

THE SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH



WHY THE SOUTHERN OCEAN MATTERS

The Southern Ocean, which surrounds Antarctica, influences ocean circulation and climate on a global scale. However, it is the least observed and least well understood of all the world's oceans. The Scientific Committee on Antarctic Research (SCAR) plays a leading role in facilitating international research to deepen our understanding of the Southern Ocean, how it could respond to future climate change, and what that means for the stability of the Antarctic Ice Sheet, global climate and sea level.

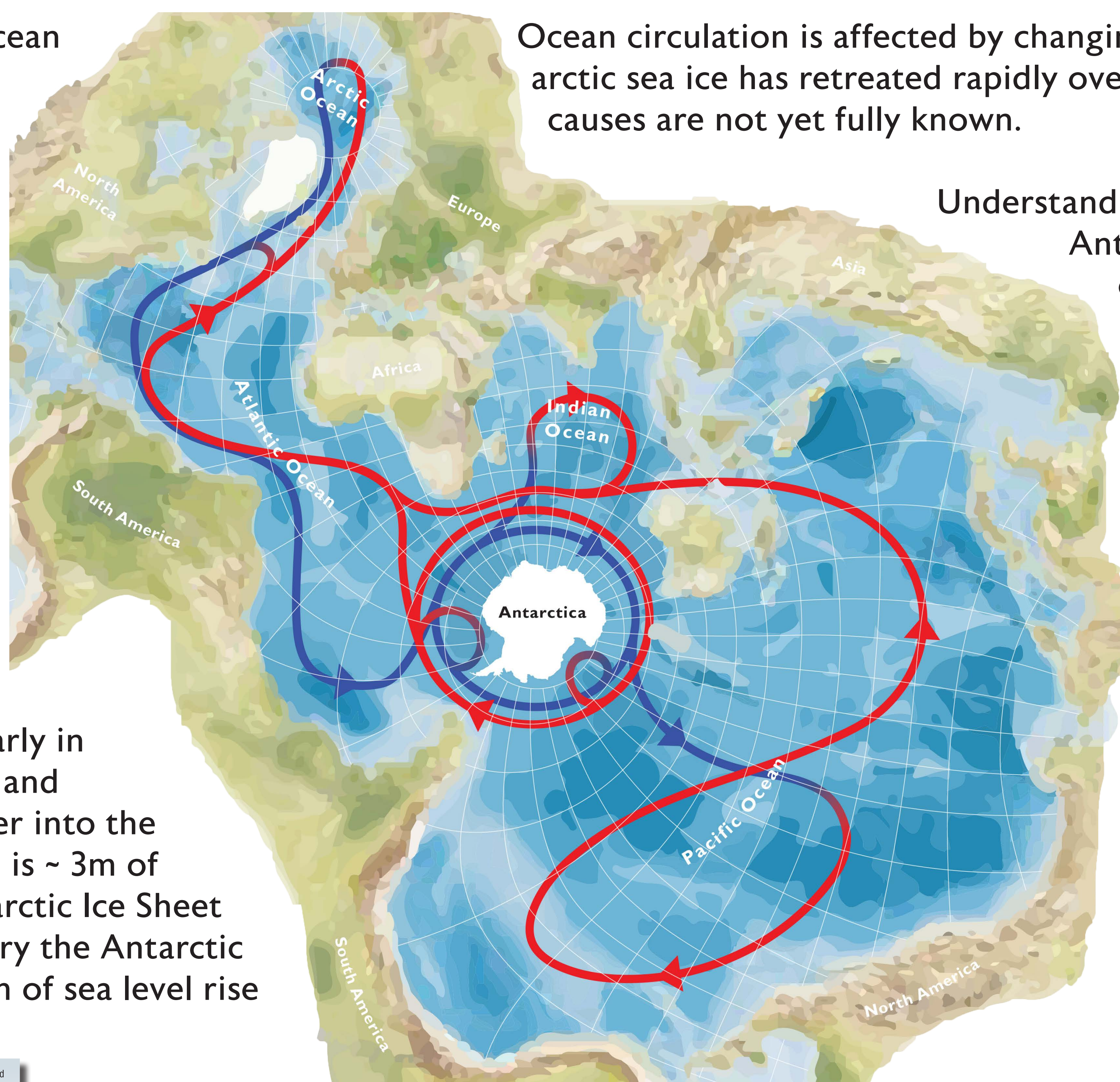
KEY RESEARCH FINDINGS AND QUESTIONS

Understanding the role the Southern Ocean plays in the global carbon cycle is a key research focus. The Southern Ocean has moderated atmospheric warming to date by absorbing significant amounts of atmospheric heat and carbon.

