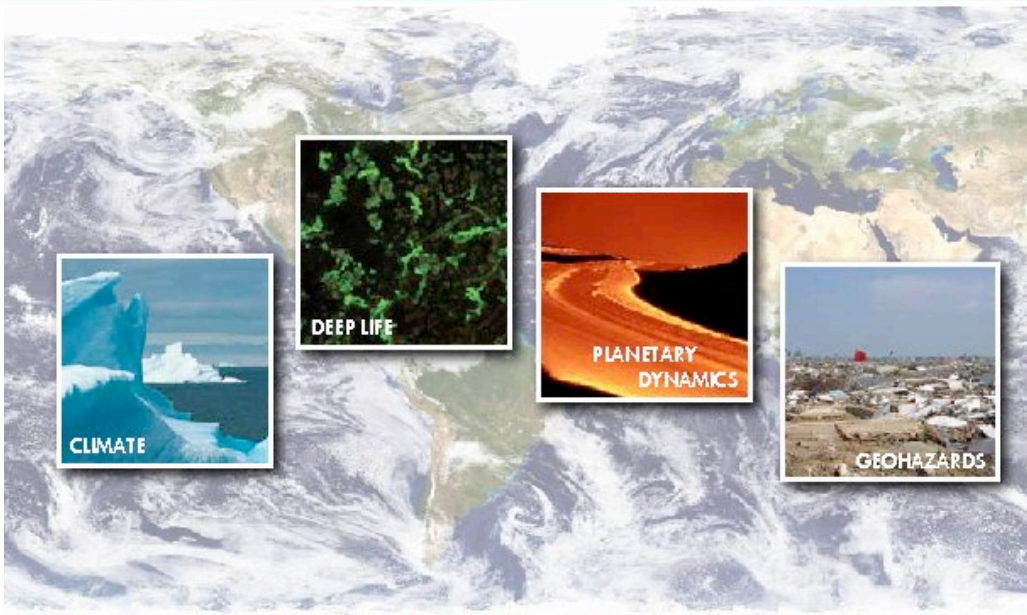


Illuminating Earth's Past, Present, and Future

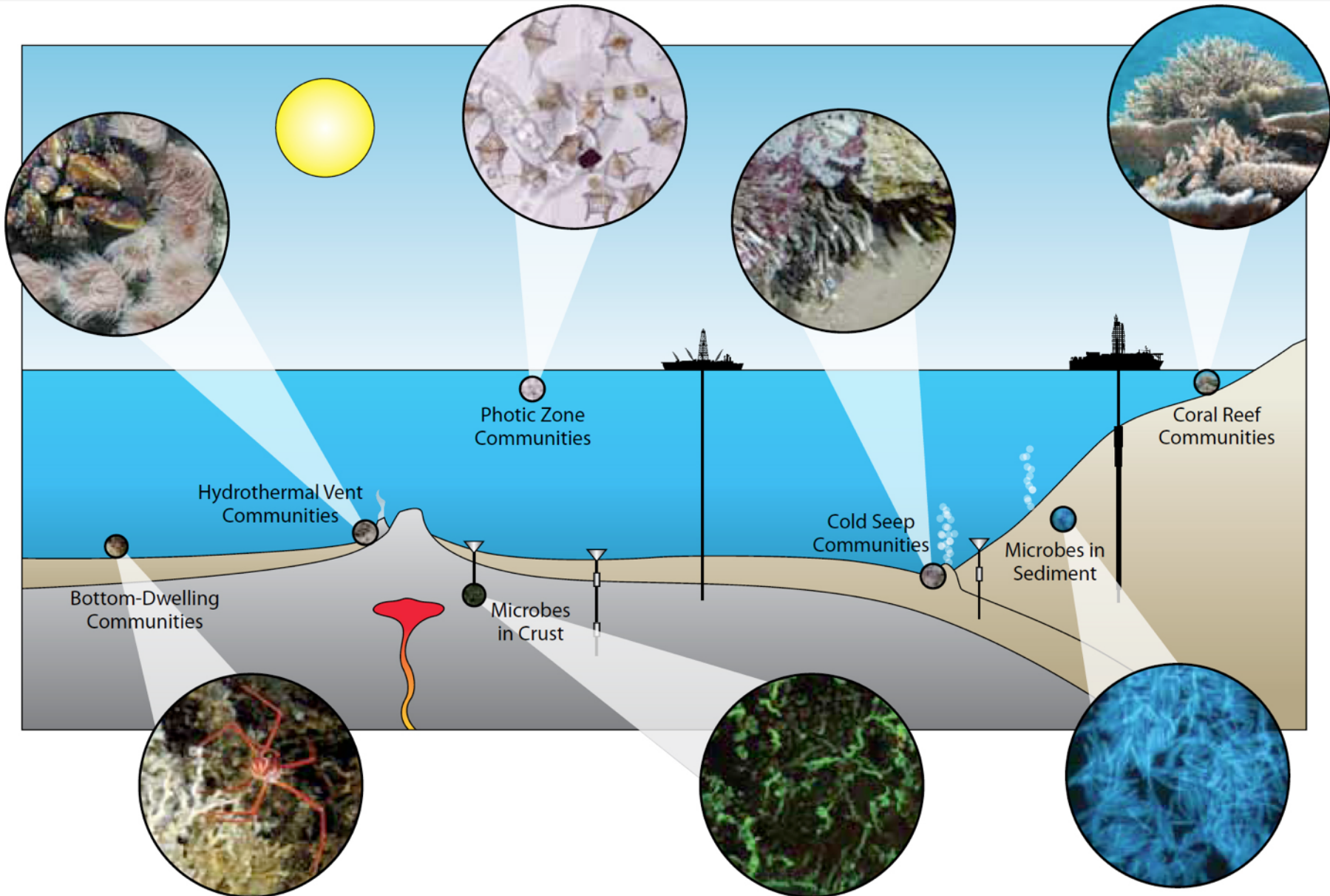


