignty through Katajjaniq / Katajjaq (Working Title)

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Schweizerischer Nationalfonds

Research Topics

- Sonic Colonialities and/or Listening Positionalities
- Recontextualization
- Intercultural Exchange of Knowledge and Music

Video *Qimmiruluapik* [Le vilain petit chien]. Interprètes : Becky Mearns et Kendra Tagoona, Ottawa, 16 décembre 2009 (49 s, 59 s, 1 min 22 s)

Archives Sonores Inuit

- 62 Recordings of Inuit Songs
- Anthropologist Jean Gabus (1908-1992)
- Swiss Arctic Expedition 1938-1939 to Arviat (Nunavut)
- Musée d'ethnographie Neuchâtel.

Photo from the collection Jean Gabus, Musée d'ethnographie, Neuchâtel

Research stay in Arviat

Goal:	Translation of Songs & Feedback Community
Date:	Ideally in 2025 Alternative in 2026
Next Step:	Nunavut Research Licence

https://www.maptrove.ca/info/where/canada/arviat

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PAMIR

SPI Flagship Initiative

Martin Hoelzle

SPI Flagship 2024: Project PAMIR

CL6: History of Glacier Science

- Recovery of a list Russian pinoeer's memoirs and a journal of visit to the Pamir range

CL5: Cryospheric. Hazards

- High resolution DEMs created under PAMIR to reconstruct and understand the landscape impacts of catastrophic glacier detachments in the Petra Pervogo range
- Observations and interpretations of glacier outburst flood occurrence and mechanisms in Rasht

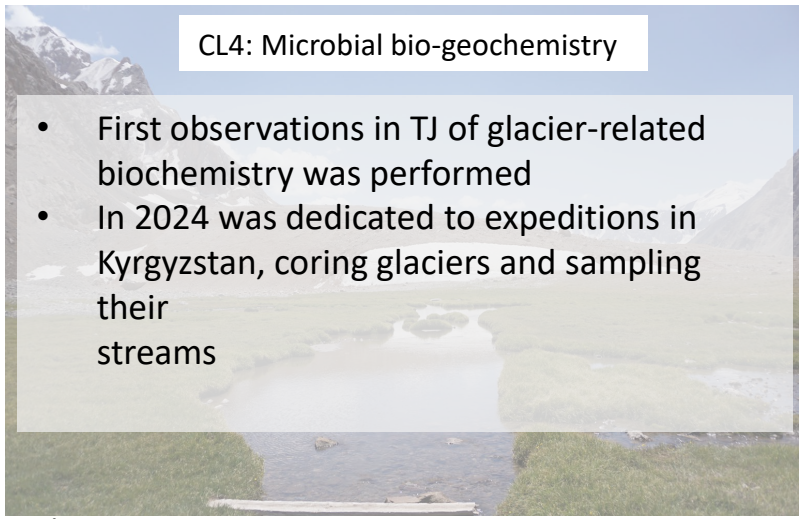
CL1: Climate and Environmental History

- Still no access via helicopter to Fedchenko, maybe 2025
- Glaciological measurements on Kon-Chukurbashi glacier as replacement for Fedchenko glacier
- Possible measurements in 2025 by a Japanese group
- Cosmogenic exposure datings for Koksu valley, around Kyzyl-Suu, Yakarcha and Zulmart glaciers and around Karakul Lake

General Flagship PAMIR:

- Publication of a children's book related to climate and cryosphere
- Large success by fully gender balanced field work
  activities. Additionally also Adventure of Science for female students took place.
- Exchange of students of CA

CL4: Microbial bio-geochemistry



- First observations in TJ of glacier-related biochemistry was performed
- In 2024 was dedicated to expeditions in Kyrgyzstan, coring glaciers and sampling their
  streams

CL2: Mountain Permafrost

- Installation permafrost borehole Eastern Pamir
- 40 geophysical profiles were established
- First steps to permafrost distribution maps in coordination with SDSC were discussed and are currently implemented
- New network of GST loggers in Ishkashim region