The warming and acidification of the Southern Ocean due to the extra carbon is affecting marine life. There was concern that the Southern Ocean carbon sink had become saturated, but recent evidence suggests it has renewed.

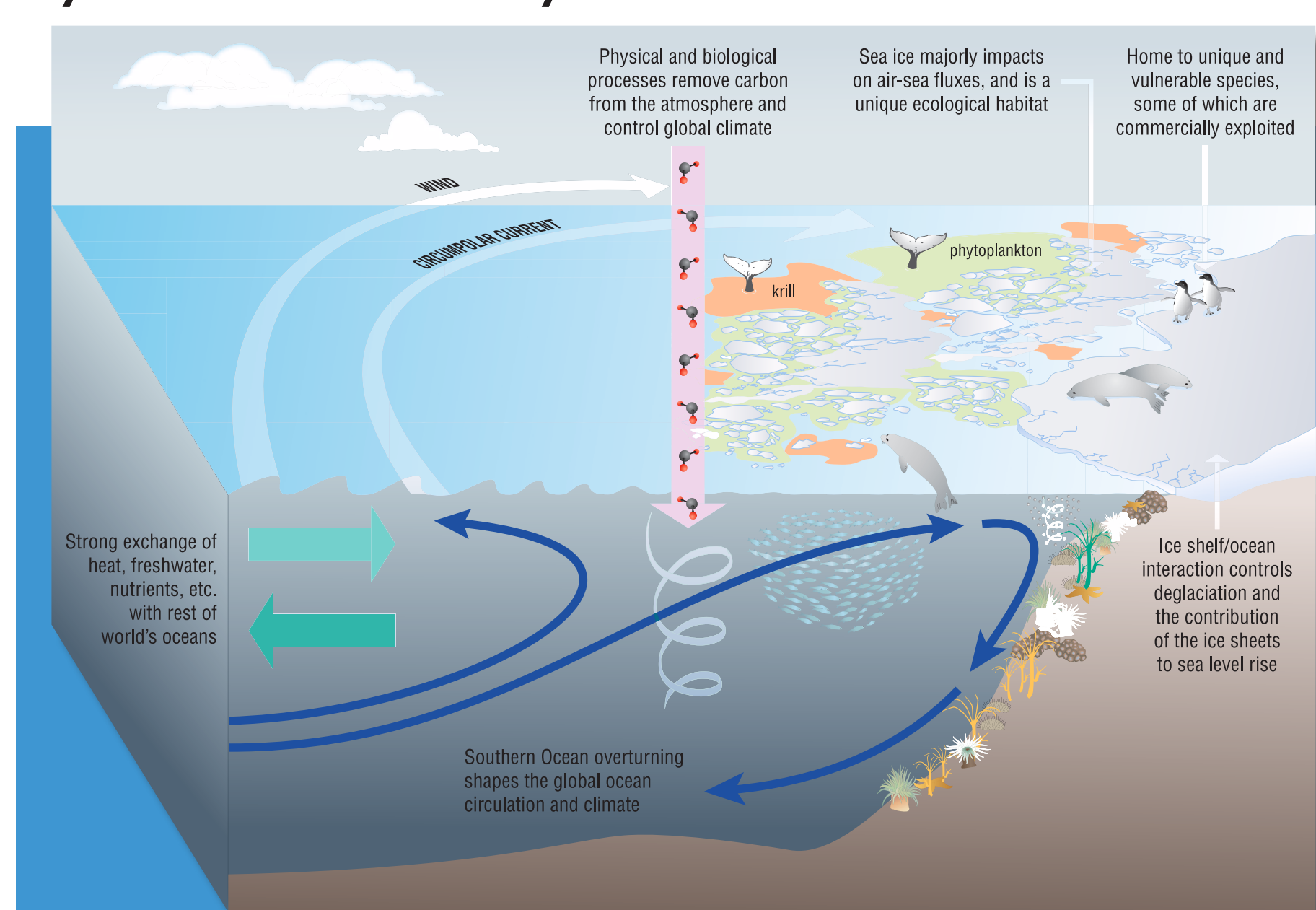
Warming ocean waters welling up beneath Antarctica's floating ice shelves are melting the ice from below, particularly in parts of West Antarctica. Their thinning and collapse means land-based ice flows faster into the ocean, causing rapid sea level rise. There is ~ 3m of sea level rise locked up in the West Antarctic Ice Sheet alone. Under the IPCC's RCP8.5 trajectory the Antarctic Ice Sheet is most likely to cause 15-40 cm of sea level rise by 2100 but many uncertainties remain.

