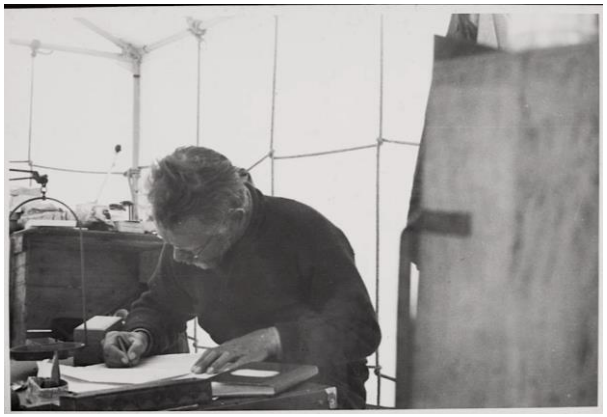


Synoptic Arctic Survey

«I am best suited to work with systematic observations and to make some sense of them.»
H. U. Sverdrup [quotation from Munk, 2000]

Celebrating the first Synoptic Arctic Survey

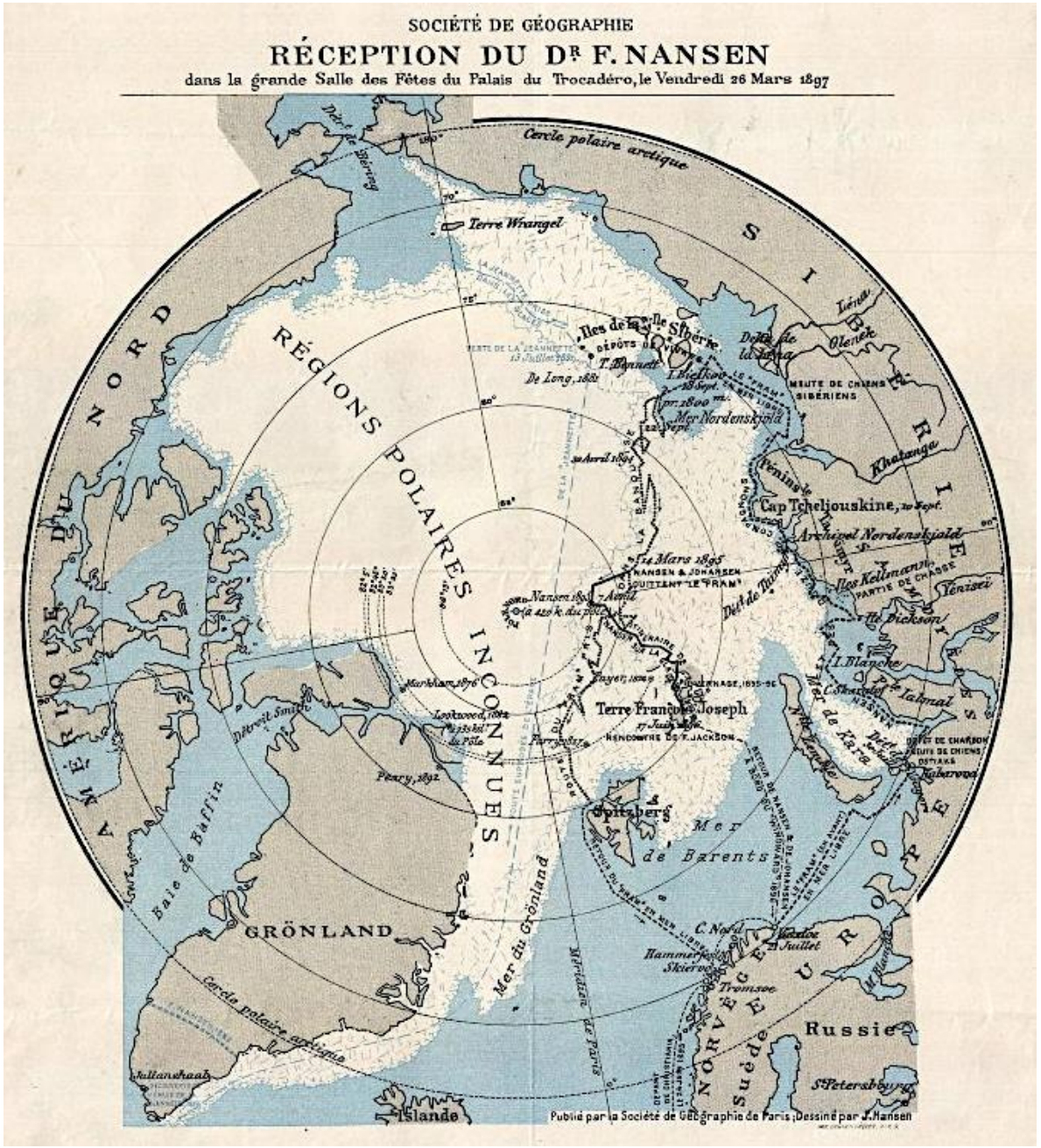
Øyvind Paasche – Chair of the SAS Scientific Steering Committee
SVP & Senior Scientist |NORCE
Bjerknes Centre for Climate Research

