SWISS POLAR INSTITUTE

Alexander Haumann

Alfred-Wegener-Institut, Germany

Image courtesy: NASA

Returns up to 80% of all deep water to surface

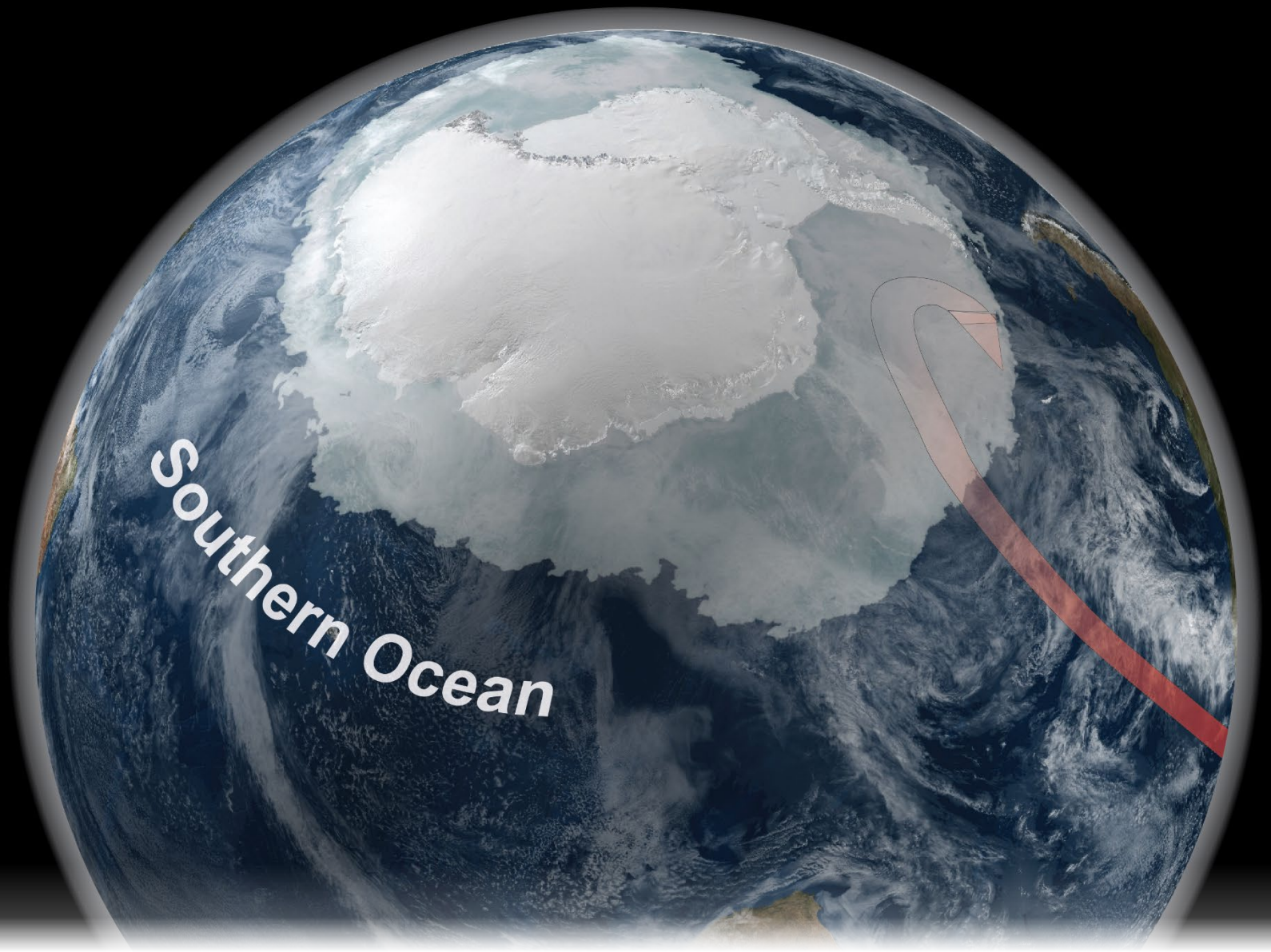
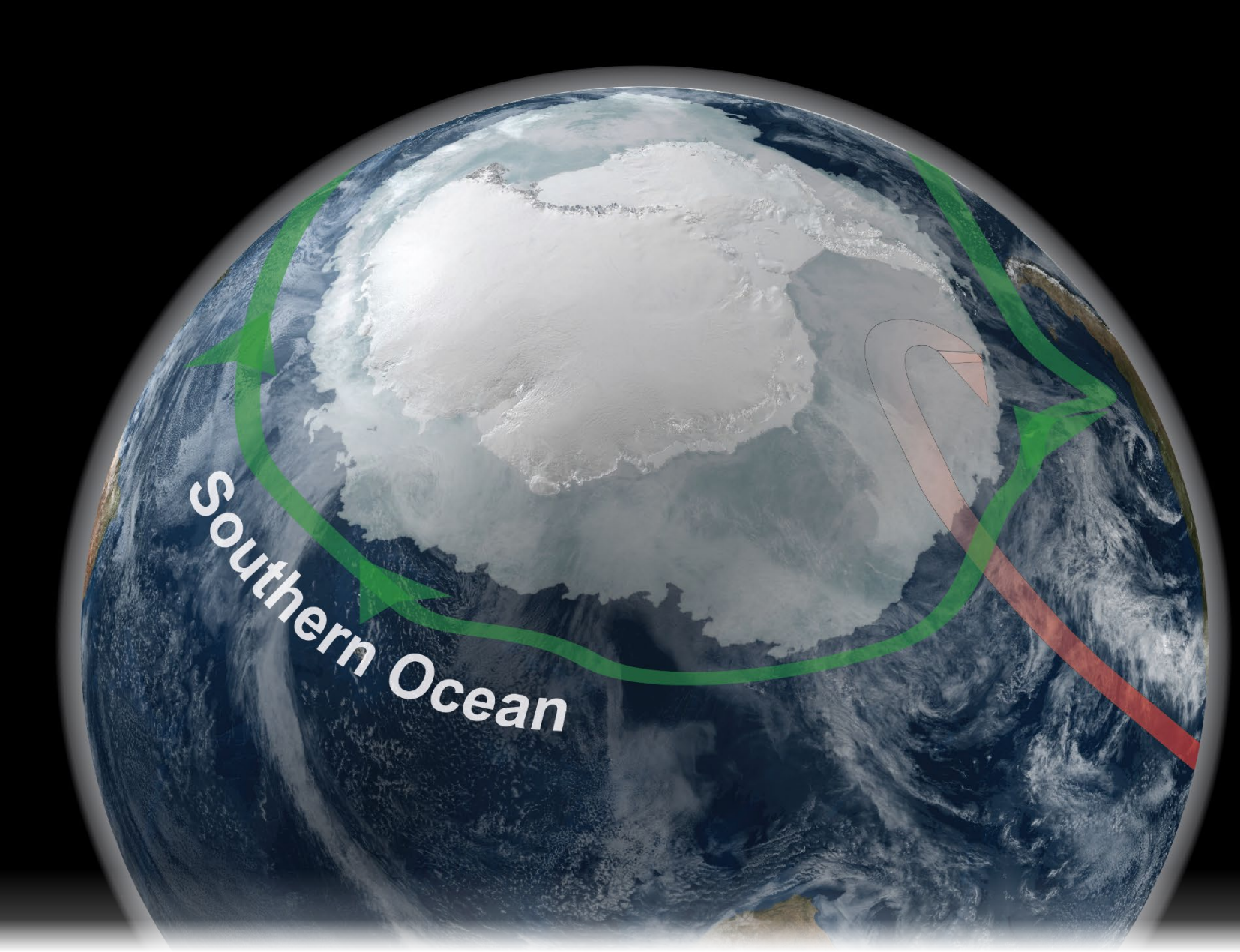
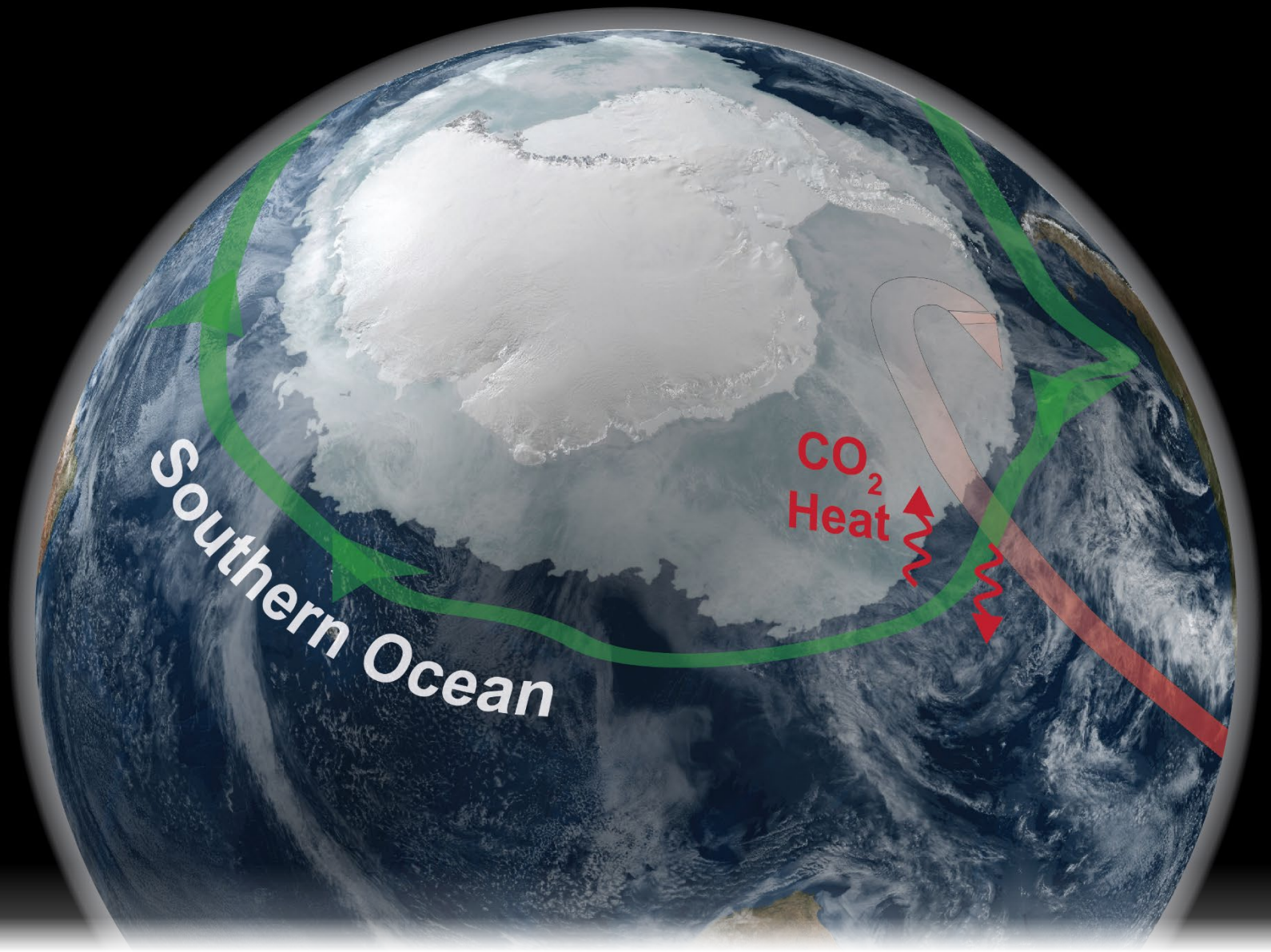


