IODP/CDEX


http://www.jamstec.go.jp/chikyu/
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The **U.S.A**. (trough the National Science Foundation, NSF) will re-fit and improve the drilling and laboratory capability of the JOIDES RESOLUTION, and will cover manage the operations of the **non-riser deep water drilling.**

JOIDES Resolution Riserless Drillship

Europe + Canada (ECORD) manages drilling operations that neither the JOIDES Resolution nor the Chikyu can do (ice-covered seas, shallow water).

ACEX (Arctic Coring Expedition)
IODP Exp. 203 (year 2004)

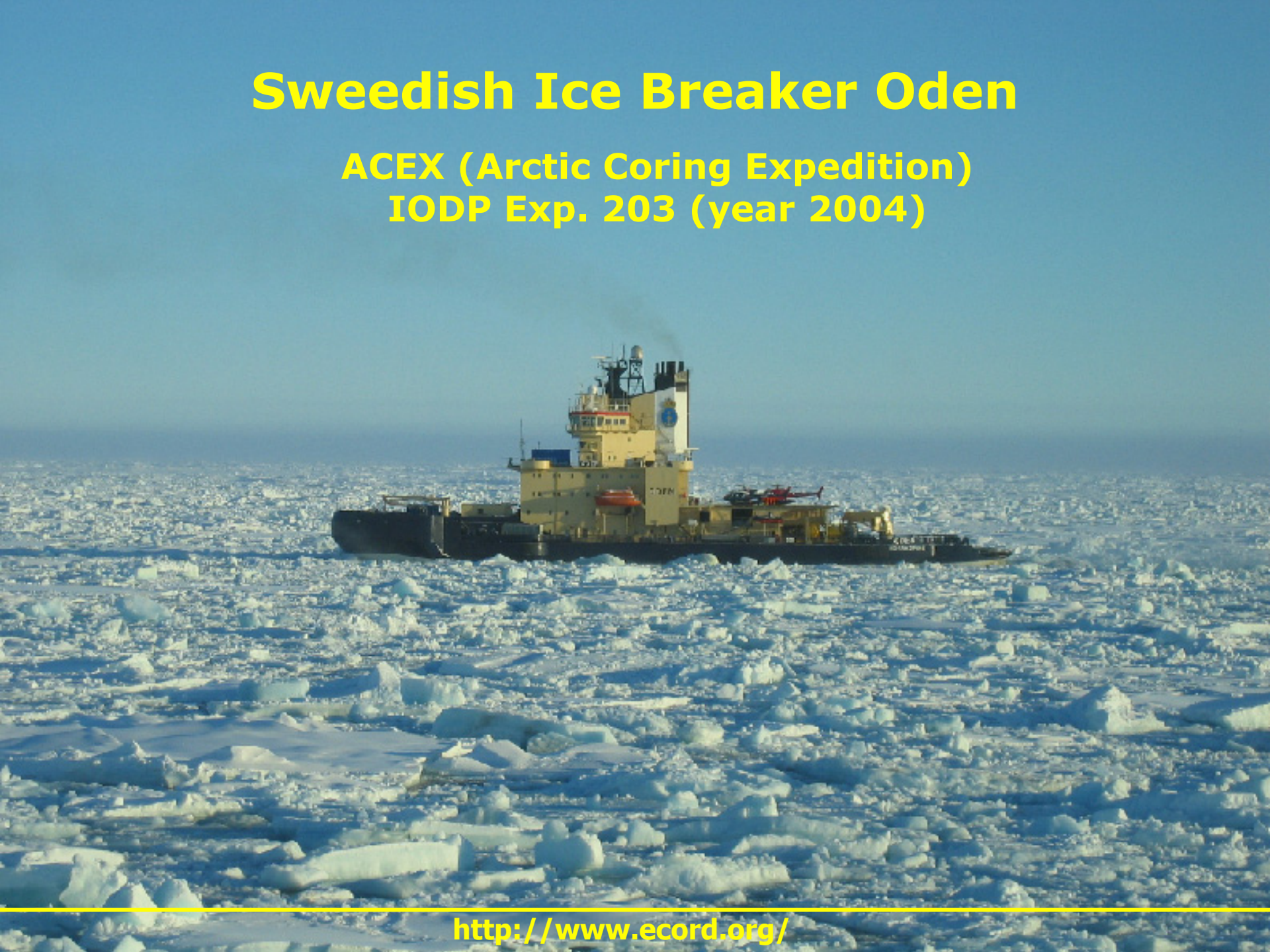
IODP/ECORD

ACEX (Arctic Coring Expedition)
IODP Exp. 203 (year 2004)

Vidar Viking: the drill ship

Sweedish Ice Breaker Oden

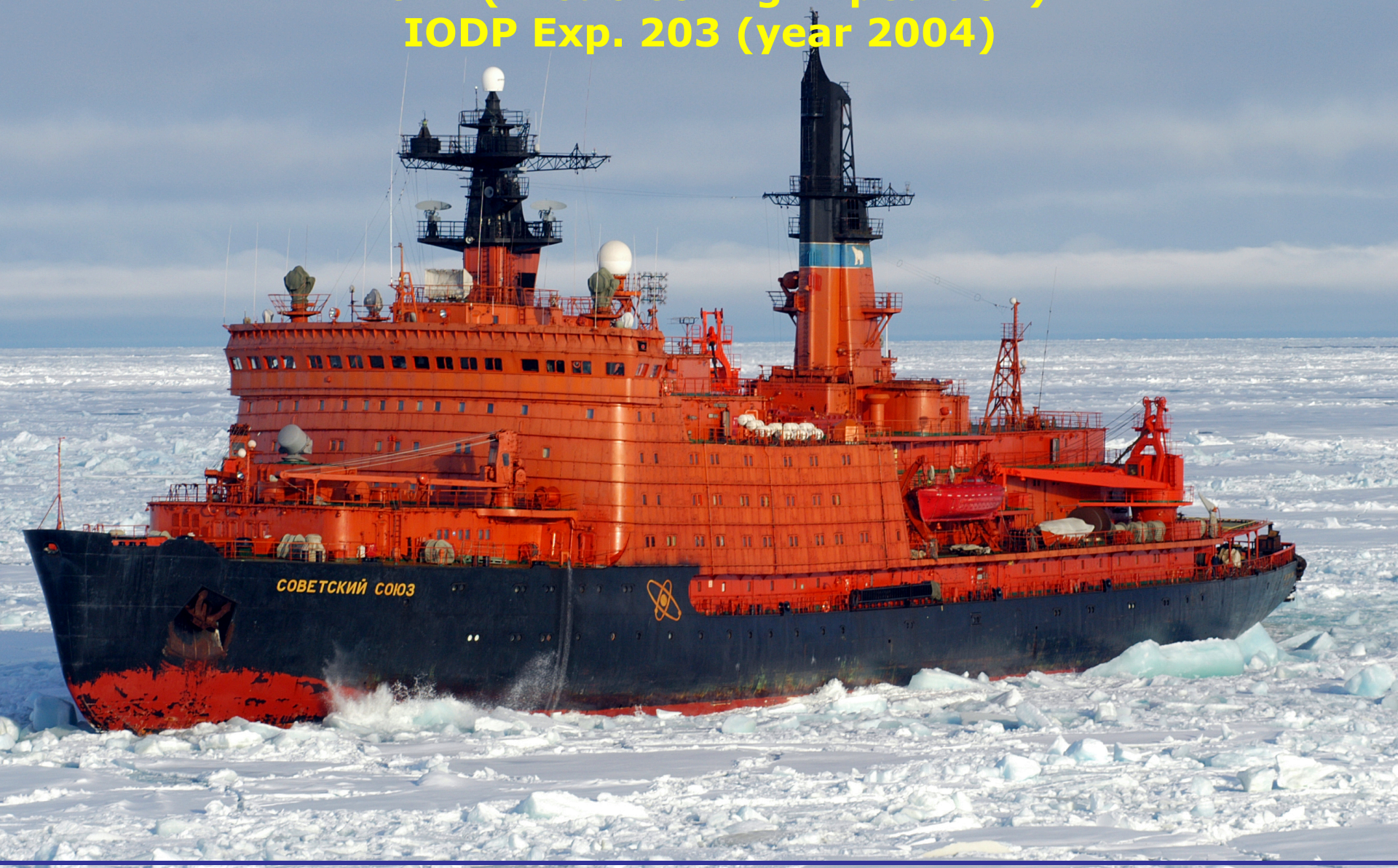
ACEX (Arctic Coring Expedition)
IODP Exp. 203 (year 2004)