CL3: Glaciers, Snow and Hydrology

- Since the 1970s three pulsations at Abramov glacier could be verified
- Snowmapper tool established
- Mass balance of all PAMIR glacier will be establisehd based on in situ data, Pléiades and other satellite data
- GPR measurements on 9 MB glaciers for ice thicknesses
- Several studies about hydrometeorological processes and the water balance

Credits Pictures: Heidi Roop/Sven Fuchs/Matthieux Tordeur/Tamara Mathys

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GreenFjord

SPI Flagship Initiative

Lisa Bröder

Greenlandic Fjord ecosystems in a changing climate: Socio-cultural and environmental interactions

Prof. Julia Schmale
PI
EPFL

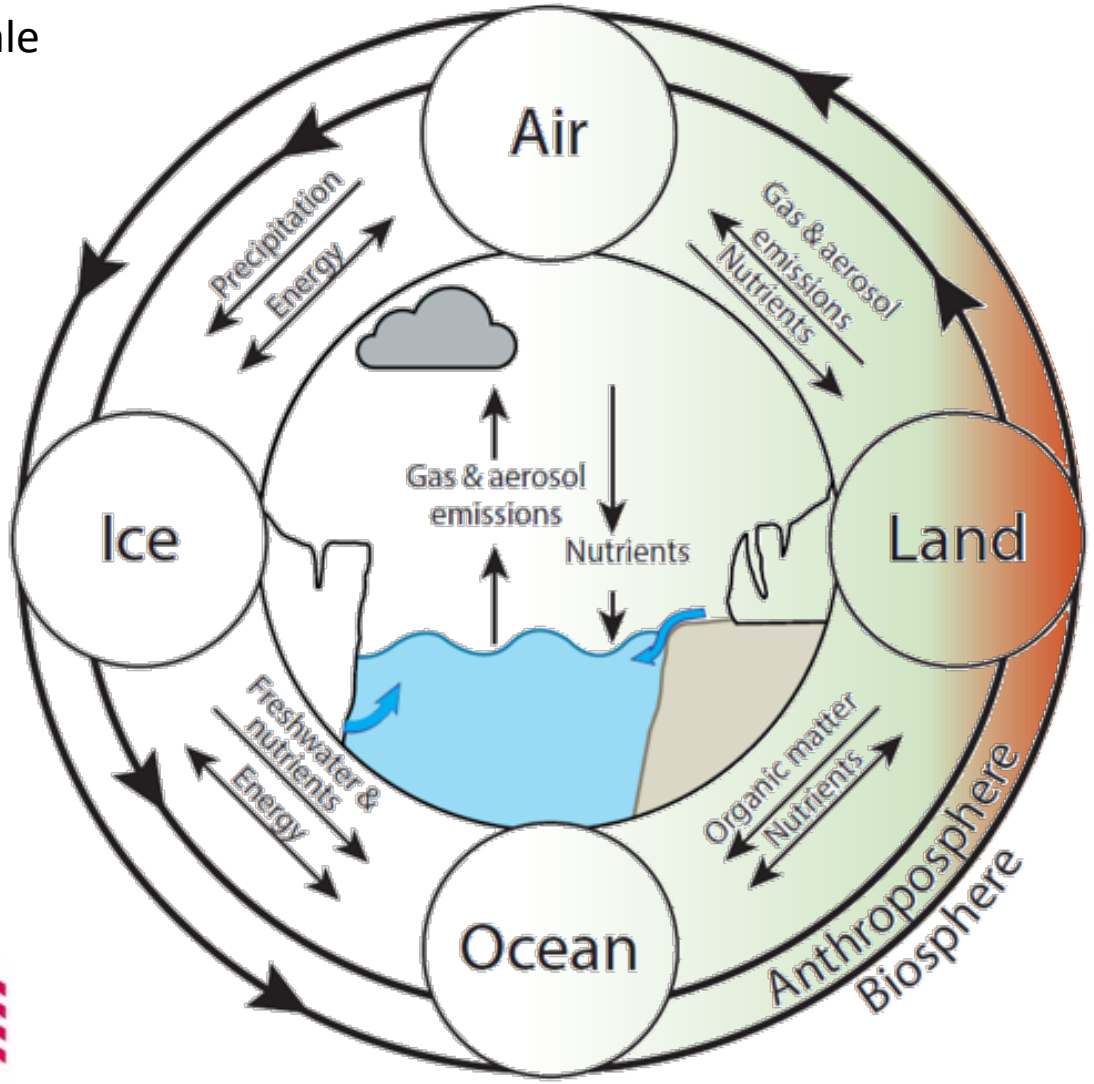
ATMOSPHERE

Prof. Andreas Vieli
co-I
UZH

CRYOSPHERE

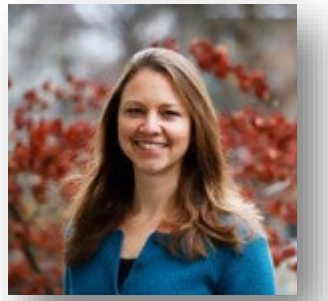
Prof. Samuel Jaccard
co-I
UNIL

OCEAN



Prof. Laine Chanteloup
co-I
UNIL

HUMAN



Dr. Lisa Bröder
co-I
ETHZ

LAND

Prof. Kristy Deiner & Prof. Loïc Pellisier
co-I
ETHZ,
ETHZ / WSL

BIODIVERSITY

Cryosphere-Cluster Update

GREEN FJORD

Successful but challenging field-campaign 2024:

- Continuous high-res. record of calving from 6 independent sensors
- Co-detection reveals complex glacier-ocean interaction
- Lots more to analyse….!