Woods Hole 7. June 2023 – WHOI.

Synoptic Arctic Survey

Motiavtions for SAS→2030

- SAS accomplishments
- Scientific progress
- Tipping Points
- Synergies ICARP/IPY 2032-33
- Aspiring polar scientists*
- New infrastructure*



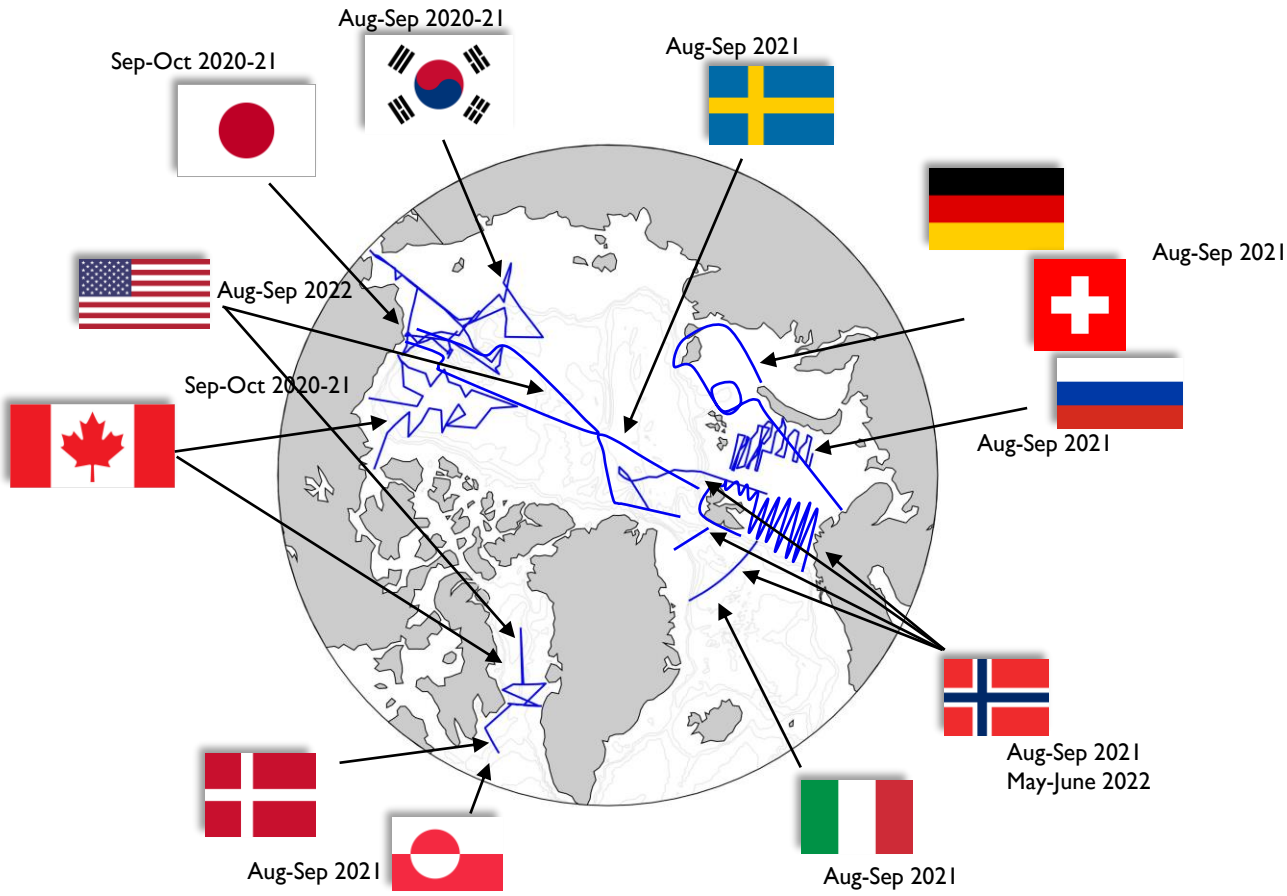
Synoptic Arctic Survey

Réception du Dr. F. Nansen dans la Grande Salle des Fétes du Trocadéro, le Vendredi 26 Mars 1897. Paris: Sociéte de Géographie, 1897.