http://www.ecord.org/

Russian Ice breaker Sovietsky Soyuz

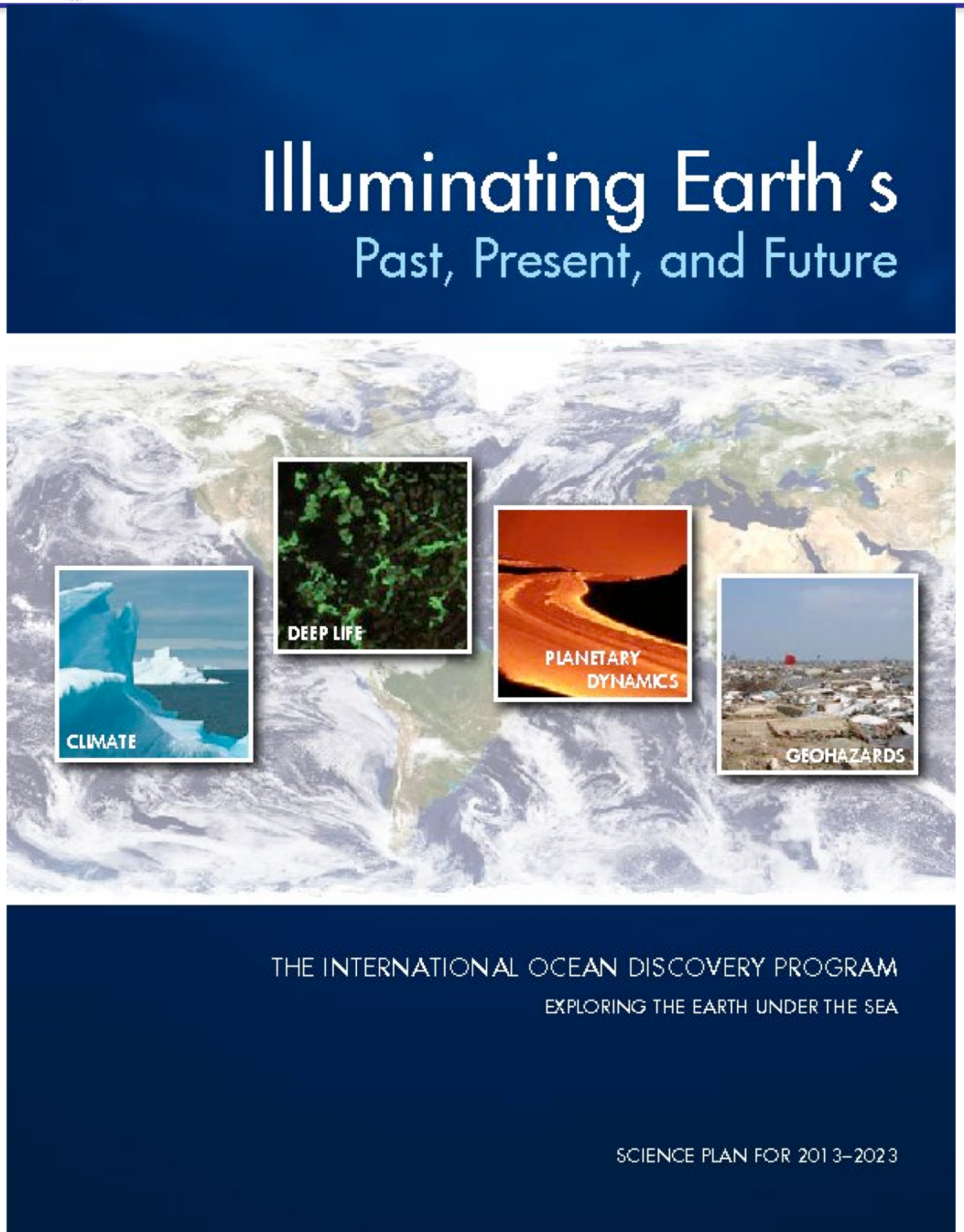
ACEX (Arctic Coring Expedition)
IODP Exp. 203 (year 2004)



DP Hunter, IODP Tahiti Sea Level Expedition (IODP Expedition- 310)

photo A. Skinner © NERC for ECORD Science Operator

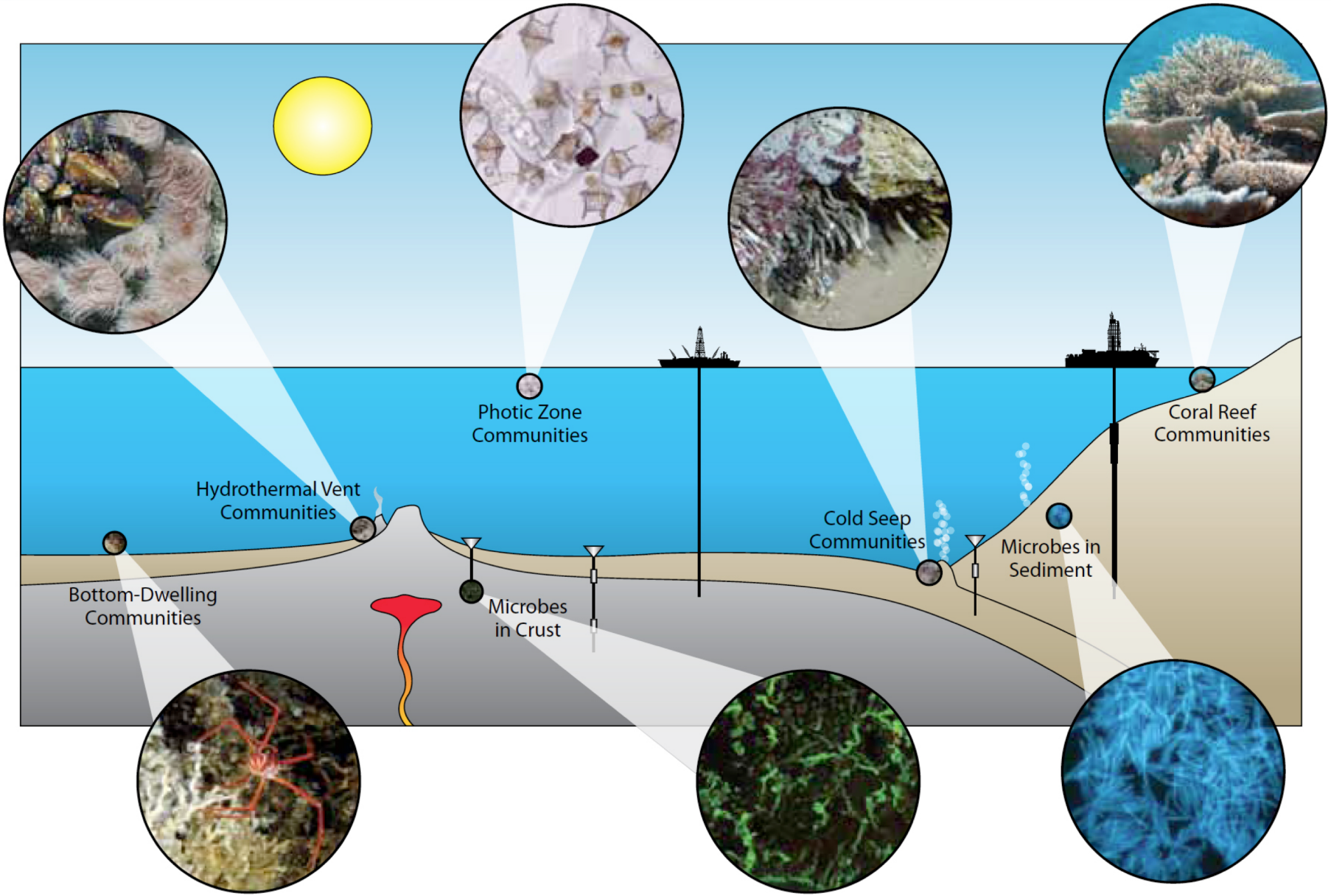
DP Hunter, IODP Tahiti Sea Level Expedition (IODP Expedition- 310, year 2005)