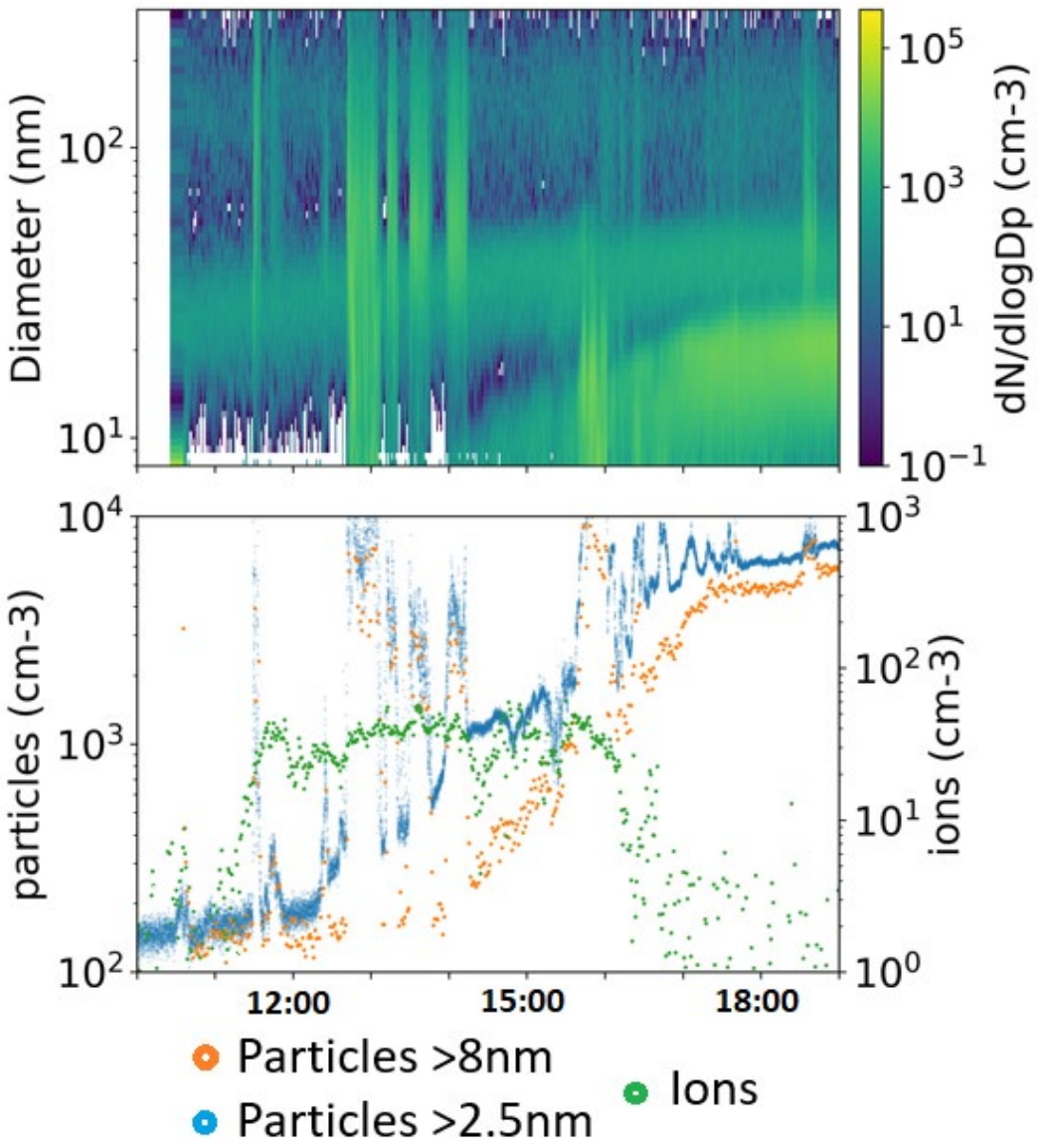
Photo: A. Vieli, July 2024

Marine-Cluster Update

Fjord with marine-terminating glacier:
much more productive conditions
(both for phyto- and zooplankton)