Research Themes

- 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

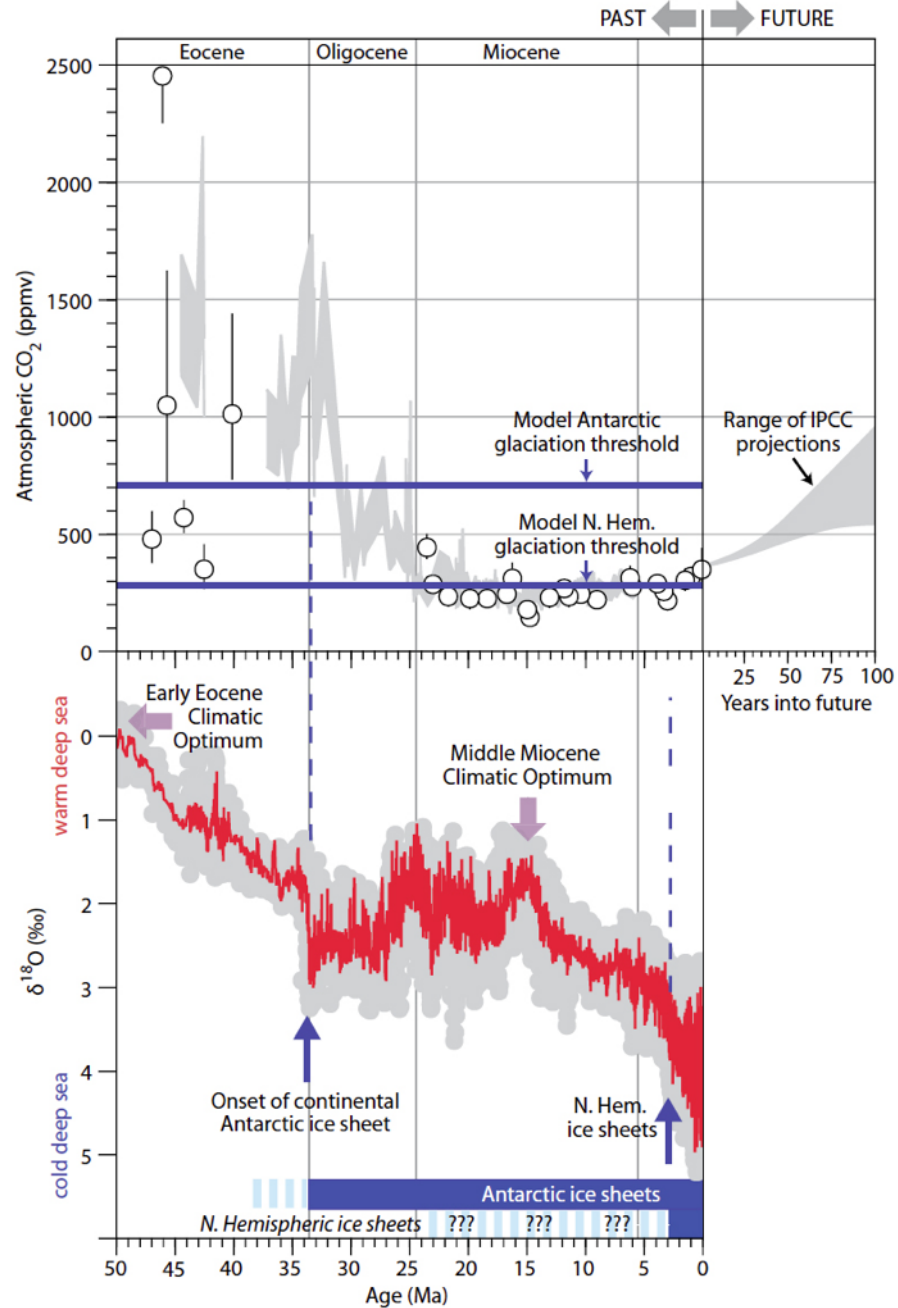