Research Themes

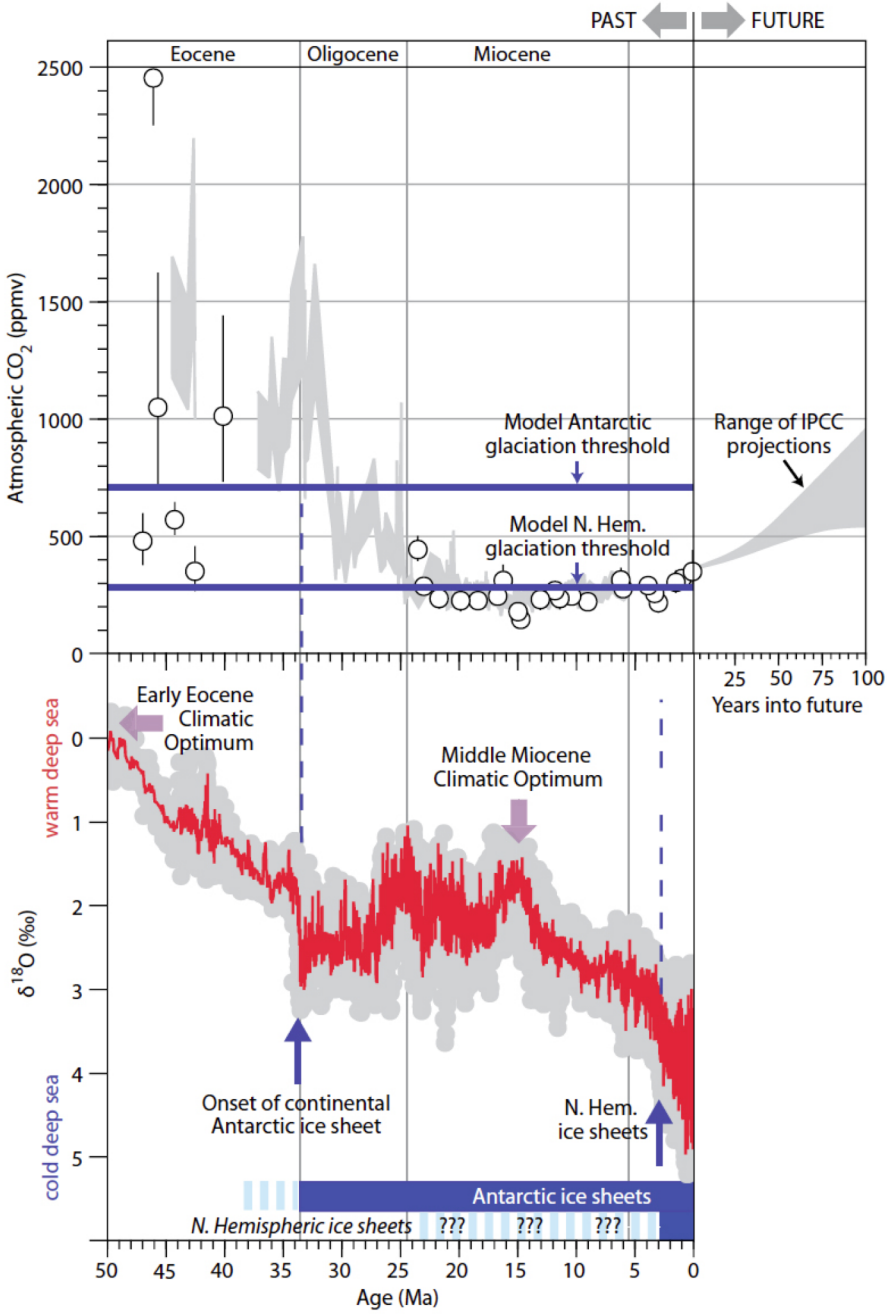
- Climate and Ocean Change: Reading the Past, Informing the Future
- Biosphere Frontiers: Deep Life, Biodiversity, and Environmental Forcing of Ecosystems
- Earth Connections: Deep Processes and Their Impact on Earth's Surface Environment
- Earth in Motion: Processes and Hazards on Human Time Scales

Education AND OUTREACH

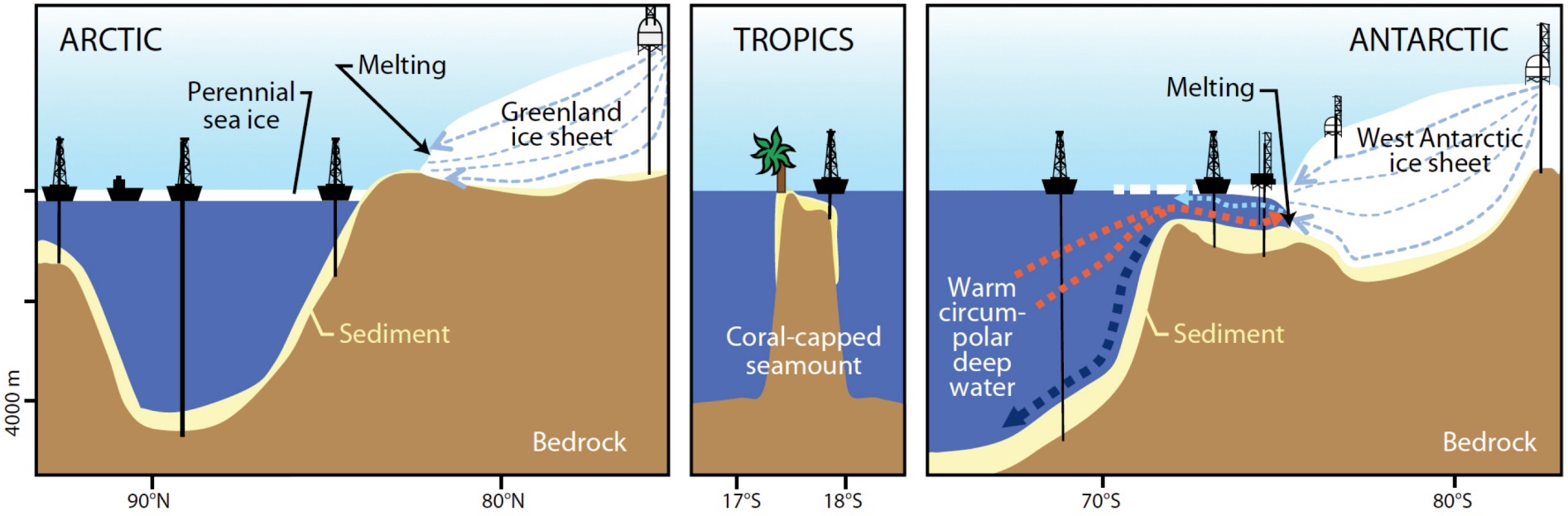


New Science Plan and as follows:
Bottom Dwelling: Ross (2007; Figure 3), Hydrothermal Vents: Devey at al. (2007, Figure 2), Microbes in Crust: Orcutt et al. (2010), Photic Zone: M. Montresor, SZN/Alfred Wegener Institute, Cold Seep Communities: Vanreusel et al. (2009, Figure 6A), Microbes in Sediment: Figure 3. 2B, Coral Reef: Coral Disease Working Group (2007; Figure 2)

