

A wide-angle photograph of a large research ship, likely the R/V Polarstern, sailing on a dark sea with scattered ice floes. The ship is white with a red superstructure and a black funnel. The sky is a mix of orange and grey, suggesting a sunset or sunrise. In the distance, a low, flat landmass is visible under a cloudy sky.

The Antarctic research strategy of the Alfred Wegener Institute (AWI)

Thomas Jung

National, European and international embedding



RESEARCH AGENDA POLAR REGIONS IN TRANSITION

Concept Paper of the MARE:N Advisory Board | Executive Summary

The 1st SCAR Antarctic and Southern Ocean Science Horizon Scan - Final List of Questions

ANTARCTIC ATMOSPHERE AND GLOBAL CONNECTIONS^{1,2}

1. How is climate change and variability in the high southern latitudes connected to lower latitudes including the Tropical Ocean and monsoon systems?
2. How do Antarctic processes affect mid-latitude weather and extreme events?
3. How have teleconnections, feedbacks, and thresholds in decadal and longer term climate variability affected ice sheet response since the Last Glacial Maximum, and how can this inform future climate projections?
4. What drives change in the strength and position of Westerly winds, and what are their effects on ocean circulation, carbon uptake and global teleconnections?
5. How did the climate and atmospheric composition vary prior to the oldest ice records?
6. What controls regional patterns of atmospheric and oceanic warming and cooling in the Antarctic and Southern Ocean? (*Cross-cuts "Southern Ocean"*)
7. How can coupling and feedbacks between the atmosphere and the surface (land ice, sea ice and

INTEGRATED EUROPEAN POLAR RESEARCH PROGRAMME



Southern Ocean Action Plan

2021 – 2030

In support of the United Nations Decade of
Ocean Science for Sustainable Development