Fjord with land-terminating glacier remained very stratified

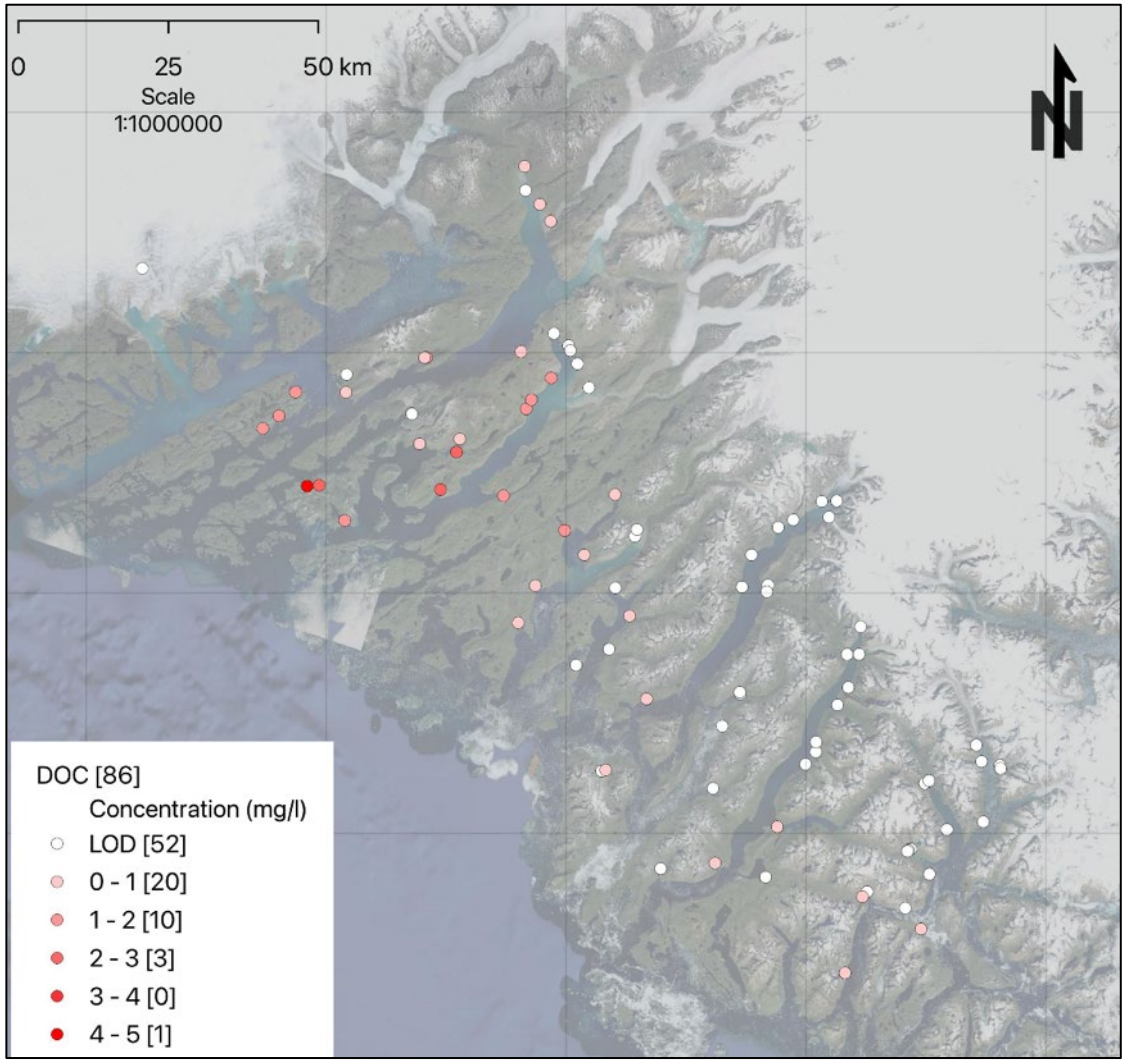
Atmosphere-Cluster Update



Observations from Sermelik Fjord (marine-terminating glacier)

- Atmospheric new particle formation observed intensely on sunny days (similar to 2023)
- Instruments with lower size range to investigate local particle formation in the fjords
- Distinct differences between Sermelik and Igaliku Fjords suggest changing fjord dynamics may affect atmospheric nucleation

Land-Cluster Update



No dedicated field campaign in 2024

Focus on lab work and data analysis:

- River and stream samples analysed for water sources, carbon, nutrient and metal concentrations, composition and sources
- Collaboration with Swiss Data Science Center for catchment classifications and properties
- Basic analyses for soil and sediment samples in progress

Biodiversity-Cluster Update

Marine campaign:

- Deep-eDNA pump deployment from the R/V *Forel*, to filter water in-situ at ~600m water depth and (after lab processing) characterize the biodiversity in ice- vs. non-ice fed fjords

Genetic analyses:

- All previous years' samples from air, freshwater and soil (~140 samples) have been analysed for four markers: 18S (eukaryotes), 16S (bacteria), COI (animals) and ITS (plants)

Photo: V. Marques

Human-Cluster Update

- Investigate the Youth's perception of climate change and livelihoods within the fjords: school workshop and youth interviews
- Field trip with a youth and an elder with the *Adolf Jensen* boat to Eqalorutsit Kangilliit Sermia (marine-terminating glacier) front
- Community outreach: Giving back – the book from the photo contest

Maren with a glacial facemask onboard the *Adolf Jensen*

Book Cover of the Photo contest

Youth and elder onboard the *Adolf Jensen* in Sermelik Fjord