Synoptic Arctic Survey

SAS accomplishments

2020-2022:
15 cruises
12 nations
Data
Networks
Collaboration



- Most cruises completed, missing only US 2022

RESEARCH ARTICLE

Enhanced simulated early 21st century Arctic sea ice loss due to CMIP6 biomass burning emissions

BY PATRICIA DEREPENTIGNY, ALEXANDRA JAHN, MARIKA M. HOLLAND, JENNIFER E. KAY, JOHN FASULLO, JEAN-FRANÇOIS LAMARQUE, SIMONE TILMES, CÉCILE HANNAY, MICHAEL J. MILLS, DAVID A. BAILEY, ANDREW P. BARRETT • SCIENCE ADVANCES • VOL. 8, NO. 30 • **27 JUL 2022**

The mechanisms underlying decadal variability in Arctic sea ice remain actively debated. Here, we show that variability in boreal biomass burning (BB) emissions strongly influences simulated Arctic sea ice on multidecadal time scales. In particular, we ...

RESEARCH ARTICLE

Arctic Ocean Amplification in a warming climate in CMIP6 models

BY QI SHU, QIANG WANG, MARIUS ÅRTHUN, SHIZHU WANG, ZHENYA SONG, MIN ZHANG, FANGLI QIAO • SCIENCE ADVANCES • VOL. 8, NO. 30 • **27 JUL 2022**

Arctic near-surface air temperature warms much faster than the global average, a phenomenon known as Arctic Amplification. The change of the underlying Arctic Ocean could influence climate through its interaction with sea ice, atmosphere, and the global ...

PERSPECTIVE

Arctic wildfires at a warming threshold

BY ERIC POST, MICHELLE C. MACK • SCIENCE • VOL. 378, NO. 6619 • **03 NOV 2022** : 470-471

[The Arctic is still hot!]

REPORT

Climate change drives rapid decadal acidification in the Arctic Ocean from 1994 to 2020

BY DI QI, ZHANGXIAN OUYANG, LIQI CHEN, YINGXU WU, RUIBO LEI, BAOSHAN CHEN, RICHARD A. FEELY, LEIF G. ANDERSON, WENLI ZHONG, HONGMEI LIN, [...] WEI-JUN CAI **+9 authors** • SCIENCE VOL. 377, NO. 6614 • **29 SEP 2022** : 1544-1550

The Arctic Ocean has experienced rapid warming and sea ice loss in recent decades, becoming the first open-ocean basin to experience widespread aragonite undersaturation [saturation state of aragonite (Ω_{arag}) < 1]. However, its trend toward long-term ...

