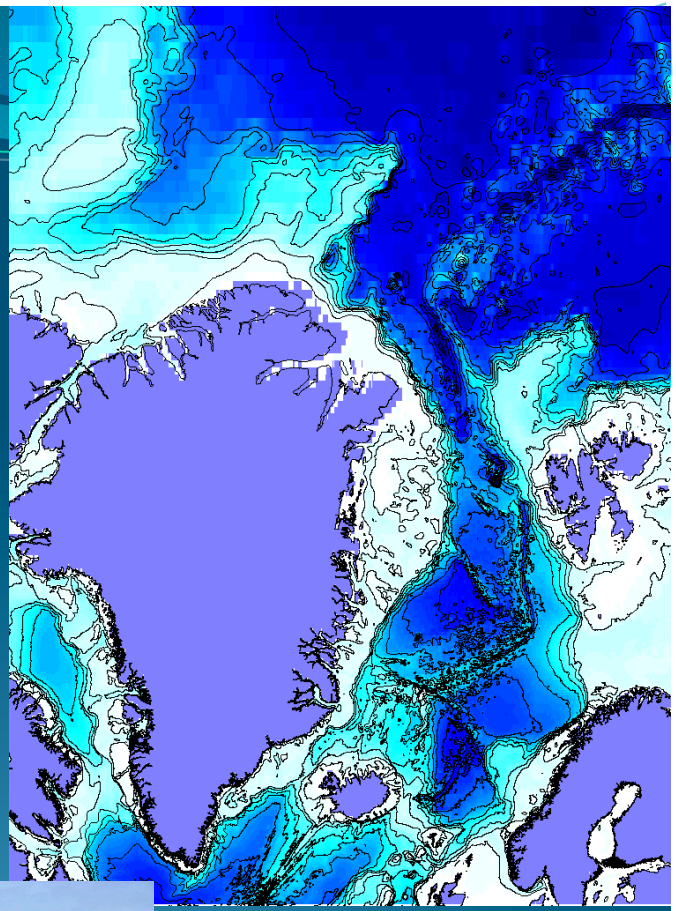
Results of Polar Research Board report pending:

-sharing of infrastructure resources
-bi-polar approach to

Nature, v. 469, 13 January 2011



Antarctic Sund, East Greenland

glacial

bedrock

geodetic surveys

marine geology

Use of helos for land support in more remote areas

Interdisciplinary approach
marine and terrestrial cruises i.e. LARISSA

cGPS installation along Nordenskold Coast from *NB Palmer*.