Image courtesy: NASA



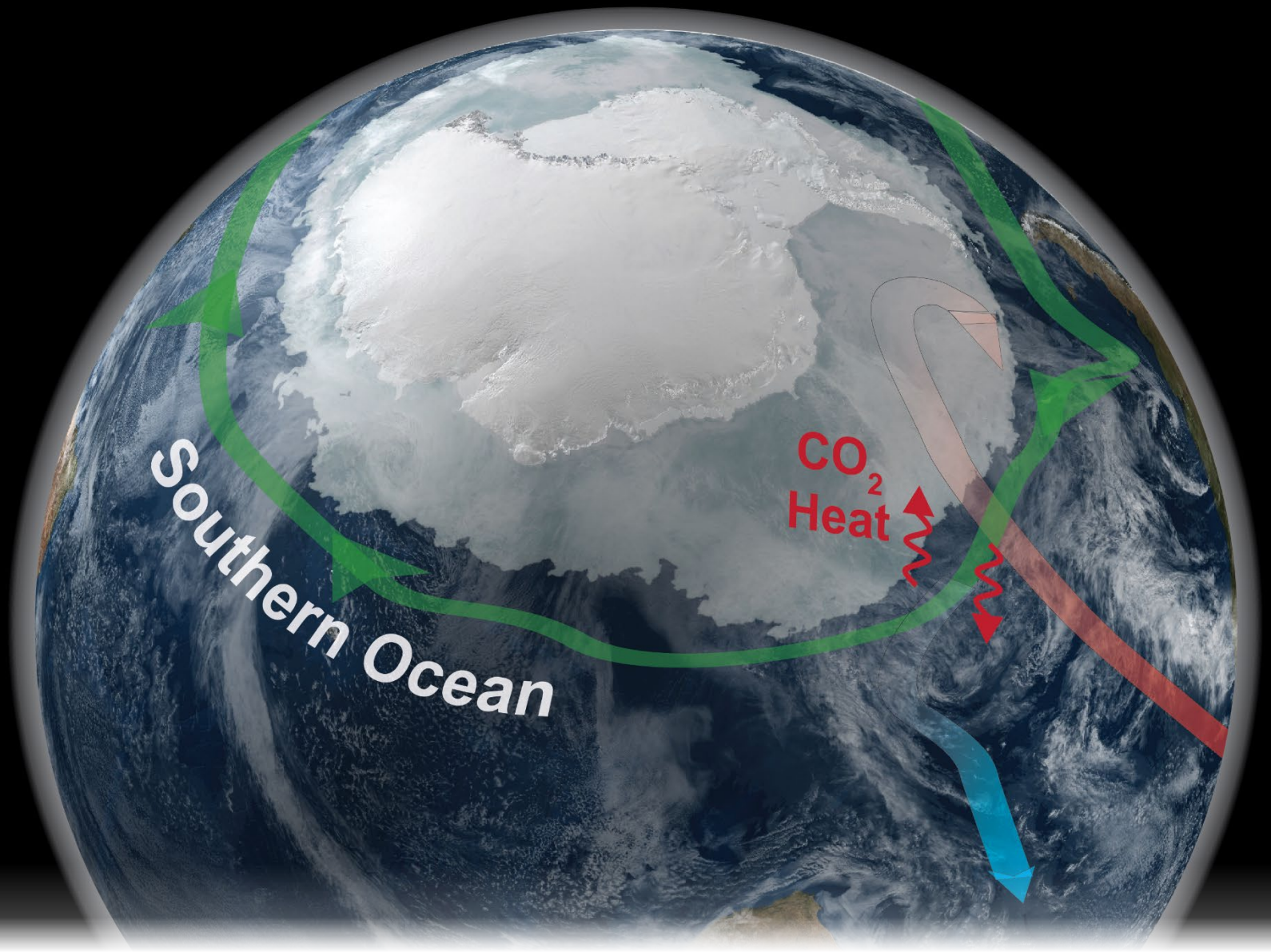
Returns up to 80% of all deep water to surface



Returns up to 80% of all deep water to surface

Releases heat and CO_2 to the atmosphere

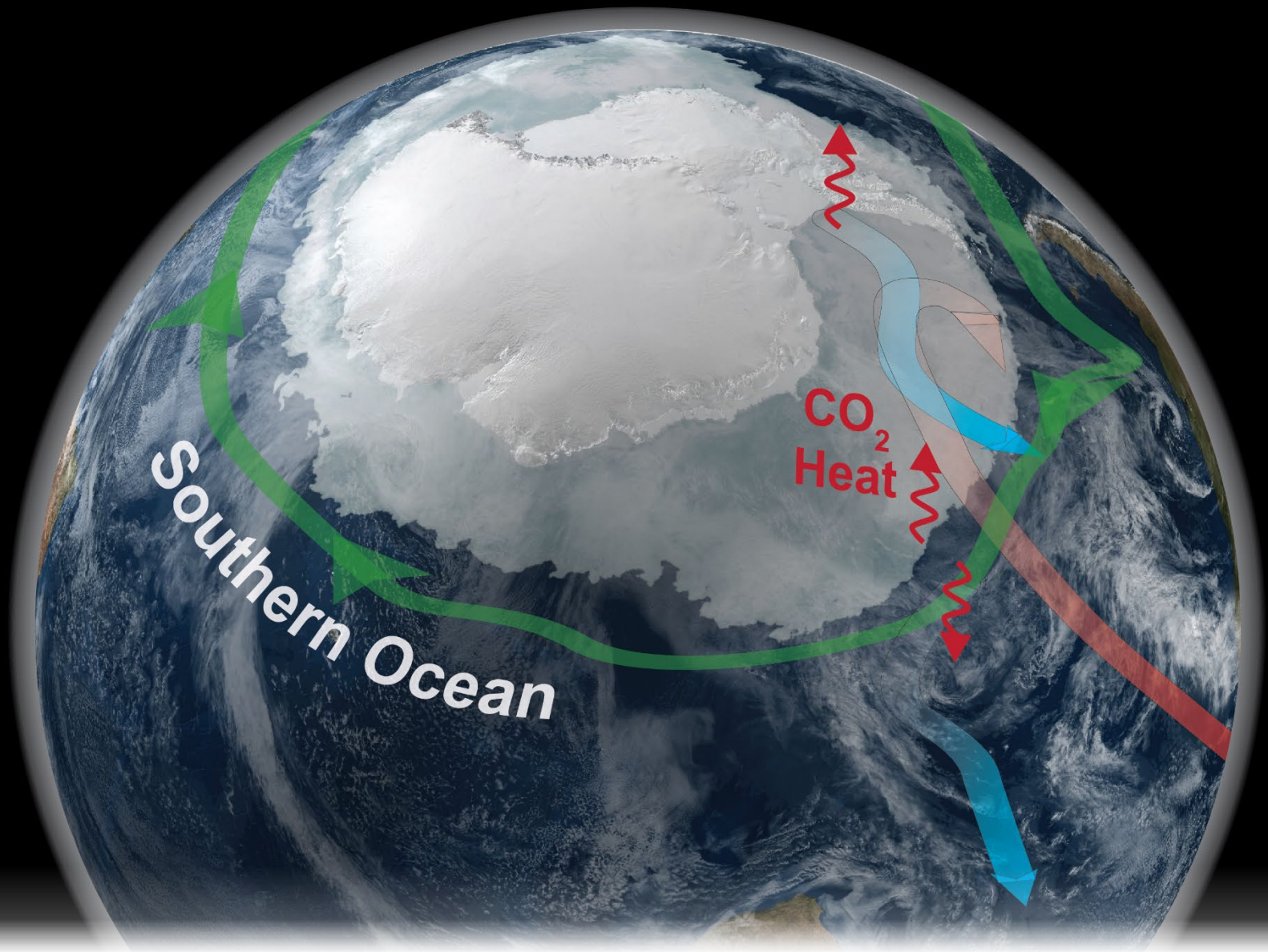
Image courtesy: NASA



Returns up to 80% of all deep water to surface

Releases heat and CO_2 to the atmosphere

Subducts large amounts of anthropogenic CO_2 (13%) and heat (68%)
 Slowing-down global warming