Climate and Ocean Change: Reading the Past, Informing the Future

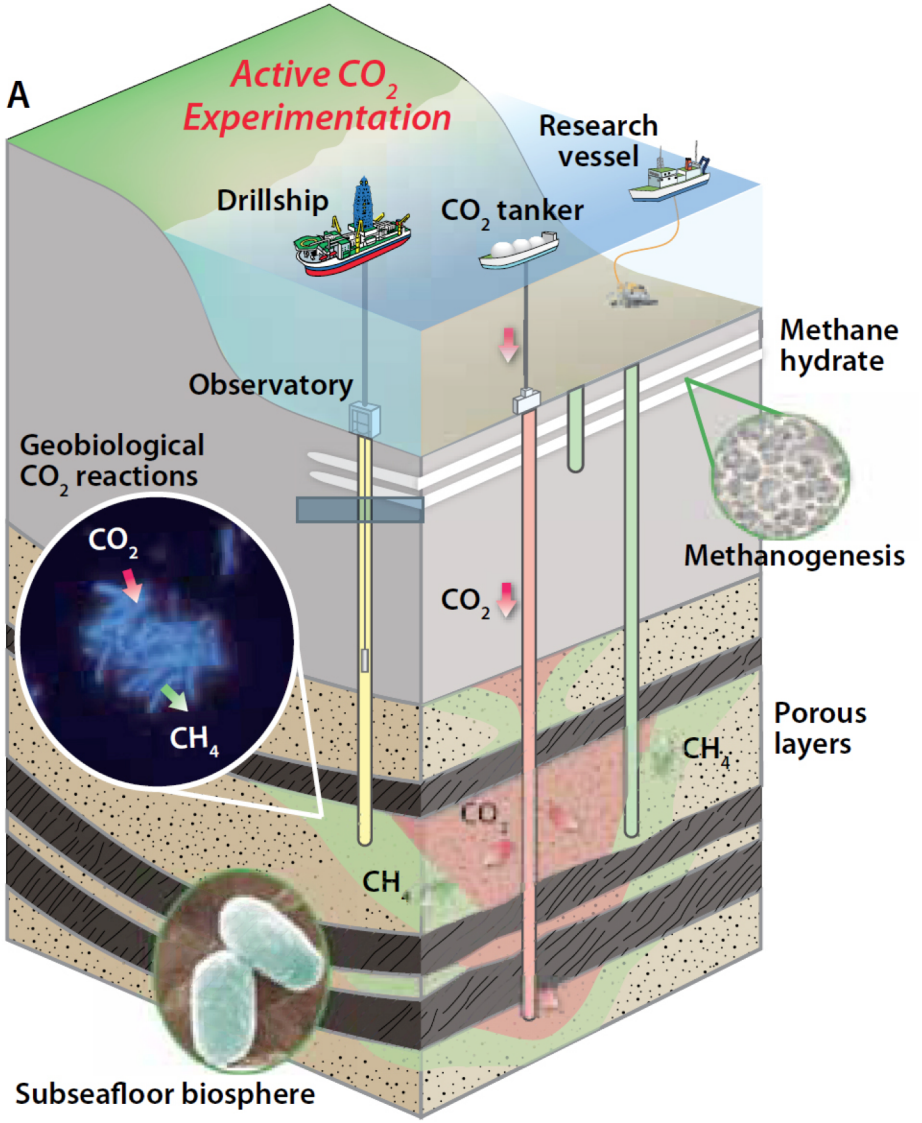


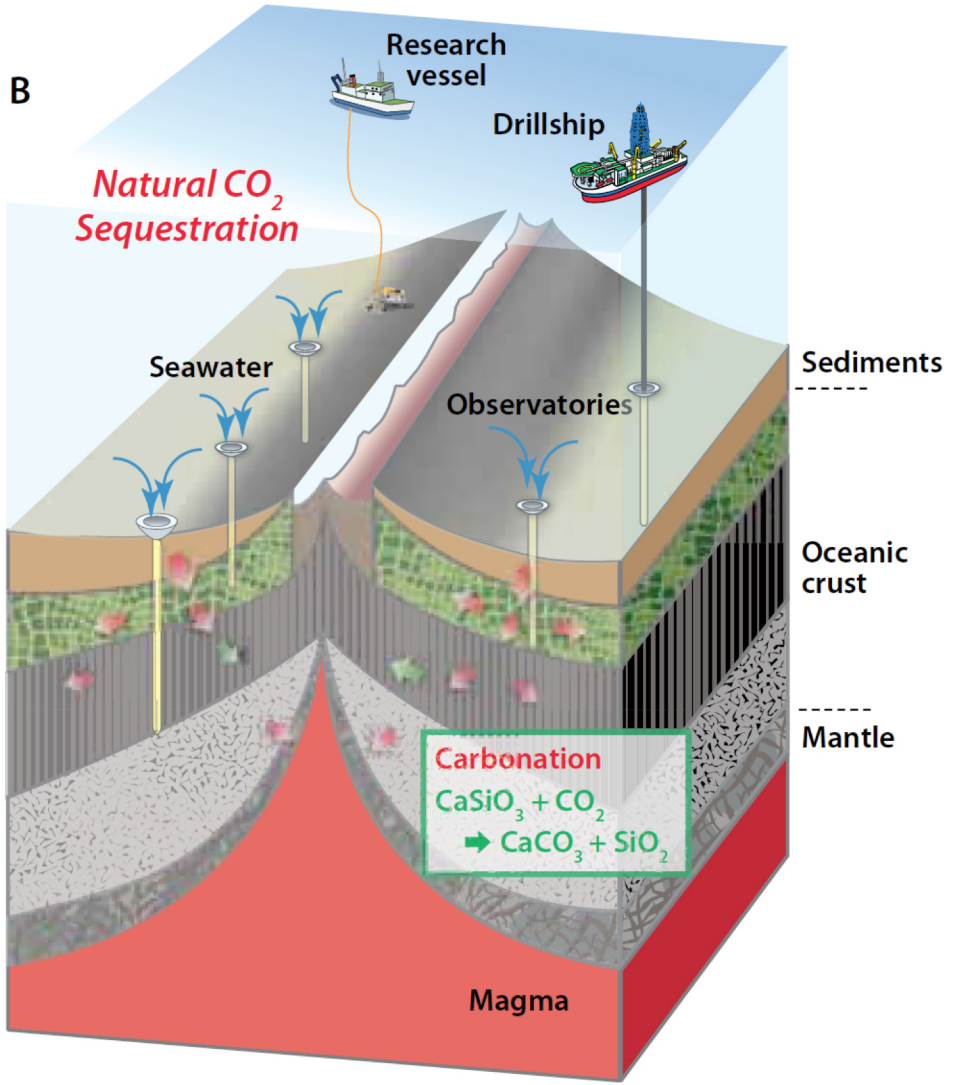
Climate and Ocean Change: Reading the Past, Informing the Future