Drilling & Long Core Facilities

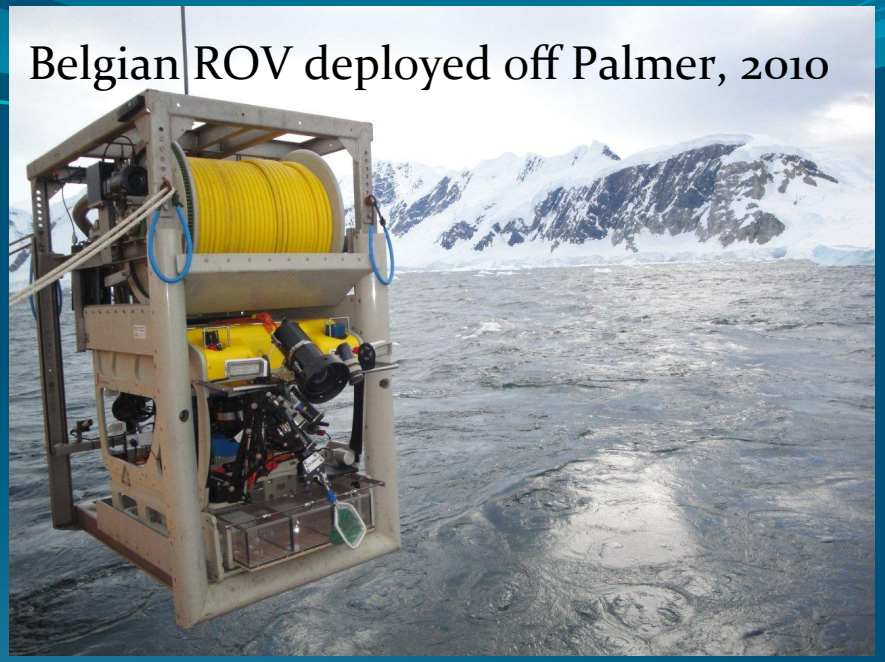
moon pool on general purpose ship

vs. IODP model, *J. Resolution* every ~12 year drilling on Antarctic margin

Better integration of intellectual resources and multi platform utilization for increased efficiency.

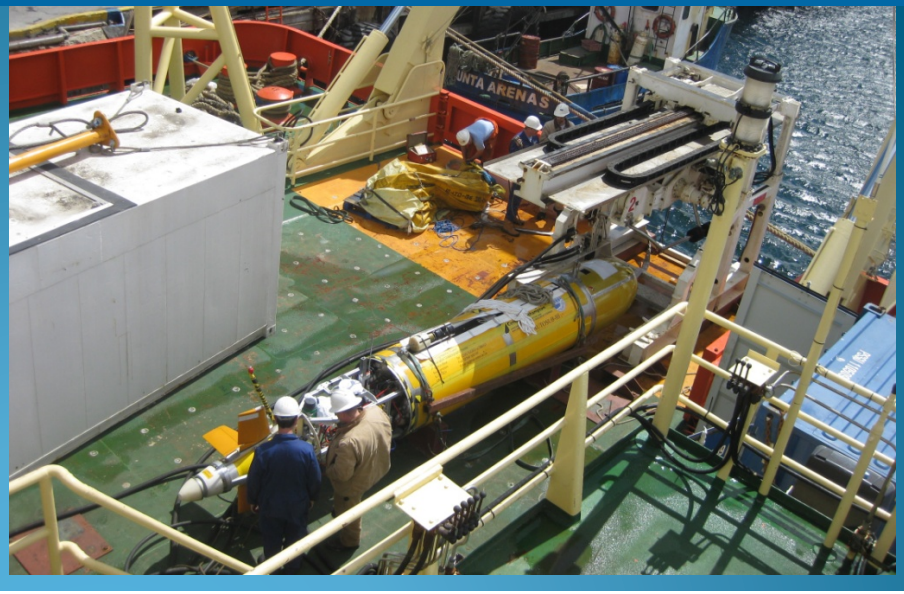
Need ROV support infrastructure and flexibility on new ship

Belgian ROV deployed off Palmer, 2010



Cold Seep discovered via simple low cost towed video sled

UK Autosub, on back deck of *NB Palmer*, Punta Arenas, Chile December 15, 2008



Rates of SLR and related environmental impact. Development of new Data Logging Systems, Mooring Deployment and
Recovery (specifically in ice covered polar regions)

how effectively is the ocean thinning ice shelves, leading to increased ice sheet discharge and rising sea level?

What was the extent and configuration of the Antarctic Ice Sheet (AIS) and fringing ice shelves prior to the
LGM? How has the AIS responded in the past, and how will it respond in the future, to warming air temperatures and
rising sea level?