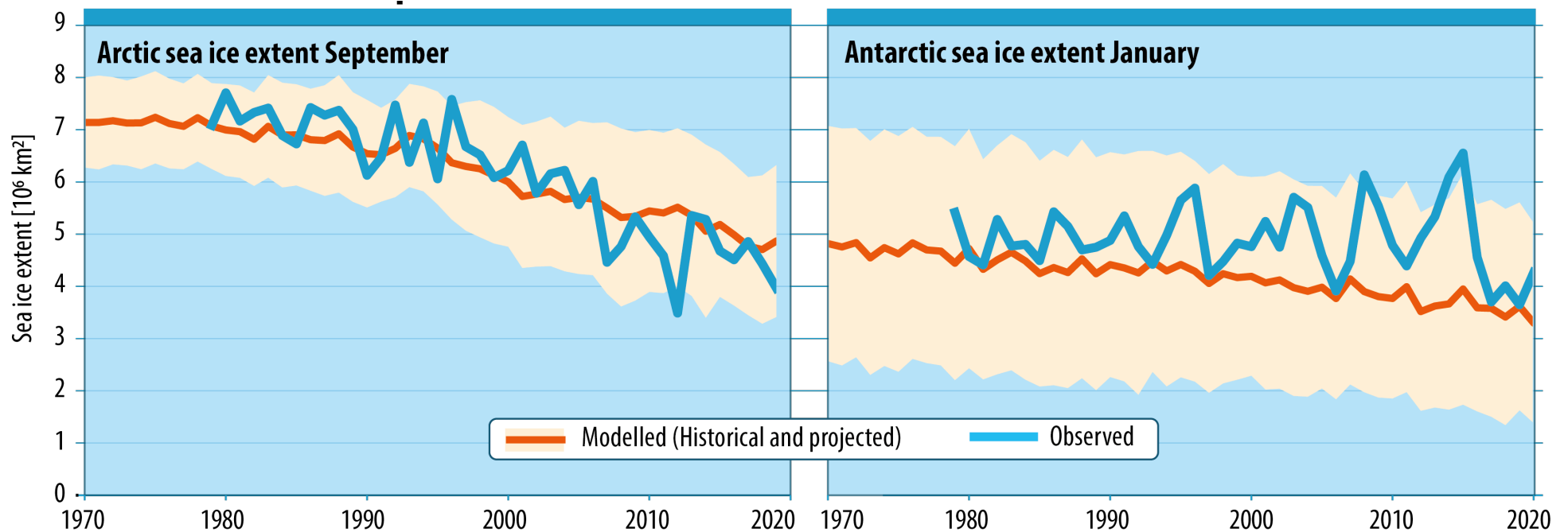
Science priorities



- Drivers of climate change and advanced predictions
- Ice sheets and shelves in a warming world and future sea level rise
- Heat and carbon uptake of the Southern Ocean in a changing climate
- Food webs/ecosystems in danger
- Direct human presence and human pressures