Elements of this figure were adapted from Schoof (2010)

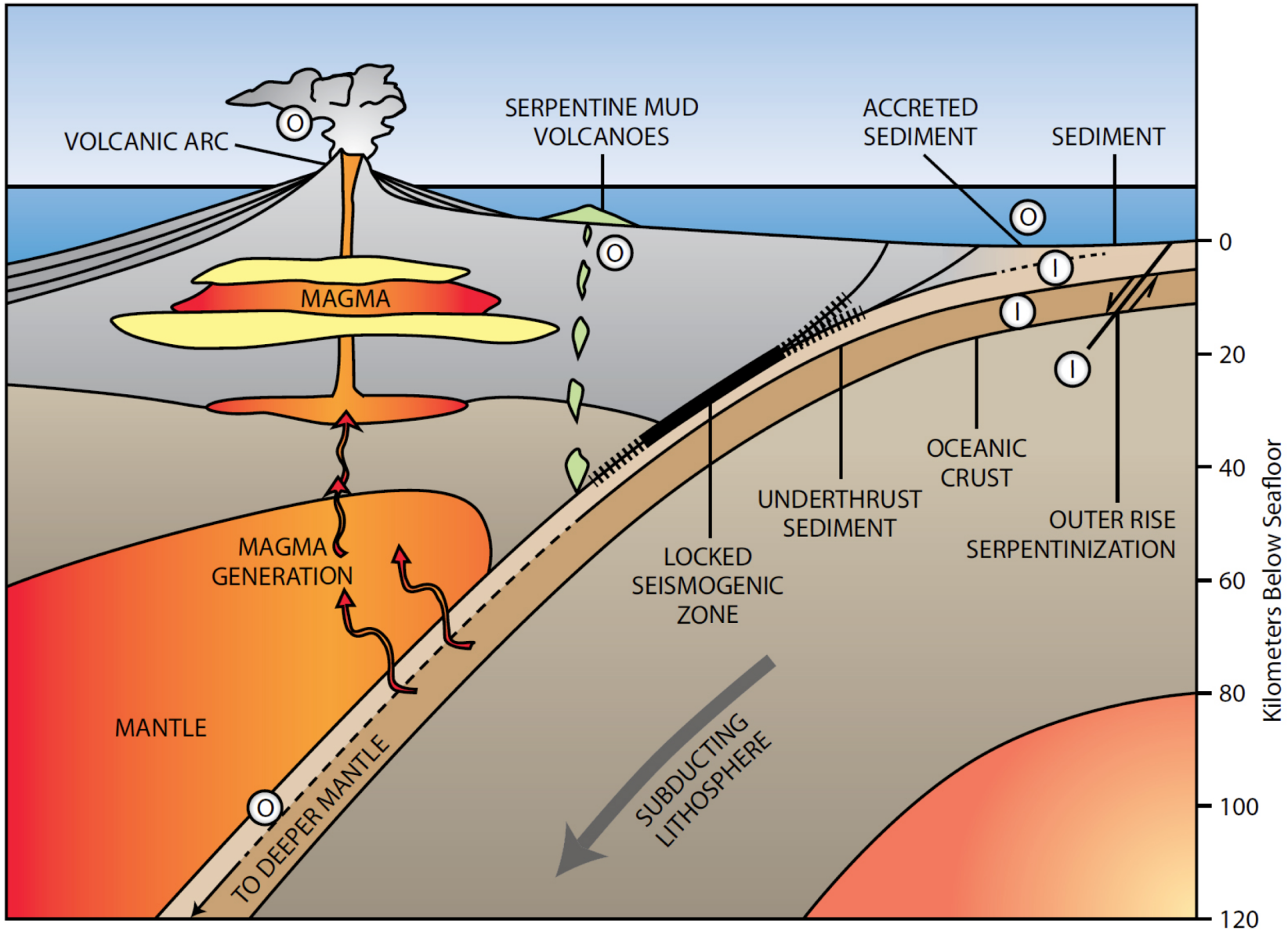
Biosphere Frontiers: Deep Life, Biodiversity, and Environmental Forcing of Ecosystems