Ice-Ocean Interaction, Glacier responses to climate and ocean warming. Cryospheric change in Antarctica is widespread. Areas of major US community interest at present include the Antarctic Peninsula and Larsen B and C Ice Shelves; and Pine Island Bay . Emergent regions in the coming decade are Getz Ice Shelf, Fimbul Ice Shelf, Cook Ice Shelf, Denman Glacier, and Totten Glacier. To support activity in these regions, both onshore and offshore -- or any area that emerges as climate continues to change -- the new vessel requires excellent icebreaking capability and onboard helicopters. The vessel should carry onboard helicopters as a standard practice. This is the case for the 'peer' vessels Healy, Polarstern, Aurora Australis, Aaron. As for ship size and capability, the NB Palmer is an excellent vessel, and should be regarded as a starting point in capability. I would support a 5%/10% increase in its size, focusing on access, some increase in hangar space, and a few more berths (~4). There will be conflicting pressure for more berths, more specialized labs. There will be a need for trade-off paradigms. My suggestions (in handy 'mantra' form) are: 'Access anywhere' is more important than 'taking everyone'. 'Access anytime' is more important than 'onboard genetic analysis' (for example). Note that, for ice-bound coasts (inland of the actual shoreline), in areas of active ice flow, there -is- no other access for scientists (geologists or glaciologists) than helicopters deployed from a ship. We need this capability desperately if we are to continue leading scientifically in the field of polar climate and ocean change. Note the herculean logistical effort to deploy science teams at Pine Island Glacier.

What is the history of continental rifting in Antarctica as preserved in the petrology of the seafloor in the Ross Sea? In order to sample the seafloor, I need a ship for dredging.

Sediment core recover of wide capability, drilling, gravity cores, jumbo piston cores, etc.. Shore deployments for glacial geology and GPS surveys along coast via small boat or aircraft. Use of ROV systems for bottom surveying. Scientific questions: What is the nature of sub ice shelf sediment sequences, what is the relationship between benthic habitats and changes in sediment flux? What is the history of ice shelf fluctuations across the Antarctic Peninsula? What role due sea level and ocean warming have upon ice mass recession in the past and at present?

My main research interest concerns the fate and cycling of labile organic matter in Antarctic sediments. I also examine chemical/biological interactions in Antarctic continental margin sediments. I am involved in some research on the Larsen Ice Shelf. It would be useful to have an icebreaker with a higher probability of making it to the Larsen Ice Shelf than the NBP. At present the Polarstern has better access to this field area than any of the US icebreakers.

Ice breaking abilities during all seasons and
access to the ice during cruises.

Access to the seafloor at high latitudes using AUV and ROV capabilities to investigate the functioning, biogeography and
biodiversity of chemosynthetic ecosystems, their geologic settings, their chemical impact on the overlying oceans and
their potential relevance to astrobiological exploration.

Capability for long cores, detached drilling systems,
offshore clean labs, advanced imaging systems, TV-guided
samoling
equipment.

How do changes in the ocean affect the stability of marine-terminating portions of ice sheets? What timescale of
variability is important for propagating changes to the ice sheet? What is the freshwater export from ice sheets in liquid
(submarine runoff) and solid (icebergs) form? Requires ice-class vessels to work deep inside glacial fjords in Greenland
and around tidewater-terminating parts of Antarctica.

Volcanic, hydrothermal, and seismic activity of Arctic mid-ocean ridges. Primary assets required are polar capable ROVs and AUVs.

How are ice-shelf loss, glaciological changes, and other climate warming effects restructuring marine ecosystems and altering biogeochemical processes around Antarctica? How does biodiversity vary as a consequence of environmental forcing in the unique marine ecosystems of Antarctica? Ar there hotspots of biodiversity in Antarctic marine ecosystems that are especially vulnerable to climate change? These research questions will require, in part a large oceanography vessel capable of (1) supporting interdisciplinary studies on single cruises (ROV operations, oceanography, marine geology, glaciology), (2) breaking into areas of heavy sea ice, and (3) carrying a large complement of scientists (circa 50).

1. What are the oceanic controls relevant to ice sheet and outlet glacier variability from decadal to centennial timescales?
Ice-strengthened or preferably ice-breaking capacities which will allow us to make measurements at the margins of the
ice-sheets, especially around Greenland which is presently beyond the reach of most icebreakers. Ability to sail into and
deploy moorings in Greenland's glacial fjords. 2. How do fluxes of heat, freshwater and mass transported across the N.
Atlantic's subpolar gyre vary on seasonal to decadal timescales and how are these connected to the Atlantic Overturning
Circulation Variability ? Ice-strengthened or preferably ice-breaking vessel able to work on the East and West
Greenland shelves.