RESEARCH ARTICLE

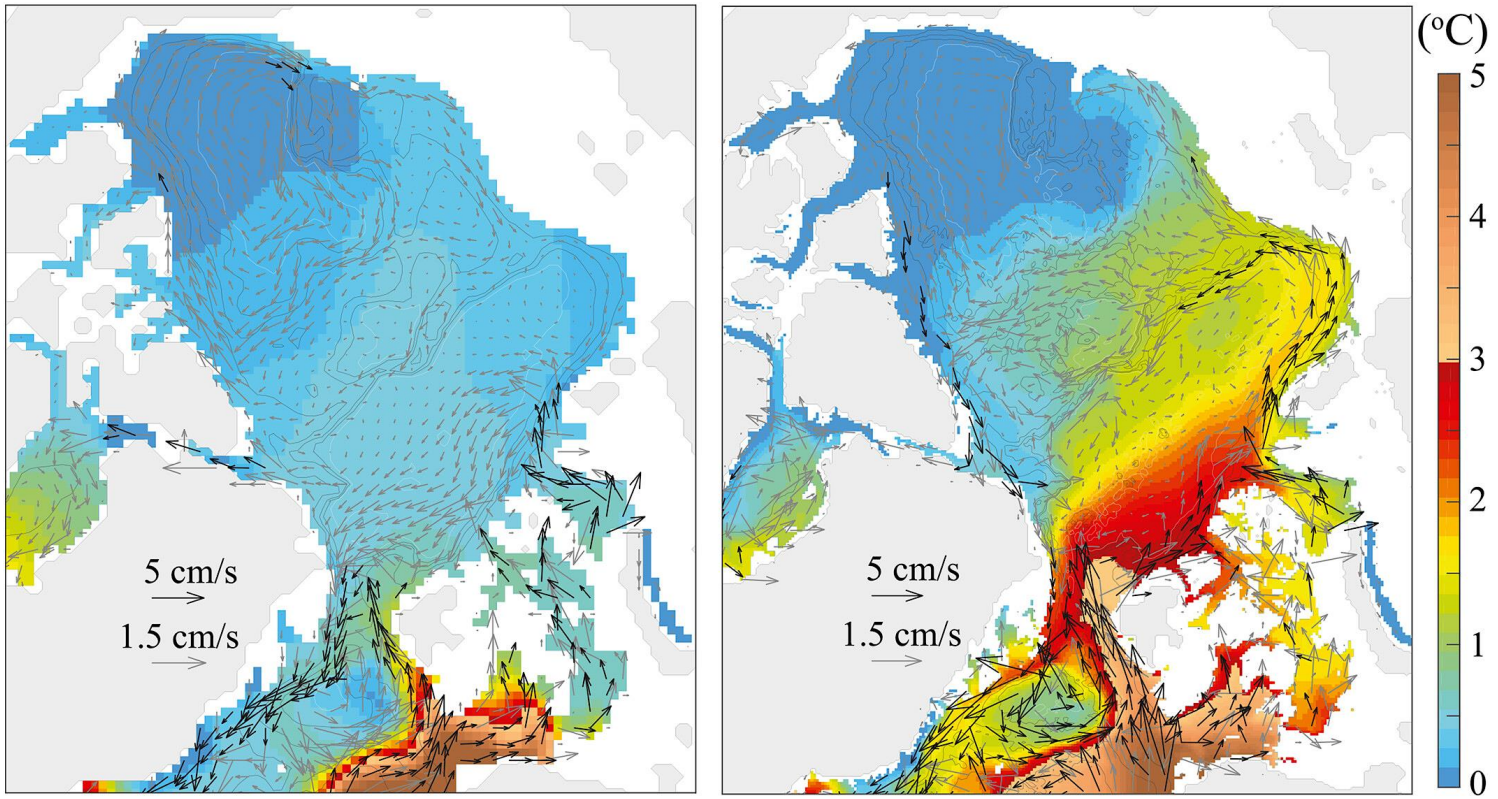
Unprecedented fire activity above the Arctic Circle linked to rising temperatures

BY ADRIÀ DESCALS, DAVID L. A. GAVEAU, ALEIXANDRE VERGER, DOUGLAS SHEIL, DAISUKE NAITO, JOSEP PEÑUELAS • SCIENCE • VOL. 378, NO. 6619 • **03 NOV 2022** : 532-537

Arctic fires can release large amounts of carbon from permafrost peatlands. Satellite observations reveal that fires burned ~4.7 million hectares in 2019 and 2020, accounting for 44% of the total burned area in the Siberian Arctic for the entire 1982–2020 ...

Scientific progress

Mean circulation in the Arctic at depth 250 m during 2002–2015



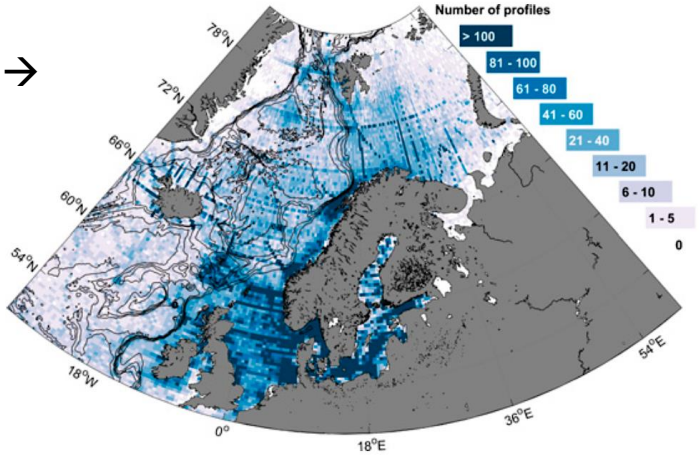
Left: ECCOv4r3 (left, averaged over 2 × 2 grids). Right: ASTE_R1 (right, averaged over 6 × 6 grids). The color scale shows temperature at the same depth from the two solutions. Vector arrows are grouped into speed ranges of [0–1.5] cm/s (gray) and [1.5–5] cm/s (black), with the vector length scales provided.