There are fundamental knowledge gaps

The Antarctic sea ice paradox

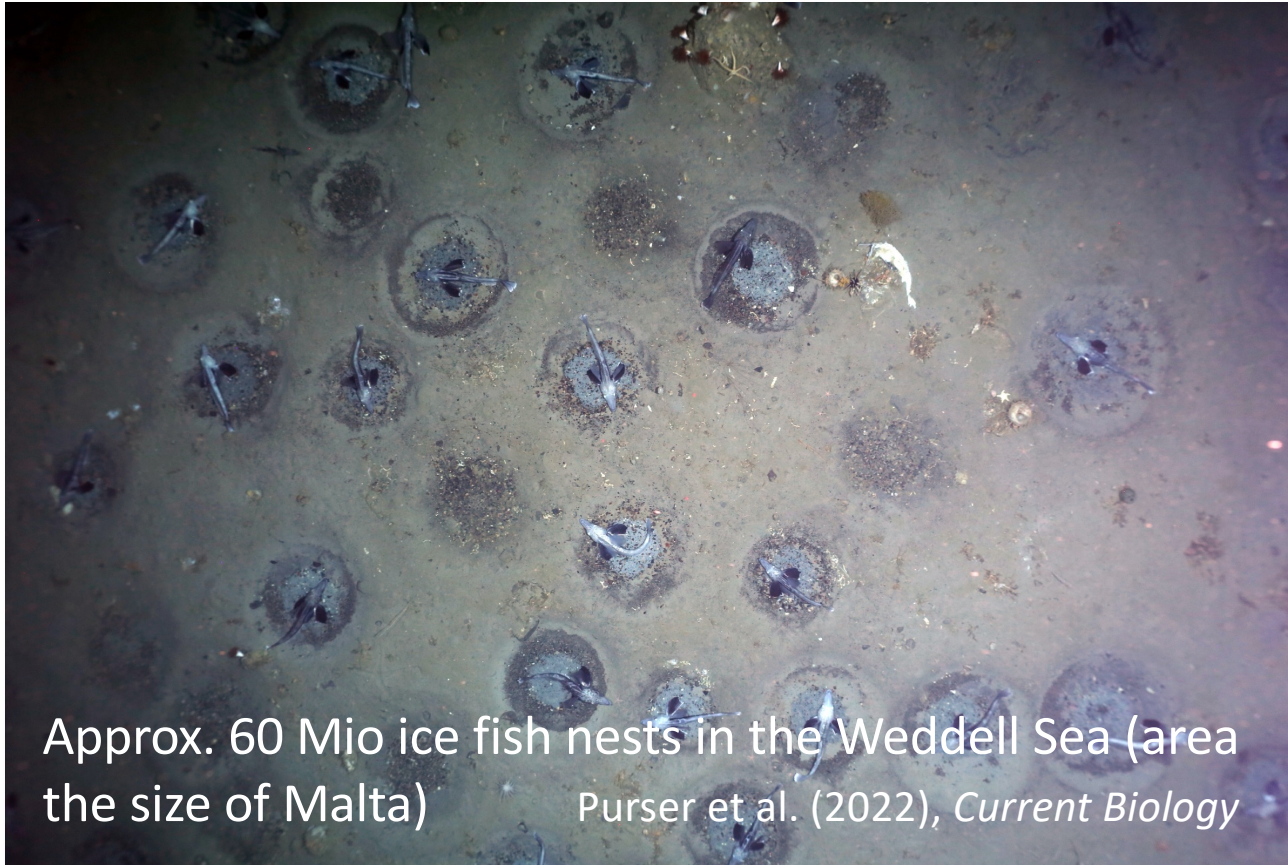


“There is low confidence in climate change projections of Antarctic sea ice extent.” (AR5, SROCC, AR6)