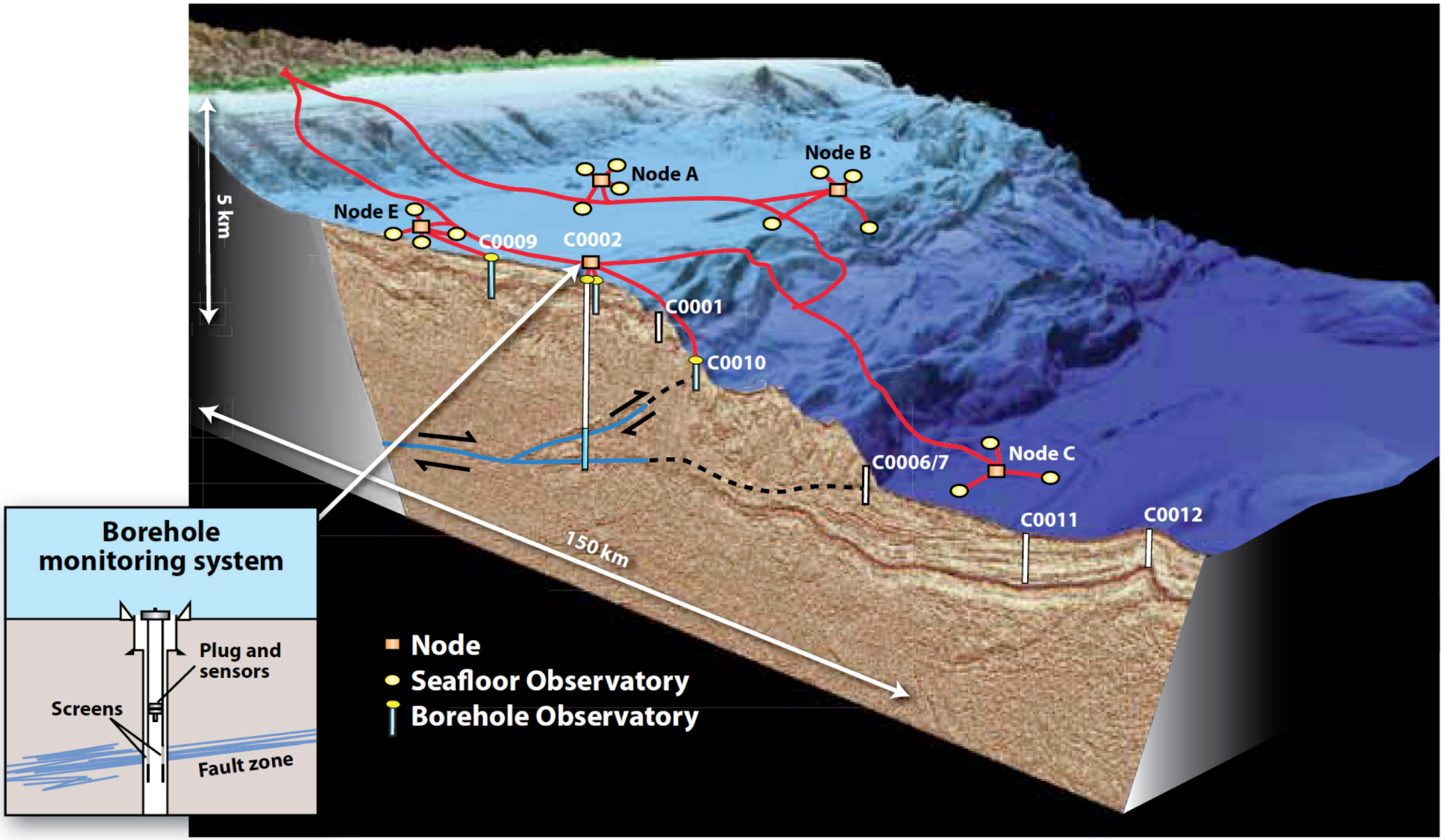


F. Inagaki, JAMSTEC

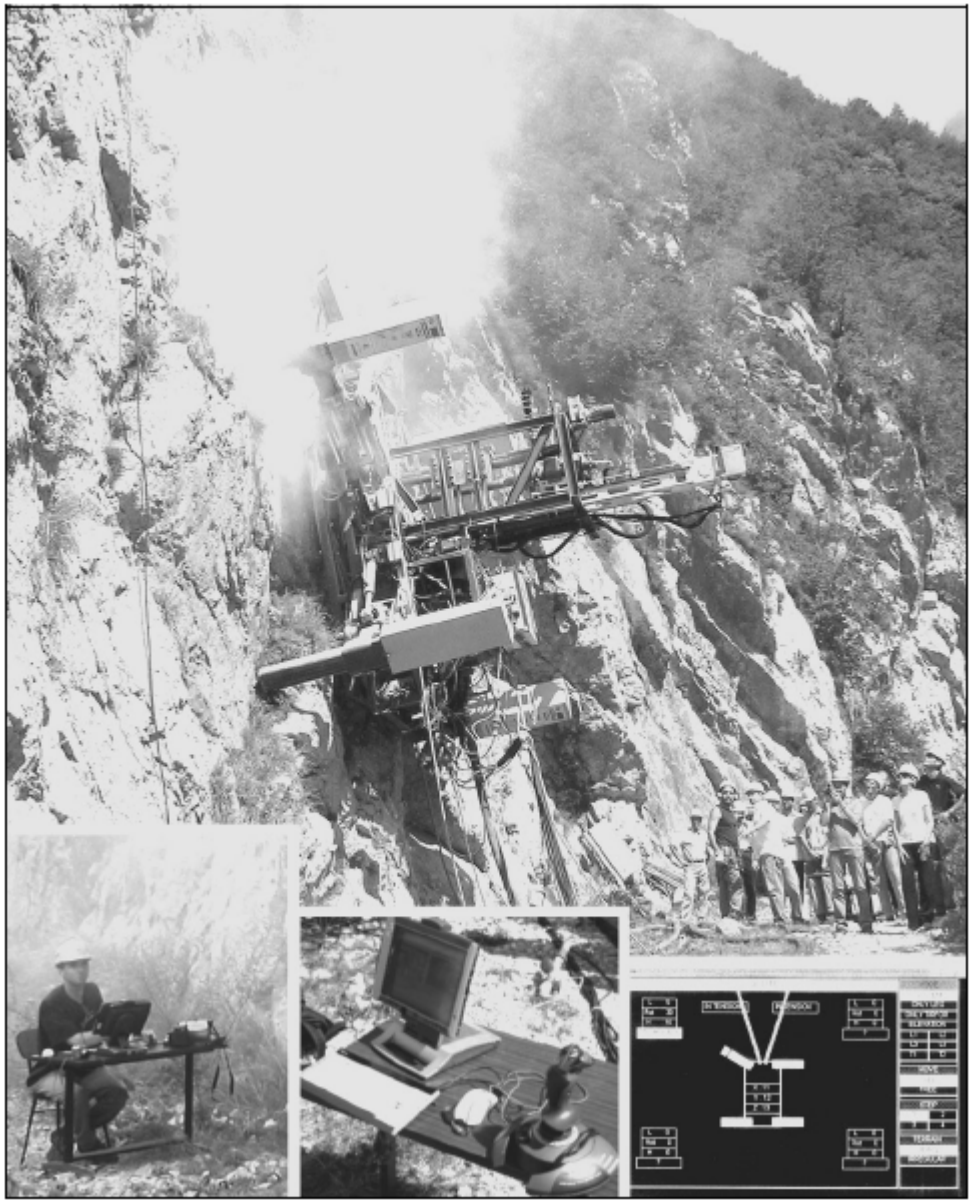
Earth Connections: Deep Processes and Their Impact on Earth's Surface Environment



Earth in Motion: Processes and Hazards on Human Time Scales



Inset from Expedition 319 Scientists (2010)



Why robotic drilling ?

Disadvantage

- Less control on drill process

Advantage

- Safety
- Access to extreme environments (steep walls, extraterrestrial environments, **sea floor**)

Picture: Roboclimber (Molfino, 2005)

Courtesy Time Freudenthal, MARUM, Bremen

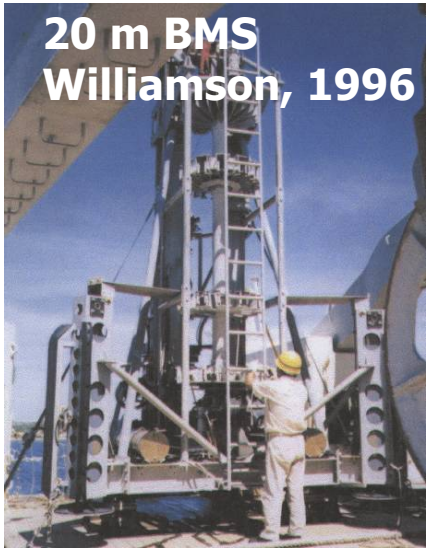
Advantages of sea bed drill rigs

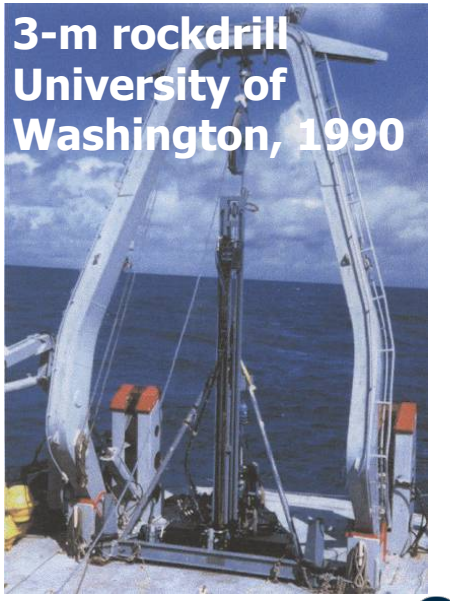
- Stable platform – optimal drill bit control
- No need for drill pipe through the water column
- Operation from multipurpose research vessels