Scientific questions revolve around ice-ocean interaction. This requires physical oceanography in ice covered fjords and helicopter access to glaciers

Scientific drilling capability for SHALDRIL type projects. (A.) Obtain well-dated, strategically located geological records
that directly sample past Antarctic ice sheet dynamics to: 1. Determine the range of temporal and spatial variability of
the marine-based West Antarctic Ice Sheet and the low elevation margins of the East Antarctic Ice Sheet (e.g. ice extent,
ice volume & contribution to global sea level, thermal condition) that may occur due to changes in Earth's climate and
ocean temperatures projected for coming decades and centuries; 2. Determine the structural, tectonic, geological and
geophysical boundary conditions (e.g. paleogeography and paleo-orography) during past ice sheet oscillations; 3.
Determine the effect of ice sheet/shelf variability on the regional extent of sea-ice, oceanic conditions (e.g. temperature
and salinity), water mass variability, ocean circulation, and impacts on Southern Ocean marine biogeochemical cycles. 4.
Determine the broader impacts of ice sheet/shelf and climate variability on ocean circulation processes within the
Antarctic Circumpolar Current and its Southern Ocean gyres and investigate the downstream influences on global
thermohaline circulation (e.g. as tracked along the Eastern Margin of New Zealand by previous ocean drilling).

Quaternary and Cenozoic evolution of continental margins. Reconstruction of ice flow and ice streams on the continental
shelf. Relationship of seafloor morphology and ice flow, benthic habitats, and warm water intrusion onto the shelf.
These topics require seafloor mapping (multibeam) systems, single and multi-channel seismic, sediment sampling using
grab sampler and sediment cores, CTD and XBT measurments of the water column. Potentially the use of AUV systems
for sub-ice seafloor mapping.

My research questions focus on reconstruction of oceanographic and climatic history of the circum-Antarctic margin based
on interpretation of marine sediment cores. An understanding of modern systems is used as a basis for interpreting
paleo-record. Capabilities needed include a full complement of marine sediment coring devices (such as kasten core and
jumbo piston core), with strategic site selection based on combination of sub-bottom geophysical data and swath
mapping information. Modern systems work based on underway/along-track data collected via uncontaminated seawater
line and moored instruments (such as sediment traps). Foresee increased use of AUVs and ROVs in general.

Sensitivity of ice shelf basal melt and calving to changing ocean and sea-ice conditions. Require ability to operate close
to ice-shelf fronts in most seasons, including placing equipment (GPS, AWS, hot-water drills for sub-ice-shelf access) on
the ice shelf, mooring and CTD deployments near the ice front, support of AUVs such as the UK Autosub for sub-ice-shelf
surveying.

Very important- Glaciology, geology and sea ice science require helo support. - Essential for
interdisciplinary science.

Clearly I agree wholeheartedly. This is important to a large -- and largely unrepresented -- part of the
polar community. You really don't have the right people in the room to stress this enough, if
'Glaciology' has to be listed under 'Other' at the top of this form (!). I note land-side geology is also not
listed. [members of the community Bindschadler, Domack, Balco, John Stone, Pettit, Hamilton,
Stearns, Truffer, Fricker, Tulaczyk, Rignot, and others will express similar support.]

Our research will continue to address the history of the Antarctic Ice Sheet by looking at its footprint on the continental shelf around the continent. There are three areas where advances in this work could be made following logistical or technical advances to the research platform. 1) We need to continue to reach deeper into the stratigraphic section; this will require drilling rather than just coring. 2) We need to access more areas that are typically under ice cover; this will require more ice breaking capabilities. 3) We need more high-resolution records and time series to document recent changes; this will require simply the time to keep a ship working in certain areas of much of a season and/or repeated several years in a row.