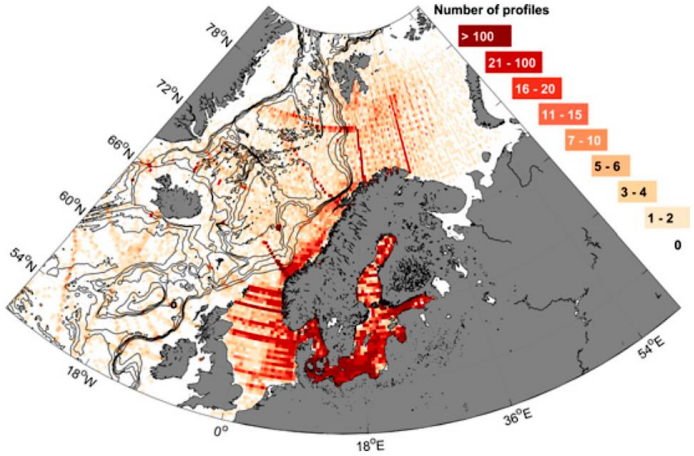
Nguyen et al., 21

Synoptic Arctic Survey

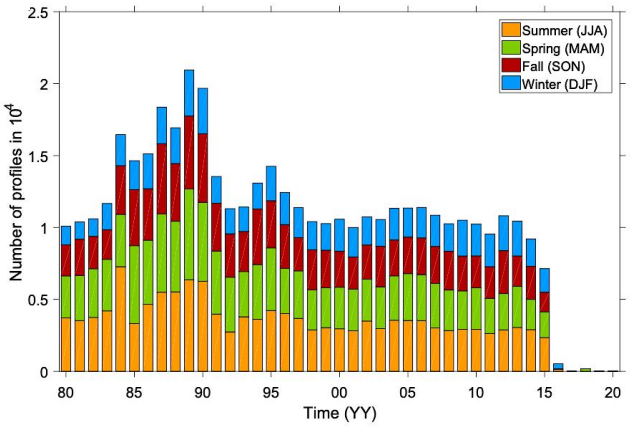
Despite progress: Arctic Ocean data gap

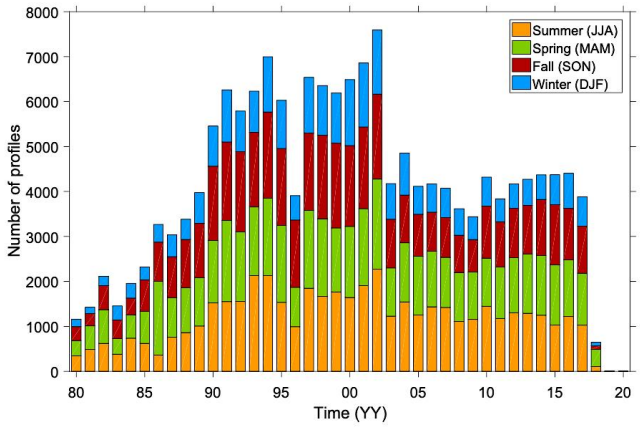
Temp. →





← Salinity



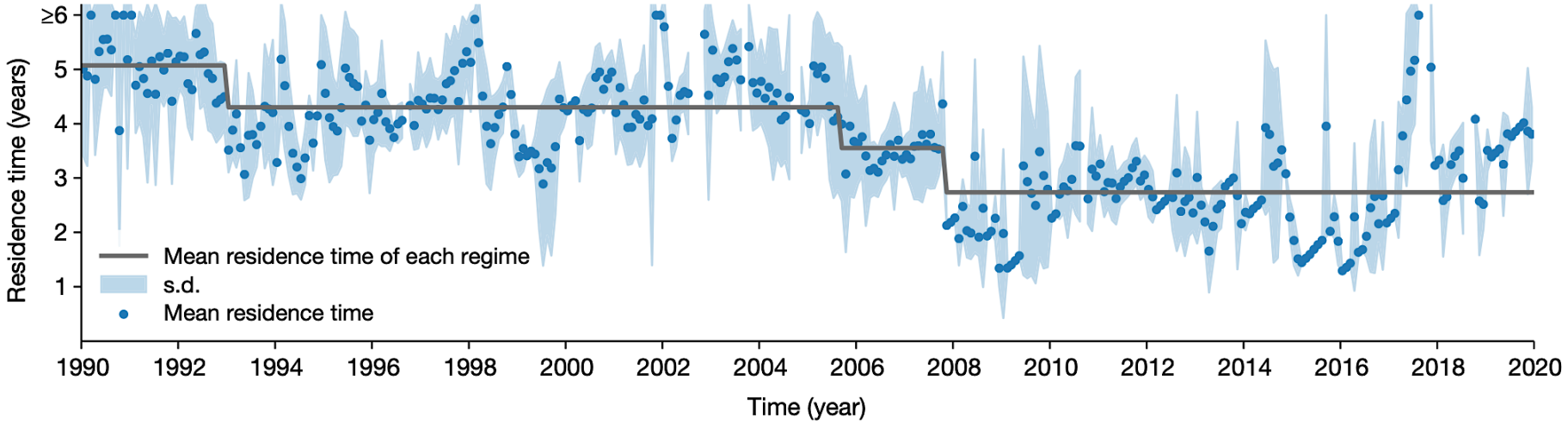


→Seasonal distribution

Stenseth et al_2020 (PNAS)

Synoptic Arctic Survey

Tipping points in the Arctic Ocean



Sumata et al., 23

WORLD METEOROLOGICAL ORGANIZATION

Synoptic Arctic Survey

Building the arctic science community

Geneva, Switzerland 2015

YOPP YEAR OF POLAR PREDICTION

MOSAiC International Arctic Drift Expedition

Synergies with international initiatives (IPY2032/3)

ICARP IV
INTERNATIONAL CONFERENCE ON ARCTIC RESEARCH PLANNING

Home About Engagement Host News Publications Past ICARPs

IASC

The 4th International Conference on Arctic Research Planning (ICARP IV) Process (2022 - 2026)