Seabed Rig AS

Courtesy Time Freudenthal, MARUM, Bremen

Existing seabed drill rigs





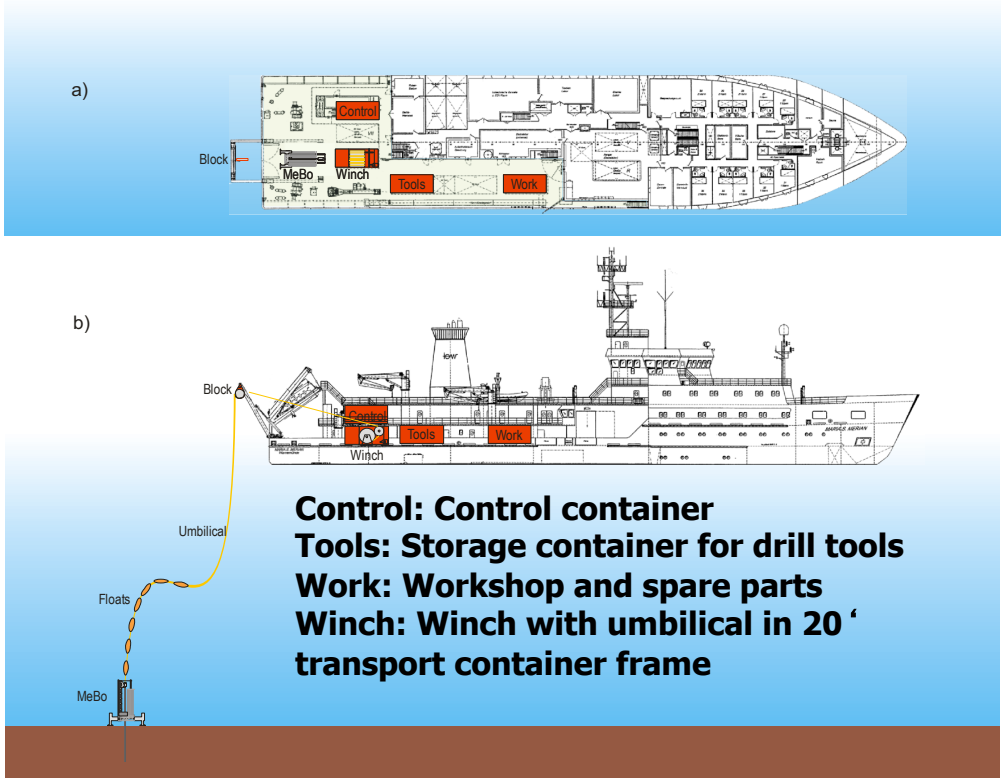
Courtesy Time Freudenthal, MARUM, Bremen

MeBo specifications

- Drilling depth 70 m
- Coring of soft sediments and hard rocks
- Core diameter 55 – 84 mm
- Deployment depth 0 – 2000 m
- MeBo weight about 10 tonnes
- Total system weight about 75 tonnes
- Transport within six 20 ‘ containers

Courtesy Time Freudenthal, MARUM, Bremen

Concept of MeBo



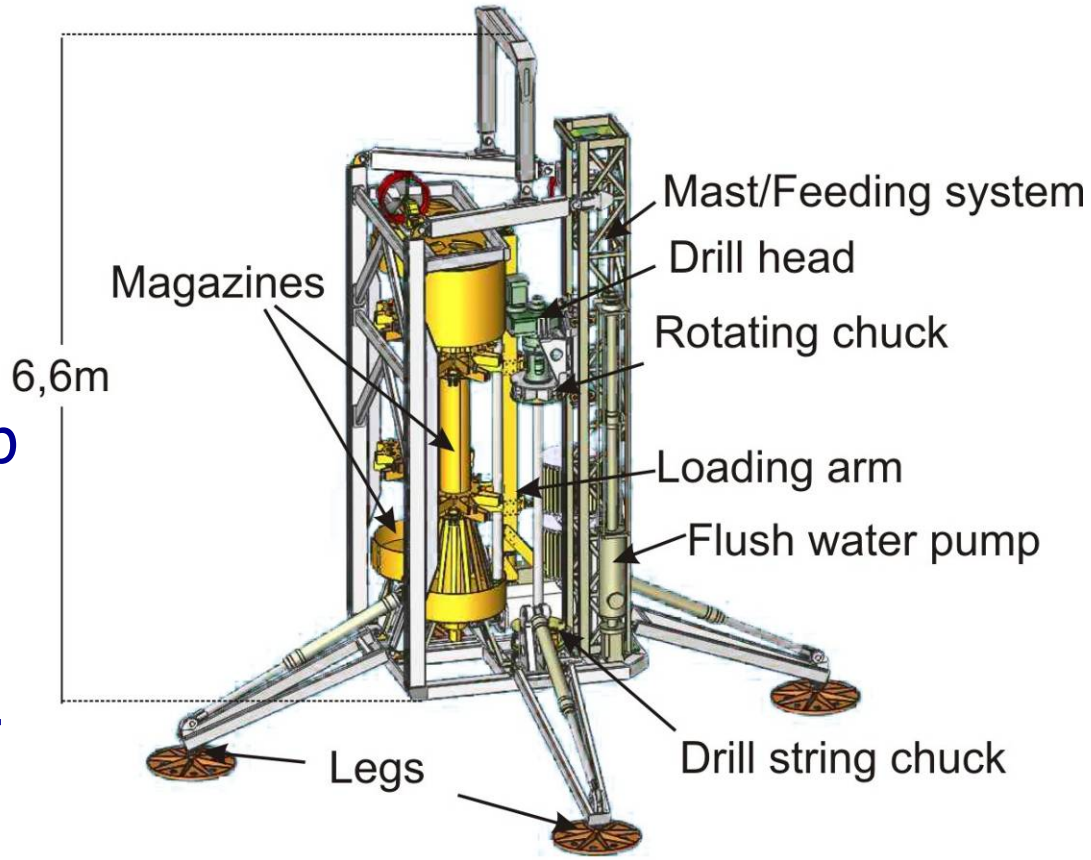
- Umbilical is used to lower the drill rig to the sea floor
- Umbilical is used for energy supply and remote control from the vessel

- Transport of the System within 20 ‘ shipping containers, that are mounted on the working deck of the research vessel