Returns up to 80% of all deep water to surface

Releases heat and CO_2 to the atmosphere

Subducts large amounts of anthropogenic CO_2 (13%) and heat (68%)
 Slowing-down global warming

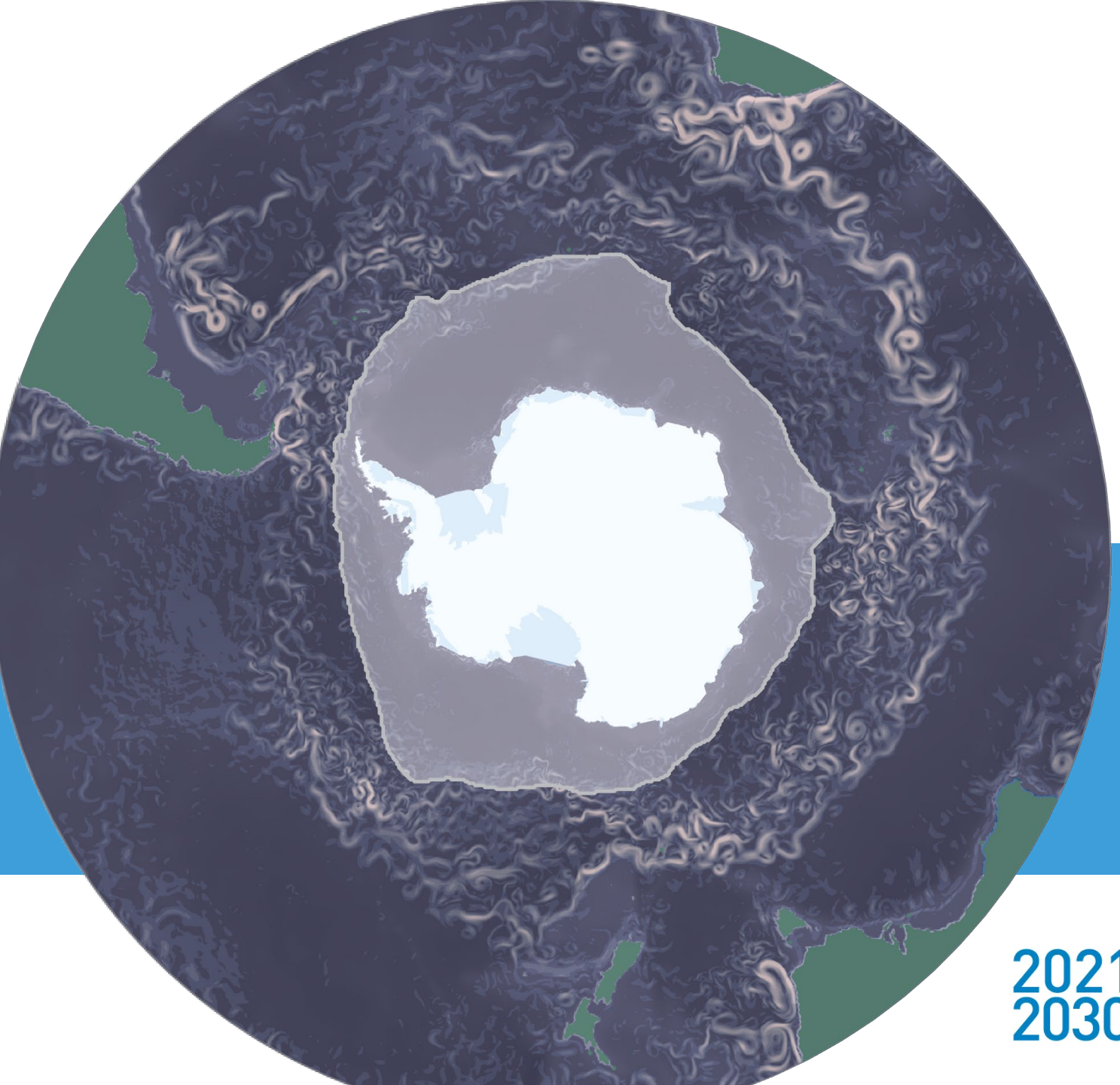
Loses heat around the continent and melts ice shelves
 Contributing to sea-level rise

Hosts the largest seasonal events on Earth (sea ice), which has been changing abruptly

Is home to one of the most unique ecosystems on Earth, sensitive to environmental changes

If we want to understand future local and global climate change and its impact on the ecosystem, we have to understand the Southern Ocean heat, freshwater and carbon budgets!

Image courtesy: NASA



ANTARCTICA INSYNC

International Science & Infrastructure for Synchronous Observation

An internationally coordinated, circumpolar, and year-round mission

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

Antarctic Treaty

1959

- Regulates international relations on a political/diplomatic level

COMNAP

Council of Managers of National Antarctic Programs

1988

- Coordinates national programs, infrastructure, operations, safety, environmental management & protection

SCAR

INTERNATIONAL SCIENCE COUNCIL
SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH

1958

- Initiates, develops and coordinates international scientific research

CCAMLR

Commission for the Conservation of Antarctic Marine Living Resources

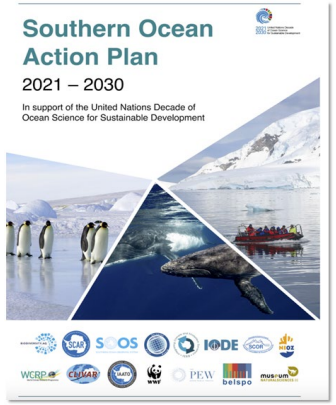
1980

- Protects the ecosystem

Background: Identifying the need for the program

UN Decade of the Ocean

Southern Ocean Action Plan



SCAR

SCAR Horizon Scan

1st SCAR Antarctic and Southern Ocean Science Horizon Scan

SOOS / ICED

Science and Implementation Plans

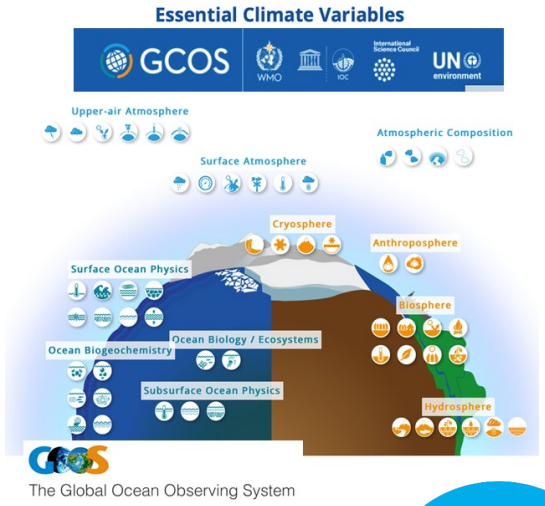
SOOS
SOUTHERN OCEAN OBSERVING SYSTEM

The Southern Ocean Observing System
2021-2025 Science and Implementation Plan

MEASO
Marine Ecosystem Assessment for the Southern Ocean

WMO GCOS / GOOS

Essential Climate Variables
Essential Ocean Variables



Background: Identifying the need for the program

UN Decade of the Ocean

Southern Ocean Action Plan

SCAR

SCAR Horizon Scan

SOOS / ICED

Science and Implementation Plans

WMO GCOS / GOOS

Essential Climate Variables
Essential Ocean Variables

- Year-round & circumpolar observations, in particular in the seasonal ice-covered Southern Ocean
- Observing network: integration of ship-based, autonomous, and remote sensing
- Multidisciplinary observations
- Integration with modelling efforts
- Unified measurements in terms of variables, protocols, meta-data, data publishing
- International coordination

A unique opportunity for the community

SCAR

Southern Ocean UN Decade Collaborative Centre (DCC)

ATCM

Information paper by Germany, Australia, France, Italy, Norway, UK, USA,

.