In the lead up to its 35th anniversary in 2025, the International Arctic Science Committee (IASC) is coordinating a **multi-year planning process** for the **Fourth International Conference on Arctic Research Planning (ICARP IV)** lasting from **2022 until 2026** that will engage Arctic researchers, Indigenous Peoples, policy makers, residents and stakeholders from around the world to collegially discuss the state of Arctic science, the place the Arctic occupies in global affairs and systems. ICARP IV will

- consider the **most urgent knowledge gaps** and **Arctic research priorities and needs** for the **next decade**, and
- explore avenues to **address these research needs**.

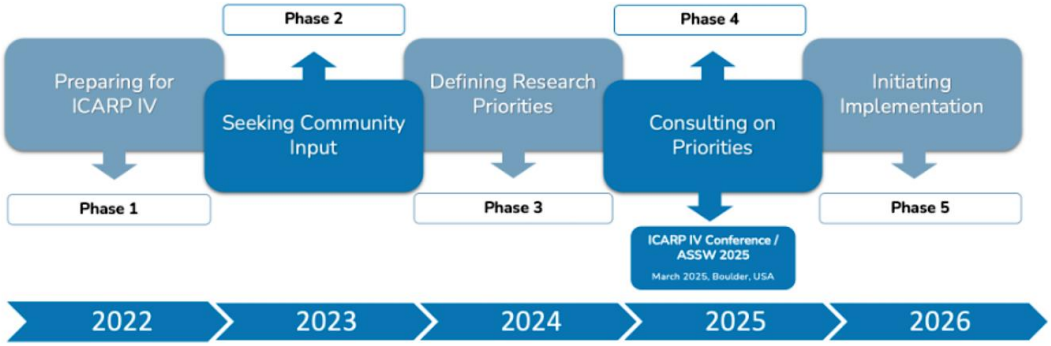
Phases of the ICARP IV Process (2022 - 2026):

Phase 1 - Preparing for ICARP IV (2022):

- ICARP IV International Steering Committee and ICARP IV Conference Host Committee formed
- ICARP IV **Engagement and Communication Plan** developed.

Phase 2 - Seeking Community Input (2023):

- Workshops, Townhall Meetings, Community Listening Sessions, Talking Circles, Webinars, Surveys, Assessments, Statements, etc.



Synoptic Arctic Survey

A string of SAS papers?