Courtesy Time Freudenthal, MARUM, Bremen

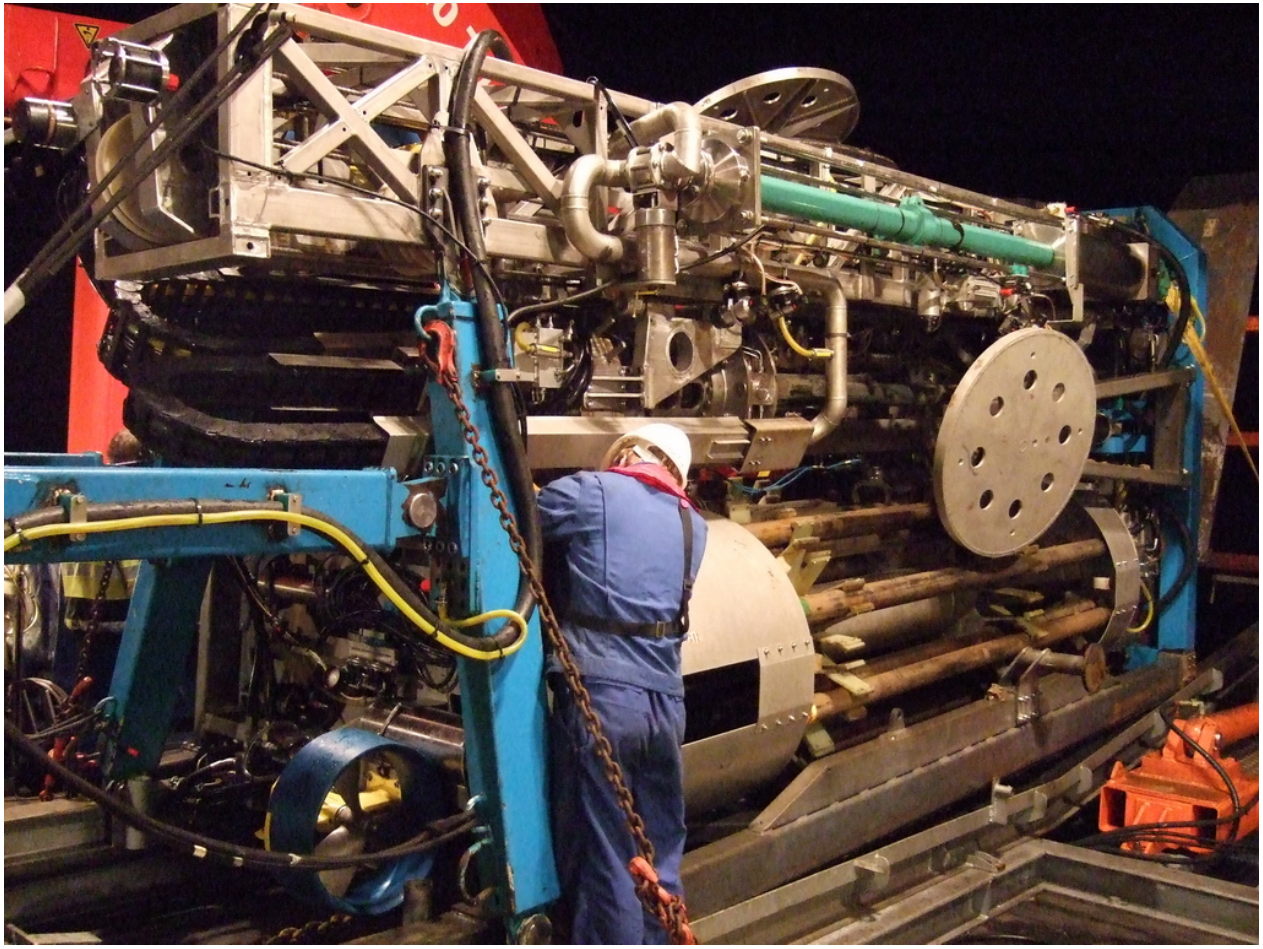
Concept

- Mast, drill head and flush water pump form the central drilling unit
- Drill rig has access to drilling tools stored within two magazines
- The drill string is built up and down using a loading arm and two chucks
- Stability on the sea floor is increased by movable legs



Courtesy Time Freudenthal, MARUM, Bremen

System



Drill rig

For maintenance work between deployments the MeBo lies horizontally on deck. The movable legs are armed in. The rig weighs about 10 tonnes.

Courtesy Time Freudenthal, MARUM, Bremen

System

Winch

The winch stores 2500 m of the umbilical. The pull force of the winch in the upper layer is 12 tonnes.

Courtesy Time Freudenthal, MARUM, Bremen

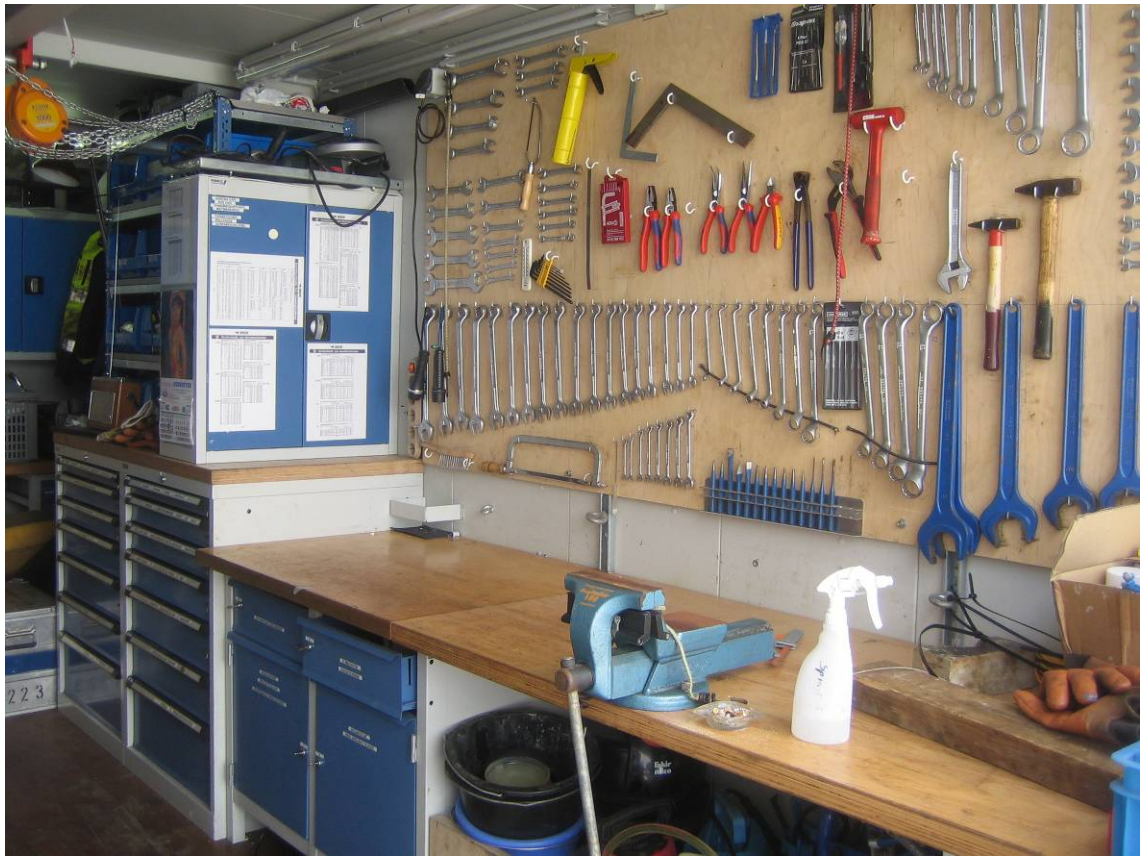
System

Control Unit

The drill rig is remotely controlled from the control container. All actions are surveyed by video cameras and sensors.

Courtesy Time Freudenthal, MARUM, Bremen

System



Workshop

A mechanical workshop and spareparts are transported within a workshop container for maintenance and repair on sea

Courtesy Time Freudenthal, MARUM, Bremen

System

Drill tools

2.35m rods are used to build up the drill string. 30 core barrels and 29 rods are required for core drilling down to 70 m below the sea floor.

Courtesy Time Freudenthal, MARUM, Bremen

MeBo 2004/2005 (HBFG)

Cooperations:

Prakla Bohrtechnik
Schilling Robotics
NSW, STA ...

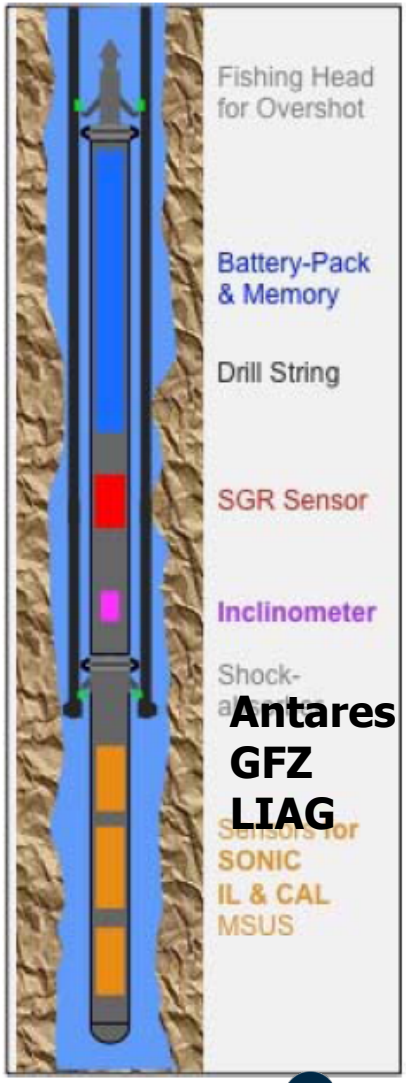
Wire-line 2007/2008 (HBFG)

Prakla
Seyferle

Pressure Core Barrel 2008/2010 (BMBF, SUGAR)

Prakla Bohrtechnik
TU Clausthal

Borehole Logging (2010)



Antares
GFZ
LIAG

Courtesy Time Freudenthal, MARUM, Bremen