Antarctica InSync Program

Coordination & Infrastructure

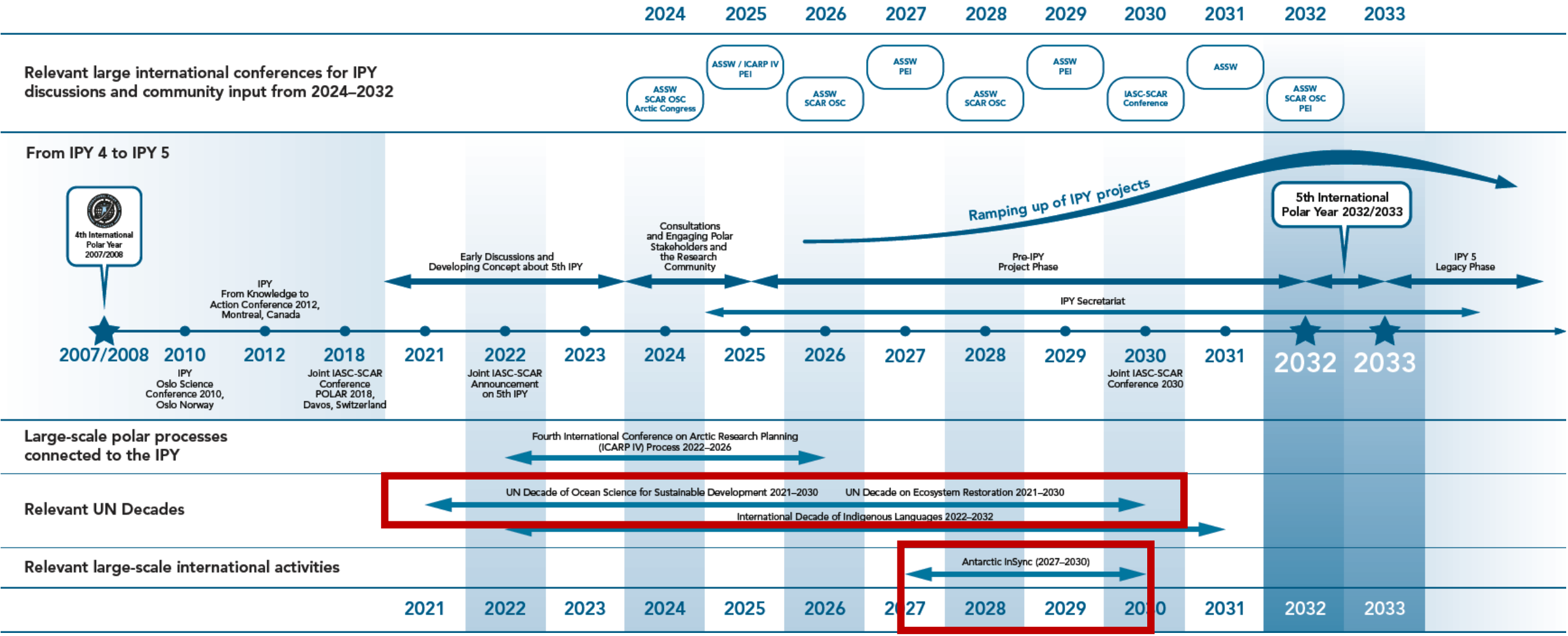
Science, planning, fieldwork

Expert / Action / Working Groups, Communities

SOOS, ICED, ASPeCt, SORP, BEPSII, SKEG, RINGS, SIPN South, e

Long-term perspective

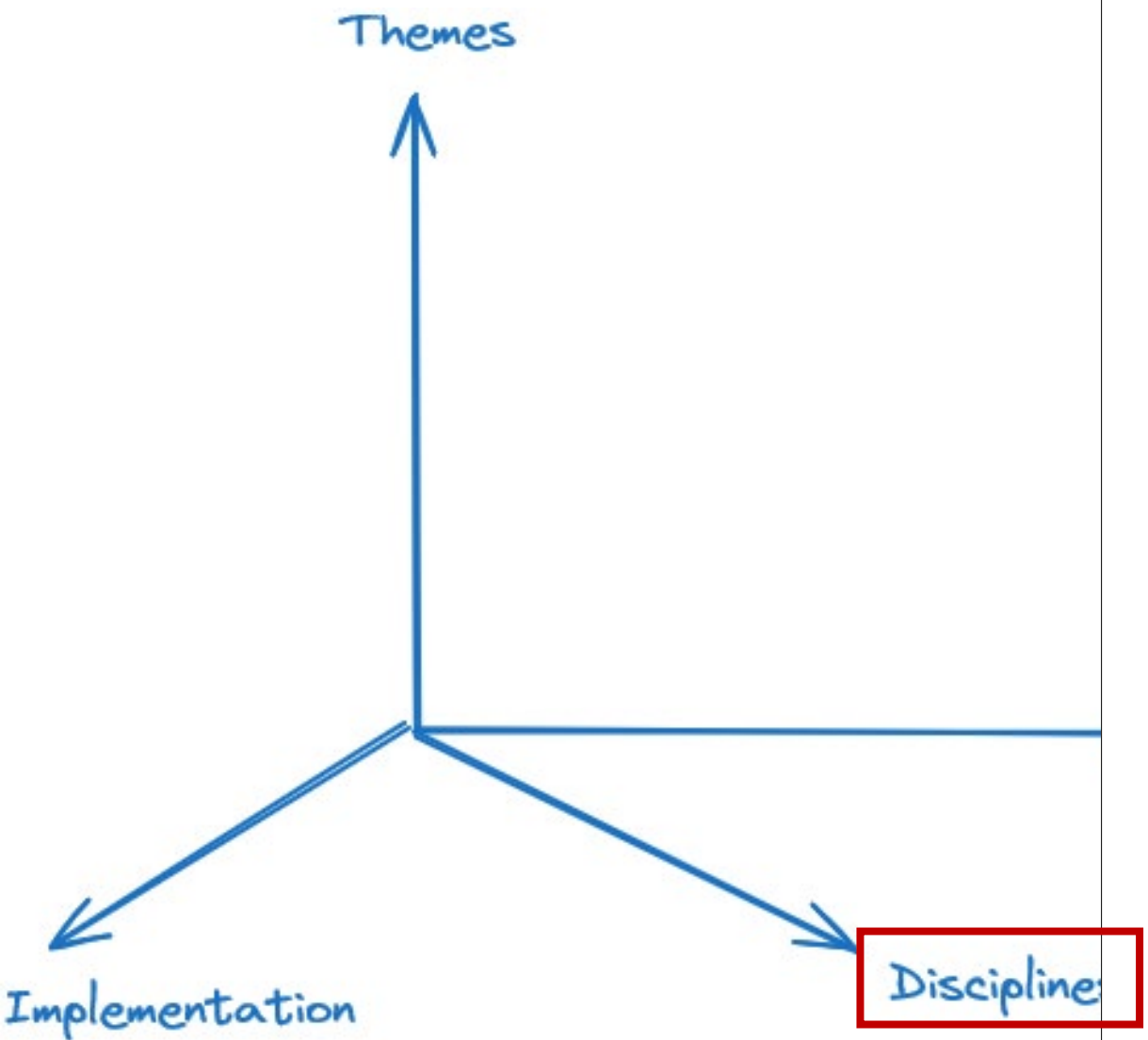
Towards the 5th International Polar Year (IPY) 2032-33

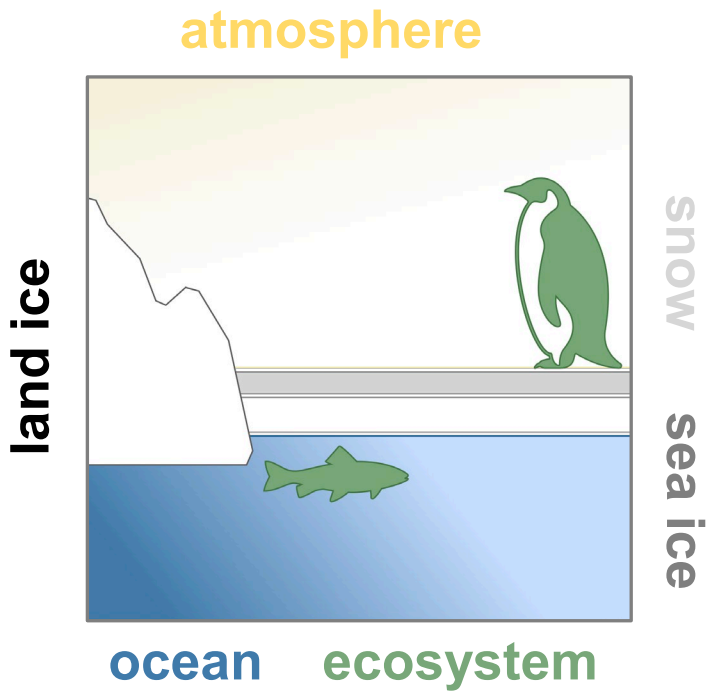


Main Aims

- To assess circumpolar connections between ice, ocean, atmosphere, climate, environment and life, including human pressures (if possible also year-round assessments)
- To accelerate the generation and use of knowledge and understanding of Antarctica and the Southern Ocean in response to research and policy-driven needs (new technologies !)