Ocean circulation is affected by changing patterns of sea ice. Antarctic sea ice has retreated rapidly over the last 3 years, though the causes are not yet fully known.



Understanding of the dynamics of Antarctic ice, atmosphere and ocean and the extent to which they are influenced by anthropogenic activity versus natural variability, will be critical for predictions of global sea level rise in the coming centuries.

Diagram: The globe as ocean fringed by land. The arrows show the global thermohaline circulation. Red=upper-layer and blue = lower layer flow. Taken from 'The global importance of the Southern Ocean', Michael P. Meredith, Ocean Challenge, in press.



The diagram illustrates the interactions between ice, atmosphere and ocean and their interface with marine and terrestrial habitats. Taken from Meredith et al, 'The Vision for a Southern Ocean Observing System', Current Opinion in Environmental Sustainability 291

SCAR GROUPS - SELECTED HIGHLIGHTS

Antarctic Climate Change in the 21st Century (AntClim21) is delivering improved regional projections of key elements of the Antarctic atmosphere, ocean and cryosphere for the next 20 to 200 years.

The Past Antarctic Ice Sheets program (PAIS) has improved understanding of the sensitivity of Antarctic Ice Sheet to a broad range of climatic and oceanic conditions.

The Ice Sheet Mass Balance group (ISMAB) promotes research on the balance between ice sheets gaining ice (through snowfall) and losing ice (through melting and calving), and the resulting contribution to sea level. ISMAB is co-sponsored by the WCRP Climate and Cryosphere project and the International Arctic Science Committee.

The Antarctic Sea-Ice Processes and Climate group (ASPeCT) is working to improve understanding and modelling of the role of Antarctic sea ice in the atmosphere-ice-ocean system. **The Biogeochemical Exchange Processes at the Sea-Ice Interfaces (BESPII)** Group aims to quantify the role of sea ice in polar ecosystem services – from biodiversity impacts to climate change.

The Southern Ocean is an extremely challenging environment for data collection. SCAR and SCOR (Scientific Committee on Oceanic Research) co-sponsor the **Southern Ocean Observing System (SOOS)**, which plays a key role in addressing gaps in observation and measurement.

Future work programs in planning include prediction of near-term conditions in the Antarctic climate system on timescales of years to multiple decades, including potential tipping points in the climate system. Future work on quantifying the Antarctic ice sheet contribution to past and future global sea-level change is also being developed.

5 Flagship Scientific Research Programmes on high priority areas

66 Early-Career Fellowships awarded since 2002

Research groups across the natural and social sciences **40**

44 Member Countries
9 International Science Council Unions

124 Papers submitted to the Antarctic Treaty 2008 - 2018

60 Years of SCAR 1958 - 2018

ABOUT SCAR

The study of Antarctica and the Southern Ocean and their role in the global Earth system has never been more important. As an international organisation of 44 member countries and 9 Scientific Unions, SCAR supports the delivery of high quality research that is collaborative, open and internationally relevant.

The Antarctic and Southern Ocean region is a matchless natural laboratory for vital scientific research. SCAR coordinates international research in the natural and social sciences across over 30 research groups. It supports thousands of scientists to collaborate on topics ranging from plastic pollution in the polar regions to the study of volcanic processes.

SCAR is an official Observer to the Antarctic Treaty and provides objective and independent scientific advice to the annual Antarctic Treaty Consultative meetings.

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