THE INTERNATIONAL OCEAN DISCOVERY PROGRAM
EXPLORING THE EARTH UNDER THE SEA



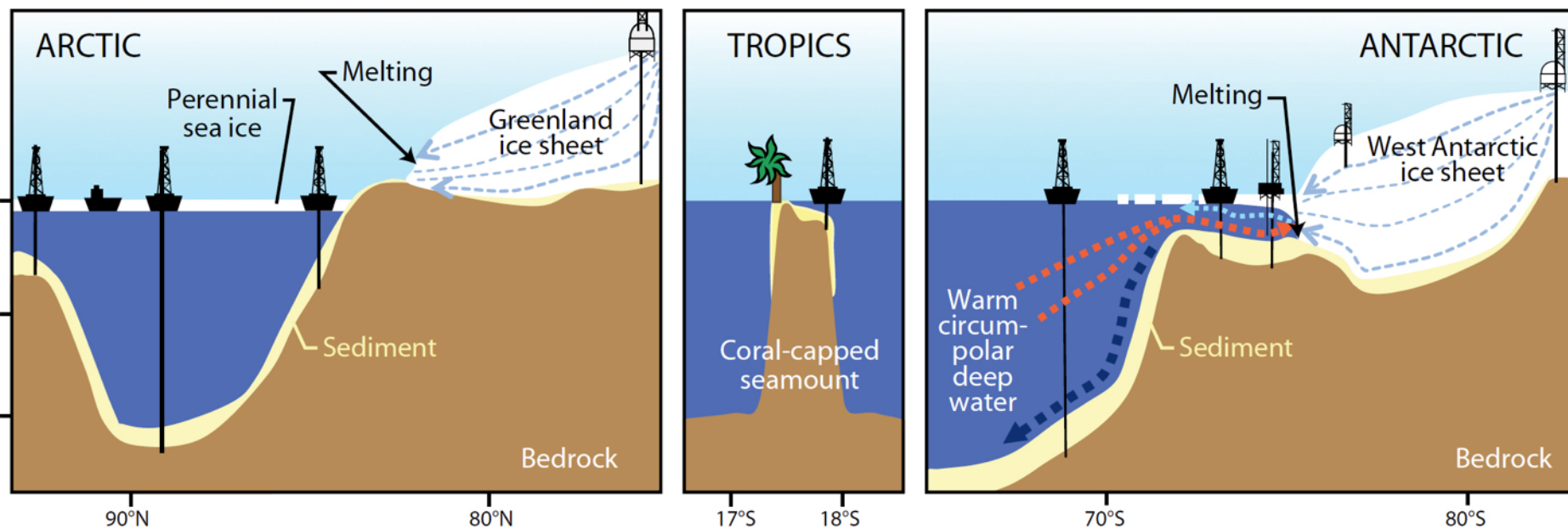
New Science Plan and as follows:

Bottom Dwelling: Ross (2007; Figure 3), Hydrothermal Vents: Devey et 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)

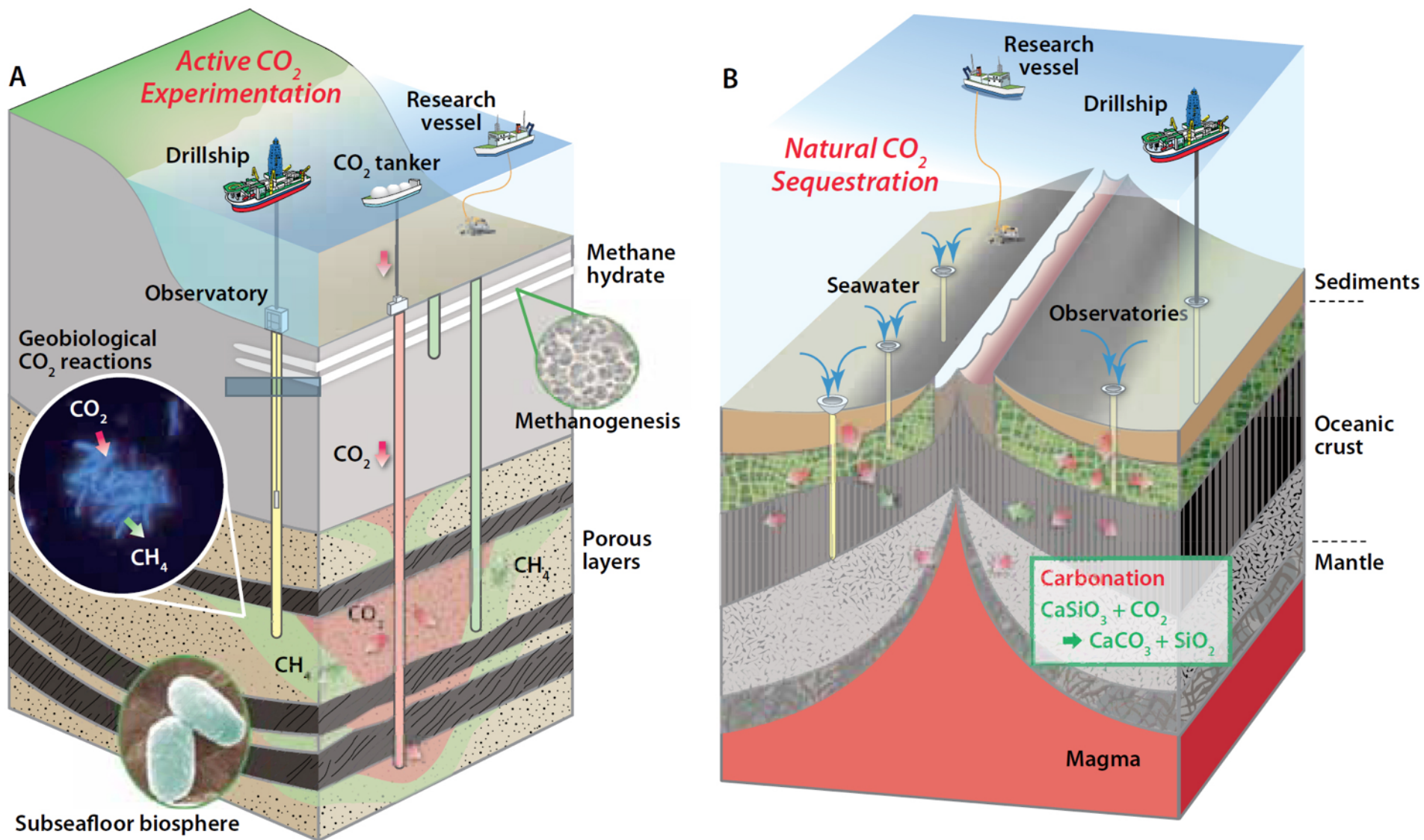
Climate and Ocean Change: Reading the Past, Informing the Future