- To ensure that resulting knowledge is provided in an open access, shared, and discoverable manner (FAIR principles)
- To enhance collaborative Southern Ocean science and infrastructure towards IPY and the UN Cryosphere decade, setting up processes for co-designed and co-delivered knowledge

Structure of Antarctica I





Scientific Vision of Antarctica InSync

Themes

Nations

Disciplines

Implementation

Southern Ocean heat, freshwater, and carbon budgets and their response to climate change

Improving knowledge and protection of the unique Antarctic life from land into the deep sea

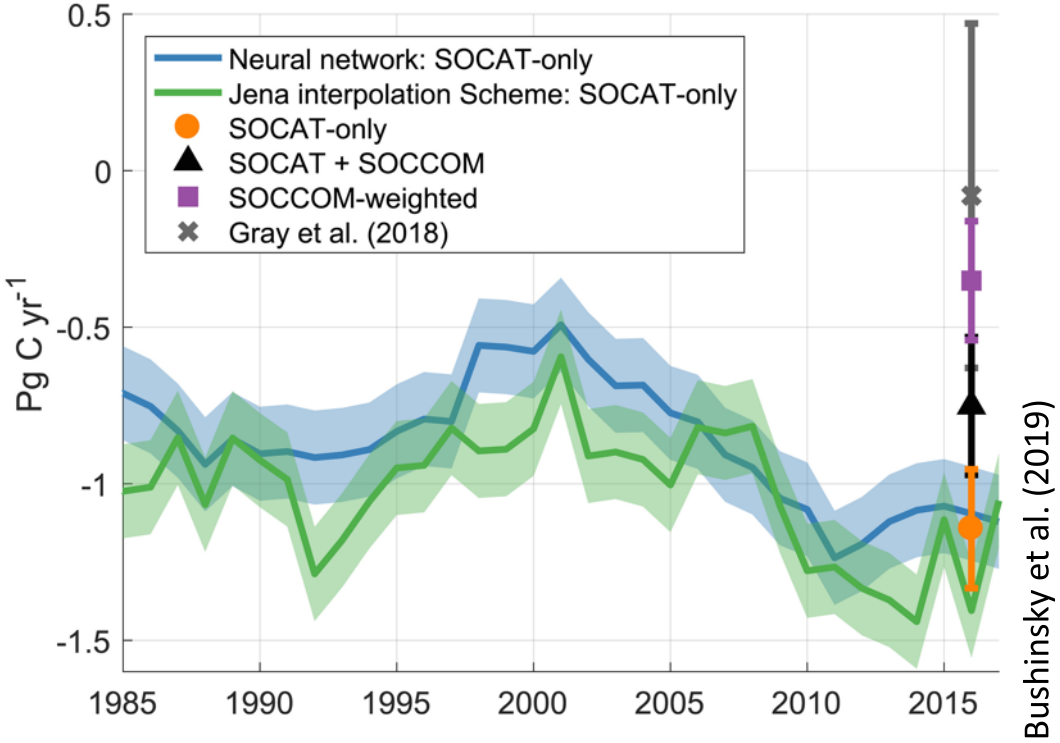
Anthropogenic signatures in Antarctica: the race against pollution and other pressures