There is potential for astonishing discoveries



A vast fish breeding colony discovered in the Antarctic

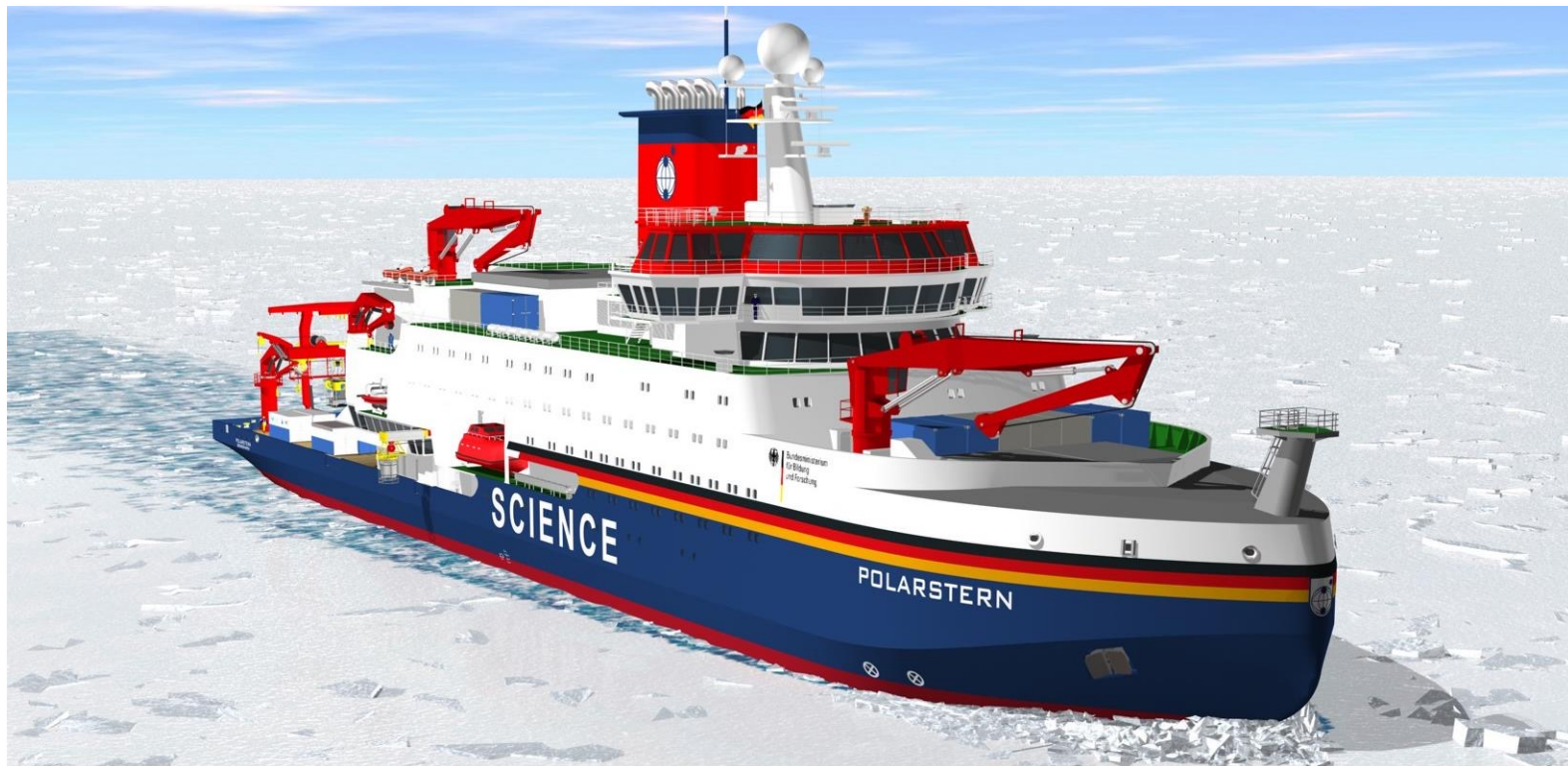


Approx. 60 Mio ice fish nests in the Weddell Sea (area the size of Malta) Purser et al. (2022), *Current Biology*

Opportunities



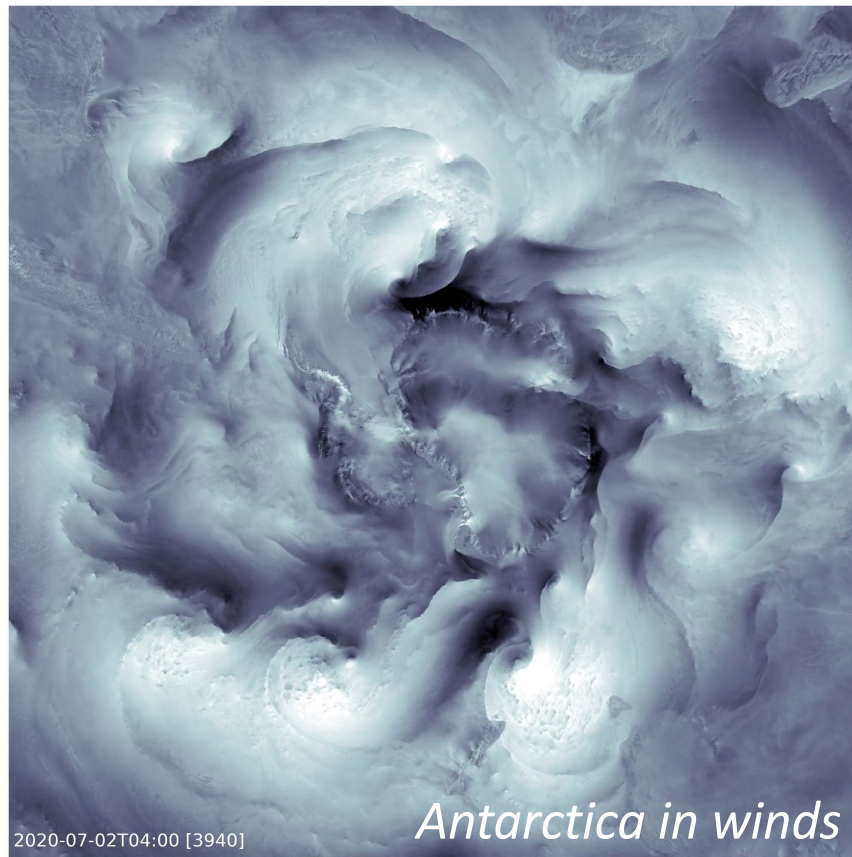
Polarstern II – and how it could look like



Opportunities



Next-generation km-scale climate models (digital twins)



Ideas for cooperations

The Synchronous Antarctic Year of Research (2027–2030)

- Contribution to the UN Ocean Decade
- Coordinated, intensive, multi-platform synoptic survey (sea, air and and land) ...
- ... at a time of expected major sea ice decline
- *Polarstern II* could cover the Weddell Sea



The Knowledge of the Weddell Sea region initiative

- Contribution to the UN Ocean Decade
- “Last summer sea ice” and special endemic life that needs protection
- Alliance (science, NGOs etc.) to increase and share knowledge of the region