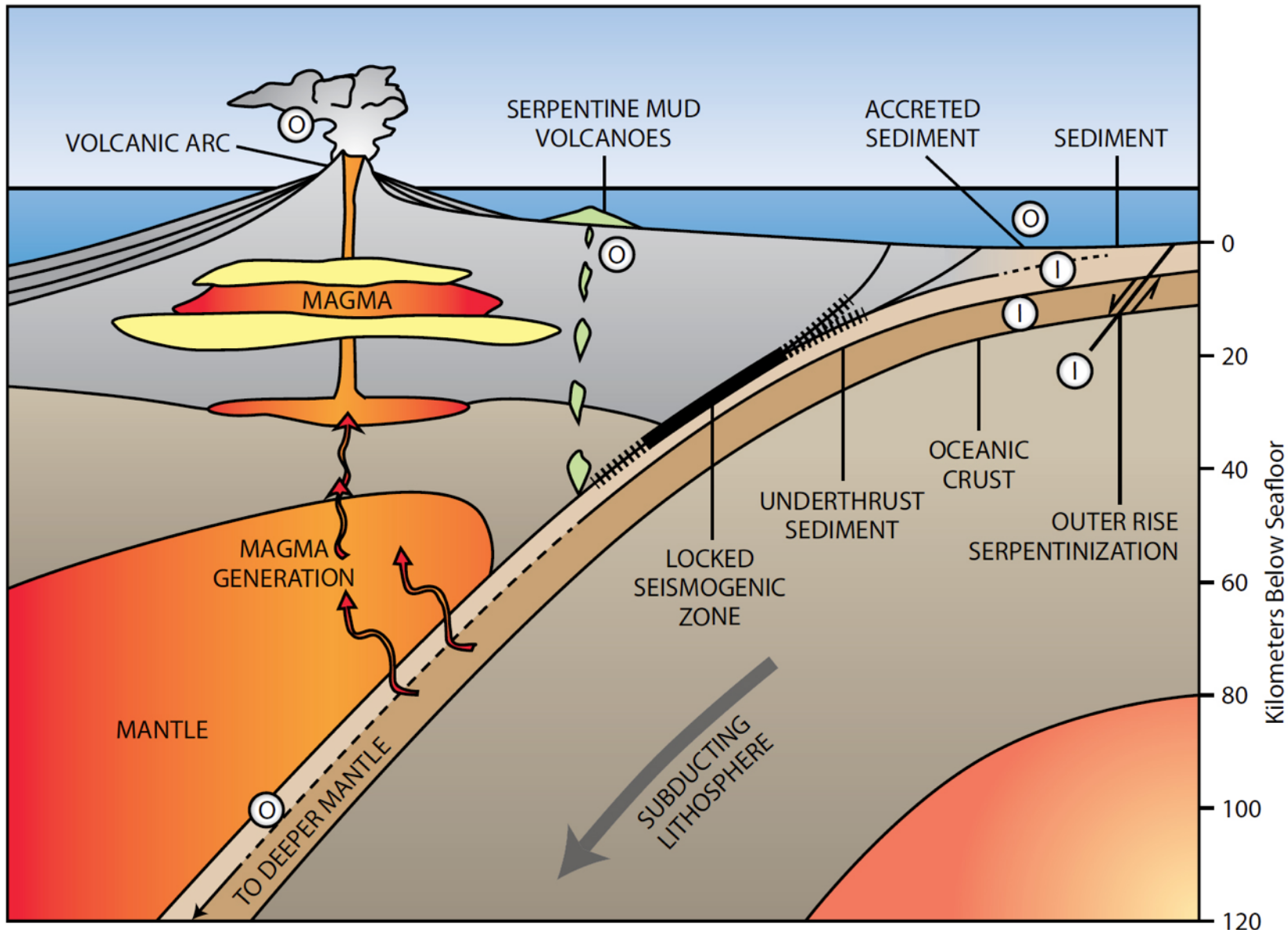
Climate and Ocean Change: Reading the Past, Informing the Future