Melting ice shelves and coastal impacts

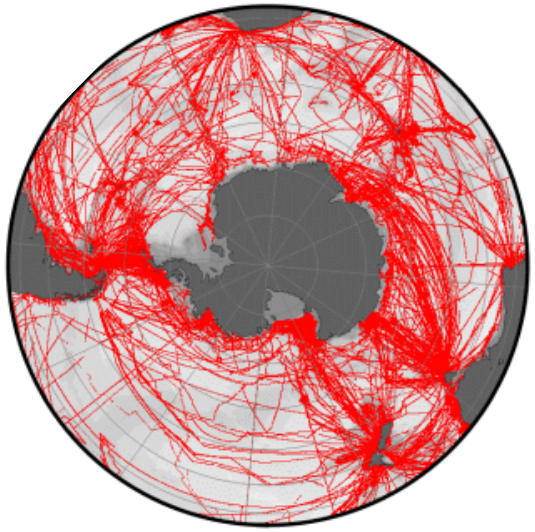
Rapid sea ice decline and its interdisciplinary consequences

Examples of panantarctic science plans: Theme 1: Budgets of heat and carbon

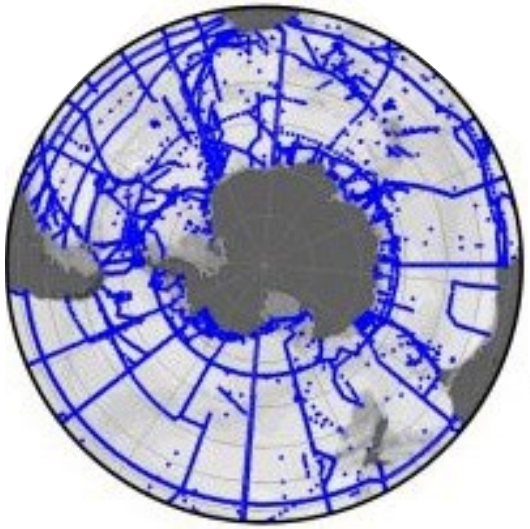
- It is critical to sustain both BGC-Argo array and shipboard measurements in order to understand the Southern Ocean carbon budget in the long-term
- Repeat hydrographic sections need to be sustained and reassessed (incl. the freshwater budget)
- International coordination needs to be strengthened to get a better circumpolar understanding, especially in winter