ELEMENTA
Science of the Anthropocene

Rabe, B, et al. 2022. Overview of the MOSAiC expedition: Physical oceanography. *Elem Sci Anth*, 10: 1. DOI: https://doi.org/10.1525/elementa.2021.00062

INTRODUCTION

Overview of the MOSAiC expedition: Physical oceanography

Benjamin Rabe[1,*], Céline Heuzé[2,*], Julia Regnery[1], Yevgeny Aksenov[3], Jacob Allerholt[1], Marylou Athanase[1], Youcheng Bai[4,5], Chris Basque[6], Dorothea Bauch[7], Till M. Baumann[8,9], Dake Chen[10,11,12], Sylvia T. Cole[6], Lisa Craw[13], Andrew Davies[6], Ellen Damm[14], Klaus Dethloff[14], Dmitry V. Divine[15], Francesca Doglioni[1], Falk Ebert[16], Ying-Chih Fang[1,17], Ilker Fer[8,9], Allison A. Fong[1], Rolf Gradinger[18], Mats A. Granskog[15], Rainer Graupner[1], Christian Haas[1,19], Hailun He[4,10], Yan He[20,21,22], Mario Hoppmann[1], Markus Janout[1], David Kadko[23], Torsten Kanzow[1,19], Salar Karam[2], Yusuke Kawaguchi[24], Zoe Koenig[8,9,15], Bin Kong[20,21,22], Richard A. Krishfield[6], Thomas Krumpen[1], David Kuhlmey[1], Ivan Kuznetsov[1], Musheng Lan[25], Georgi Laukert[6,26,27], Ruibo Lei[25], Tao Li[28,29], Sinhué Torres-Valdés[1], Lina Lin[20,21,22], Long Lin[4,10], Hailong Liu[12], Na Liu[20,21,22],

A major conference?

Synoptic Arctic Survey

Lessons learned and ways foreward

(1) The Arctic Beehive – numerous organizations and initiatives, still critical to work close with major international organizations like IASC and WMO etc.

- *Still tricky. Who's responsible for what? Where to store data, access data?*

(2) The Value of Baselines. 'Baselines' are incredibly important both for past datasets (for comparison), for present understanding and for future studies (and site/cruise selections).

- *Making the SAS 'baselines' are still work in progress.*

(3) Broaden the scope. Time is ripe to broaden the disciplinary scope. We started off with three thematic areas – physical oceanography, marine ecosystems and carbon cycle and acidification – now more can be included.

- *Modelling, eDNA, fish, freshwater run-off from land and ice, modelling and Argo', AUV'*

(4) Data revolution. Despite a data revolution with autonomous data measurements, empirical data will still be very very important. And many of them cannot be collected in any other way.

(5) Community. The Arctic Science Community is a friendly place where international collaboration is the true cog in the machinery. It is our responsibility to carry that tradition on.

