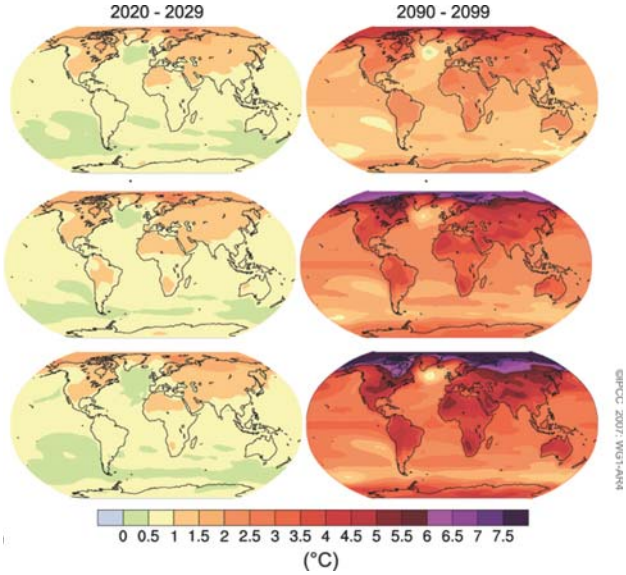
SCIENTIFIC RELEVANCE

ERICON AURORA BOREALIS

Polar Oceans play a critical role in the earth system. They are characterized by large areas that are permanently or seasonally covered by sea ice, very low temperatures, pronounced seasonal changes, and bordering prominent continental ice sheets. These areas control global climate evolution on a broad range of time scales and directly influence global ocean circulation, sea level change, atmospheric forcing and teleconnections. Complex interactions between ecosystems, ocean, atmosphere and sea ice determine the nature of these unique regions. Long repeated time series observations will be critical for understanding the functioning of the Arctic and Antarctic climate system.

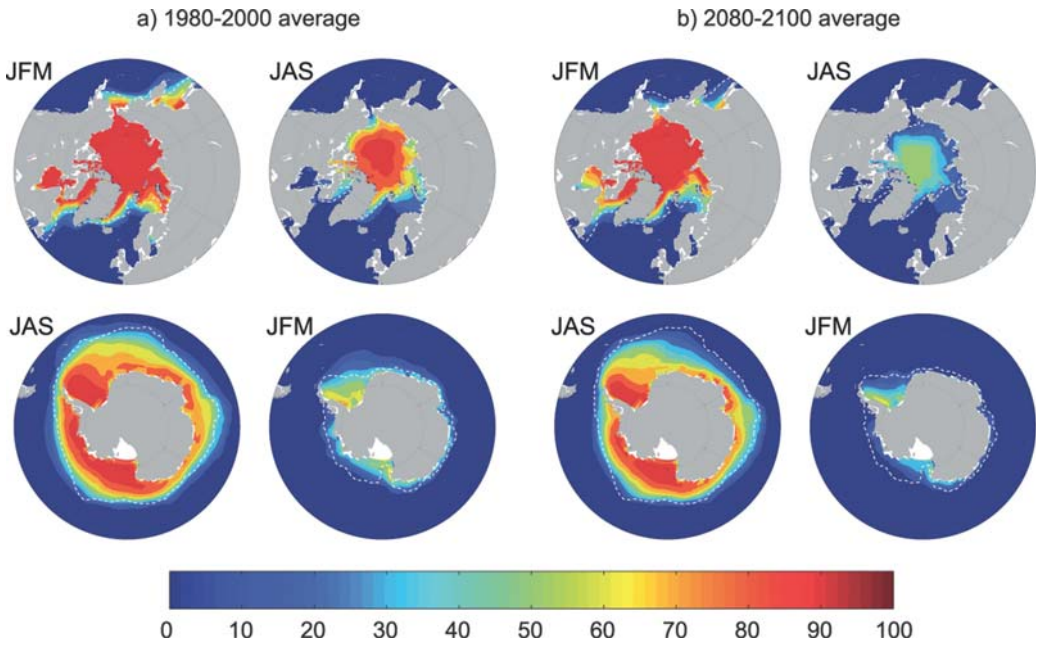
The Polar Oceans are potentially most vulnerable to present and future global environmental changes on our planet, where small shifts may cross thresholds, trigger unknown feedbacks and cause irreversible consequences. Research in the Polar Regions play a decisive role in developing and applying mitigation and adaptation measures for changing high latitude environments. Today, even the most sophisticated modelling forecasts, e.g. the IPCC 4th Assessment Report, are limited by insufficient data coverage in high latitudes. But Polar Regions will certainly face some of the most dramatic changes such as unprecedented rise in temperatures (Fig. 1), surpassing in magnitude other regions on Earth.

Fig. 1) Temerature rise



Understanding polar natural variability demands an extensive and profound knowledge of involved processes. To gain this insight, natural paleoenvironmental archives such as sediment cores from the deep seafloor must be retrieved and analysed. Despite the significance, polar realms are not well understood and substantially lack temporal and areal coverage in discrete sampling and observations. There is a lack of information about natural physical or biological variability of the oceans or long-term shifts in the cryosphere or ecosystems due to the extreme technical and logistical efforts involved to operate in these extreme environments. Even with widely differing forecasts about changing climates in the high latitudes, both Polar Regions will remain a challenge to operate in, due to severe ice and weather conditions (IPCC AR 4: Arctic and Antarctic Summer/Winter Sea ice concentration analysis/forecast see Fig. 2) for the foreseeable future.

Fig. 2) Sea ice concentration



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PRIORITY TARGETS FOR POLAR RESEARCH:

AURORA BOREALIS SCIENCE PORTFOLIO

The unique year-round operational capacity will allow crucial new process-oriented studies of Polar Regions. Expeditions can be staged outside the optimal weather windows of opportunity, independent of the vagaries of drifting pack ice or limitations by severe weather and endurance, even in completely ice-covered waters. These scientific research comprise topics like:

- Climate Variability: scales and indicators of polar climate change to forecast future threats and possibilities.
- State and stability of the cryosphere: changing biodiversity and ecosystems in polar environments: Integrated real-time ice–ocean–atmosphere–hydrosphere observations and forecasting for users and inhabitants of Polar Regions.

The advanced scientific drilling capability turns AURORA BOREALIS into an extremely useful and necessary platform for scientific deep-sea drilling in regions inaccessible by other, conventional drilling platforms with a focus on:

- Reconstruction of past climatic variability including extreme events.
  Unravel the tectonic and geodynamic history of the Arctic and Antarctic ocean basins.
  Reconstruct the long-term history of Antarctic ice sheets and the transition from a distant “greenhouse” into the current “icehouse” world.
- Assess nature and stability of the submarine permafrost environment, evaluate the potential de-stabilisation of continental margins and releases of gas hydrates into the hydro- and atmosphere.
- Long-term geophysical monitoring of boreholes and the surrounding environment with observatories and instruments.
- Access the deep biosphere below seafloor and study life in extreme environments below permanently ice-covered ocean basins.

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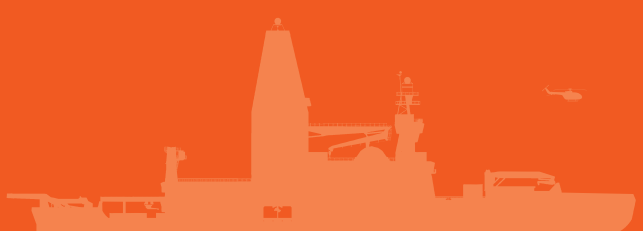

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