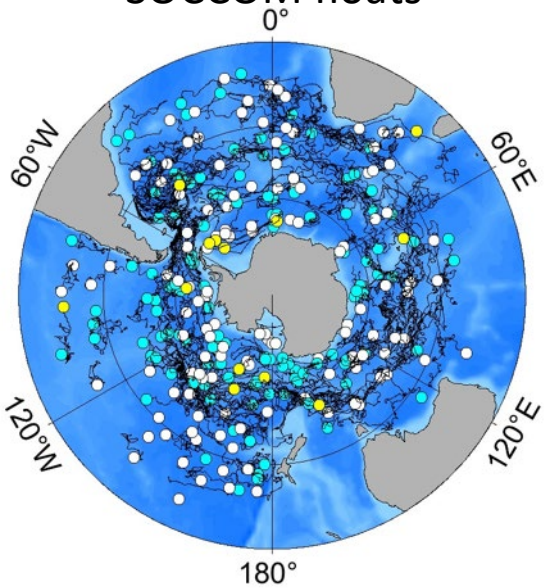
SOCAT surface pCO_2



GLODAP sections

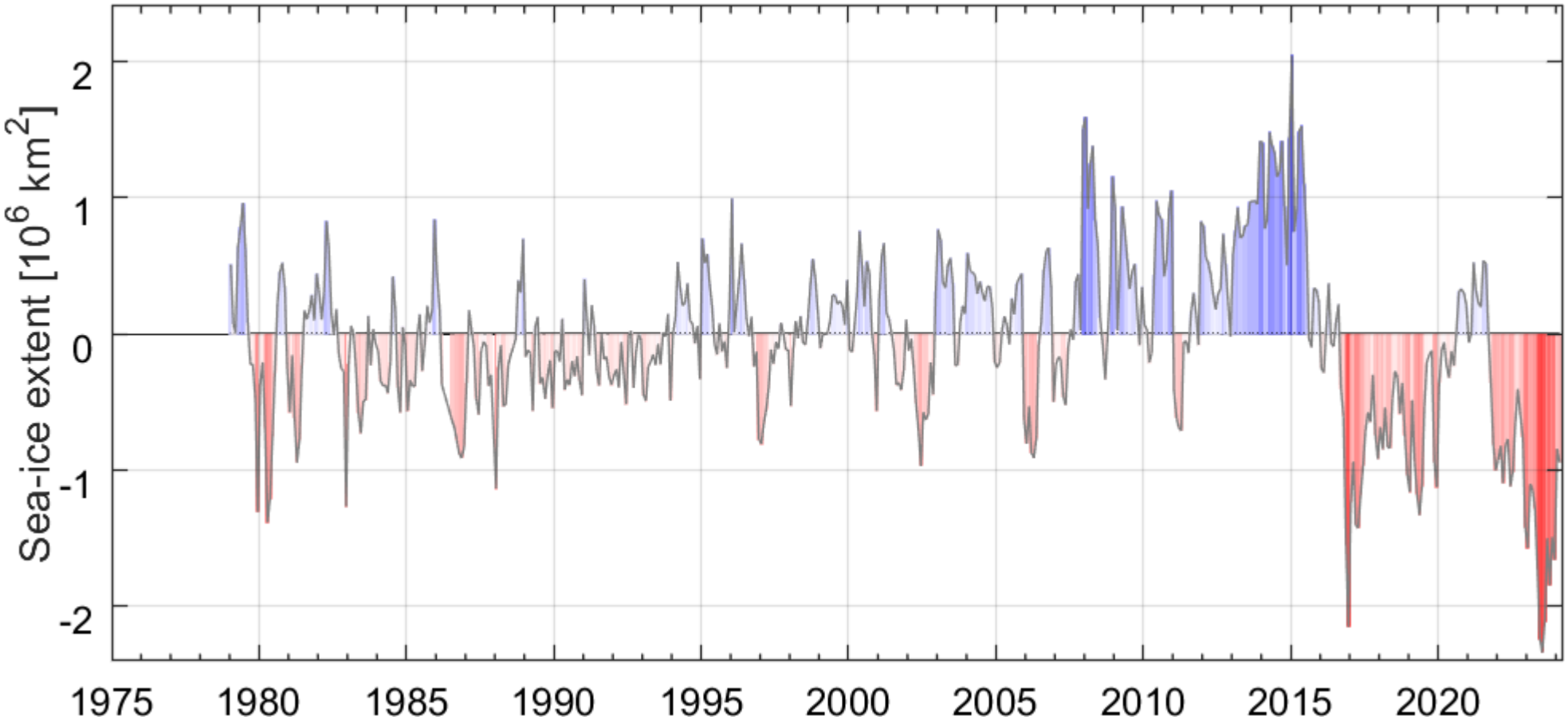


SOCCOM floats



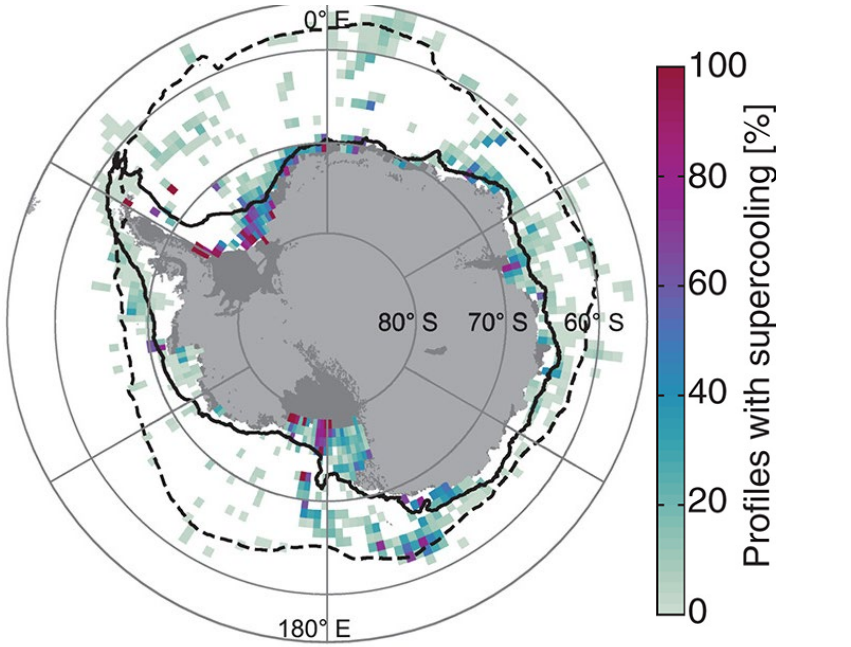
Theme 2: Rapid decline of Antarctic se ice

- Why did the sea ice in the Southern Ocean decline so abruptly?
- Is the decline linked to human-induced climate change?
- Did the system reach a tipping point?
- What are the consequences for the ecosystem, ocean circulation, and the ice shelves and ice sheets?

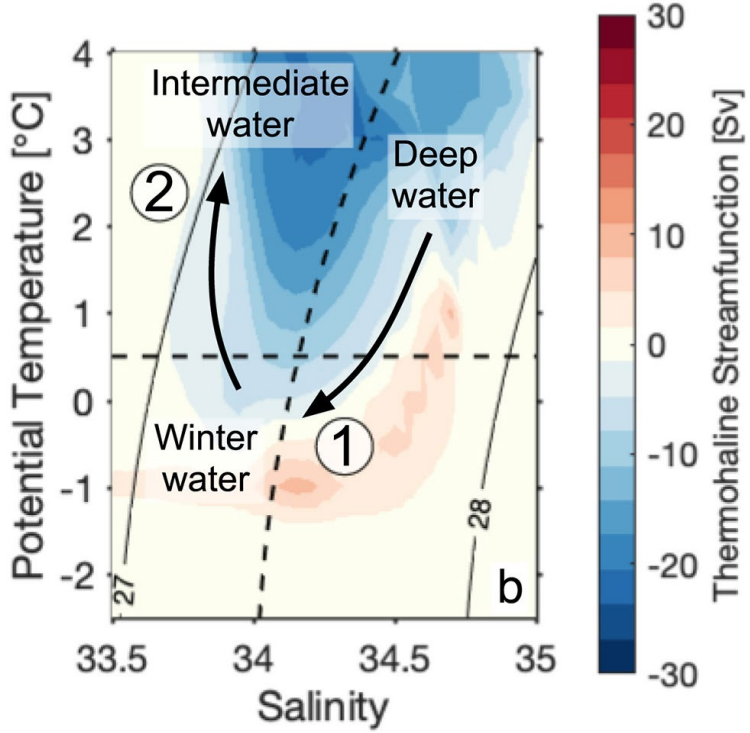


Theme 2, Blind Spot: What happens under and around the sea ice in winter?

- Further advance efforts to collect data from the seasonally ice-covered ocean in winter
- Focus on upper ocean processes to understand how deep waters are ventilated and affect surface fluxes
- Ship and autonomous capabilities directly under sea ice need to be strengthened
- Develop coupled platforms to measure atmosphere, ice, and ocean properties



Haumann et al. (2020)



Evans et al. (2018)

Partnership in Antarctica InSync .. International Steering Board of Sci & Infra Directors

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Partnership in Antarctica InSync

CCMAR

C. Pol. Espanol

IAA

İTÜ PolReC

SWISS POLAR INSTITUTE

International Science teams – Actions to the program

Progress towards the Science teams (open and bottom up)

- Collect Ideas of working groups and shape them to science plans with some leaders in the field and some representatives of the “next generation”
- Let ideas ripen / propose to standing working groups, discuss, shape, write a short plan
- Bring plans forward to international steering committee for feedback
- Announce on Antarctica InSync website
- Bring forward to “Infrastructure” and “National committees”/ Funding agencies

Antarctica InSync

Antarctica International Science & Infrastructure for Synchronous Observation

Antarctica InSync is a global effort to synchronize research across Antarctica and the Southern Ocean, connecting ice, ocean, climate, and life to protect this vital region.

Thank you!

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