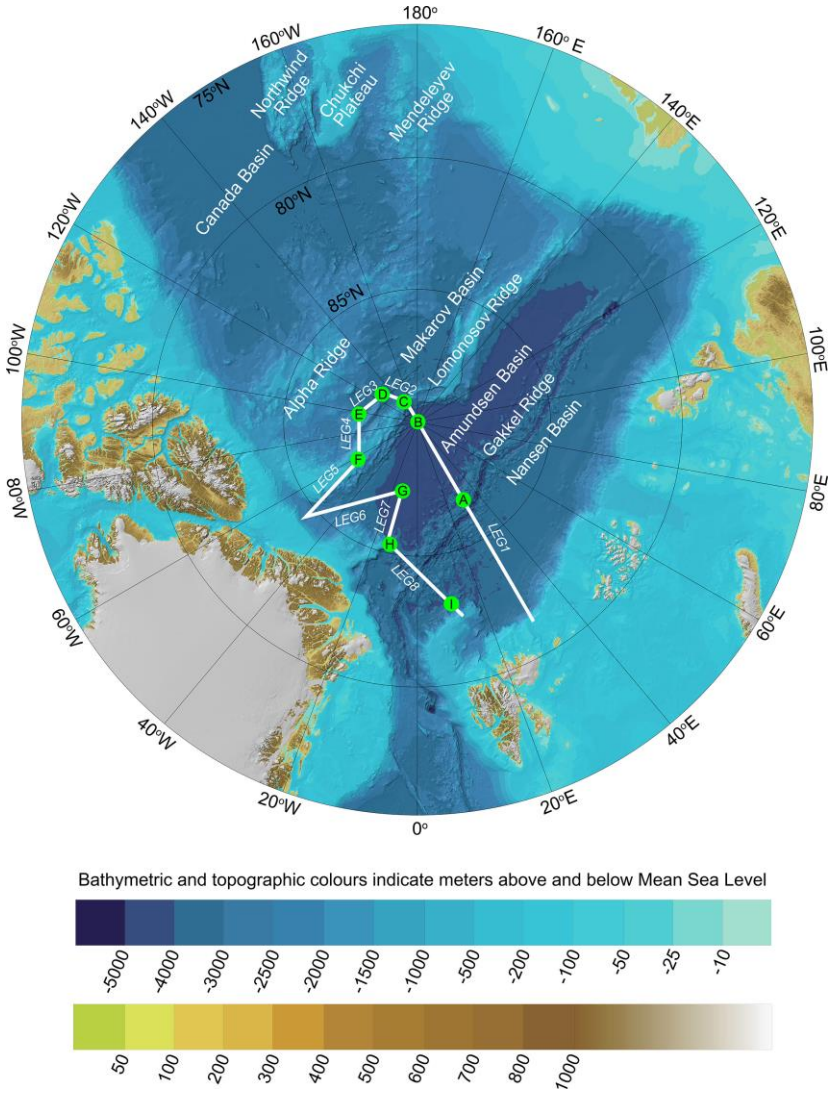
Synoptic Arctic Survey

→What is it? What will it be?

I) SAS is a bottom-up, researcher driven, initiative having secured the collection of empirical data from the Arctic ocean in 2020-2022 by the means of research vessels.

II) THE GOAL is to generate a comprehensive dataset that allow for an improved characterization of the Arctic Ocean including its (i) physical oceanography, (ii) marine ecosystems and (iii) carbon cycle and acidification.

III) THE SAS DATASET will provide unique baselines, which will allow us to track climate change and its impacts as they unfold in the Arctic.



Synoptic Arctic Survey

New political premises for Arctic research

INTEGRITY AND SECURITY IN THE GLOBAL RESEARCH ECOSYSTEM

OECD SCIENCE, TECHNOLOGY AND INDUSTRY
POLICY PAPERS
June 2022 **No. 130**

→New (2020-22) set of policy documents
→For good reasons, but they come with a prize
→They will impact int. projects in ways hard to foresee
→Initiatives like YOPP, SAS and MOSAIC are complex bodies with many nationalities.

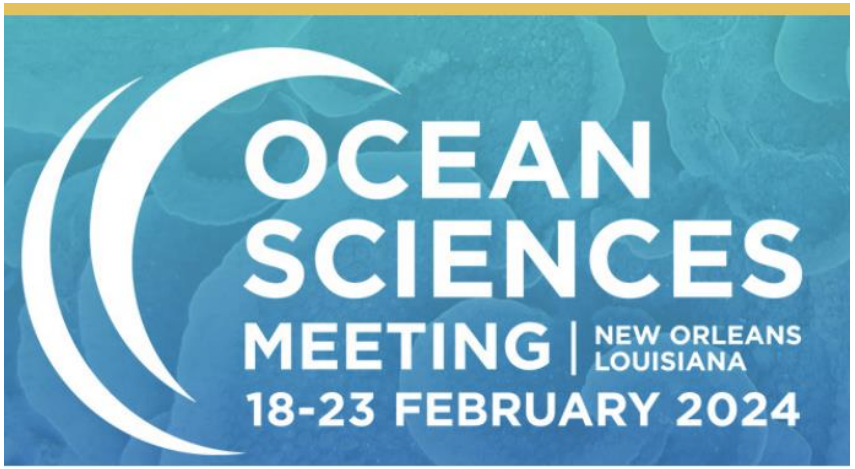
European Commission

Tackeling R&I foreign interference

«Today's allies or friends can quickly be perceived as tomorrow's threats.»

Upcoming SAS meetings

Town Hall Meeting: *The International Synoptic Arctic Survey (SAS) Program – Accomplishments to Date and Planning for SAS2030* has been submitted to the 2024 Ocean Sciences Meeting.



Towards the Second Synoptic Arctic Survey – SAS→2030

→Continue to build the Arctic Research Community
→Utilize the impressive amount of data collected
→Connect with the modelling community
→The SAS SSC needs to strengthened and expanded
→Connect with the new International Polar Year initiative

https://synopticarcticsurvey.w.uib.no

Thanks