Towards a European Research Icebreaker and Deep Sea Drilling Facility for Polar Research: ERICON-AURORA BOREALIS


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The European Research Icebreaker Consortium - AURORA BOREALIS (ERICON-AB) was established in 2008 to plan the scientific, governance, financial and legal frameworks needed for the construction and operation of the first multi-nationally owned and operated research icebreaker and polar scientific drilling platform.

The AURORA BOREALIS is planned as:
- a heavy icebreaker with the highest ice class
- powered to break continuously in more than 2.5 m of multi-year ice and
- able to manage ridges of more than 15 m
- to autonomously perform dynamic positioning in pack ice of more than 2 m thickness while deploying the entire suite of drilling equipment and analytical tools.

The ship shall perform year-round research tasks including scientific drilling in the Arctic and Antarctic without any support vessels. The main task is to perform multi-disciplinary polar and marine research as a European large-scale research infrastructure, including long-term sustained service as a mobile polar observatory and conducting extensive bathymetric, geophysical, biological and other survey works.

The ERICON-AB Science Advisory Panel (ESAP) is a scientific consultative body established within the project. It provides the Consortium with efficient expert advice for the ERICON–AURORA BOREALIS Science Plan drafting as well as other relevant scientific and professional community activities.

**THE SCIENCE PERSPECTIVE**

The ERICON-AB project is currently generating a Science Perspective document for the first fifteen operational years of the vessel.

The Science Perspective will focus on the key questions and will provide the long-term scientific rationale and the roadmap for international strategic use of the vessel. This Science Perspective is based on:
- the scientific excellence
- the integration of the European Countries’ polar capacities and perspectives

**Topic 1: The Changing Polar Oceans, Ice and Atmosphere**
1. Why is Arctic sea ice decreasing and Antarctic sea ice not?
2. Stability of ice shelves, glaciers and ice caps, and their influence on sea level rise
3. Which are the Polar sources and sinks of CO2 and other gases?
4. Extending the global climate observing system into polar oceans
5. Which are the climatic consequences of changes in dense water formation?
6. Changing polar ocean circulation, biogeochemistry and earth system impacts
7. Improving weather and sea-ice forecasts

**Topic 2: The Polar Biosphere**
1. What would humankind loose if the biosphere of Polar Regions is not investigated before irreversible changes occur in Polar ecosystems?
2. What are the likely consequences of a changing environment for ecosystem functioning and ecosystem services provided by the polar biosphere?
3. What role has a permanent ice cover in maintaining ecosystem structure and functioning?
4. How will global biogeochemical cycles be influenced by changing biological systems in Polar Regions?

**Topic 3: Polar Paleoclimate and Paleoenvironment**
1. Extreme Climates - What can we learn from the past to explain the future?
2. How sensible is the climate system and which are the rates and amplitudes of sea level change?
3. Paleo-ecosystems: biodiversity and biogeography
4. Transition between Greenhouse and Icehouse Worlds
5. Bipolarity of climate change: connection between the southern and northern hemisphere polar regions
6. What is the role of polar oceans in the carbon cycle?

**Topic 4: The Polar Ocean's Geological History**
1. Timing and mechanisms behind opening of Arctic and Antarctic gateways
2. Formation of Arctic and Antarctic basins
   - Dynamics
   - Subsidence history
   - Crustal thickness, composition, structure
3. Gas-hydrates distribution, properties and dynamics
4. How will global biogeochemical cycles be influenced by changing biological systems in Polar Regions?
5. Bipolarity of climate change: connection between the southern and northern hemisphere polar regions
6. What is the role of polar oceans in the carbon cycle?

**Topic 5: Seafloor Processes and Natural Hazards**
1. Which are the sedimentary processes on shelves, slopes and deep basins?
2. Cold seeps and sub-surface fluid circulation in polar regions
3. Gas-hydrates distribution, properties and dynamics
4. Submarine permafrost: distribution, morphology, stability
5. Continental slope stability assessment in polar areas
6. Seismicity and paleoseismicity in polar areas

**SCIENCE PERSPECTIVE - TIME SCHEDULE**

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Nov 2010</td>
<td>1st ESAP meeting at CS</td>
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<tr>
<td>Jan 2011</td>
<td>Deadline EU contribution</td>
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<tr>
<td>Feb 2011</td>
<td>2nd ESAP meeting at CS</td>
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<tr>
<td>Mar 2011</td>
<td>Deadline ESAP contribution</td>
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<tr>
<td>Apr 2011</td>
<td>SCIENCE PLAN PUBLIC REVIEW</td>
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<tr>
<td>May 2011</td>
<td>SCIENCE PLAN FINAL VERSION</td>
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<tr>
<td>June 2011</td>
<td>End of the project</td>
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**GROUP COORDINATION**