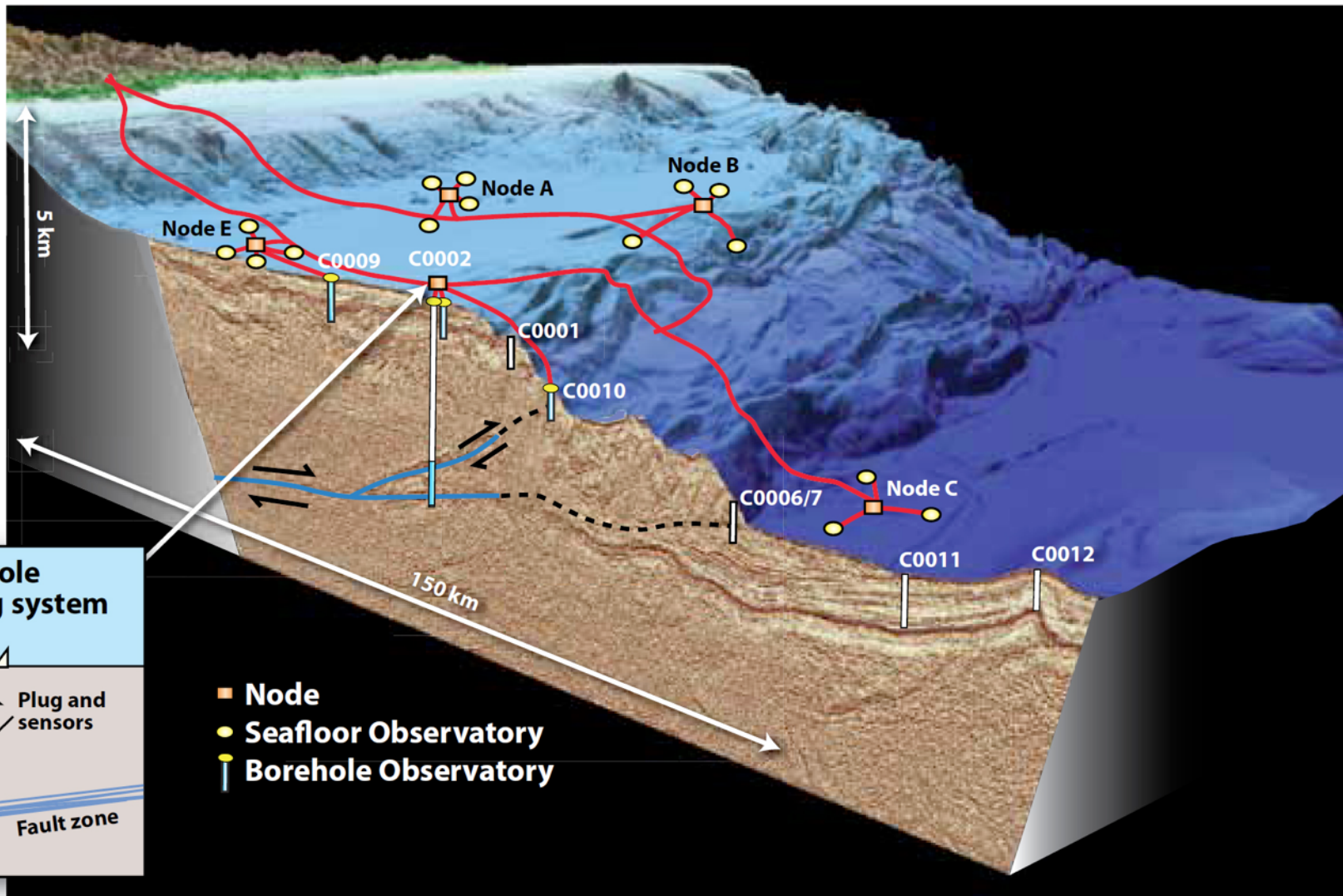
Biosphere Frontiers: Deep Life, Biodiversity, and Environmental Forcing of Ecosystems



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



Earth in Motion: Processes and Hazards on Human Time Scales





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)

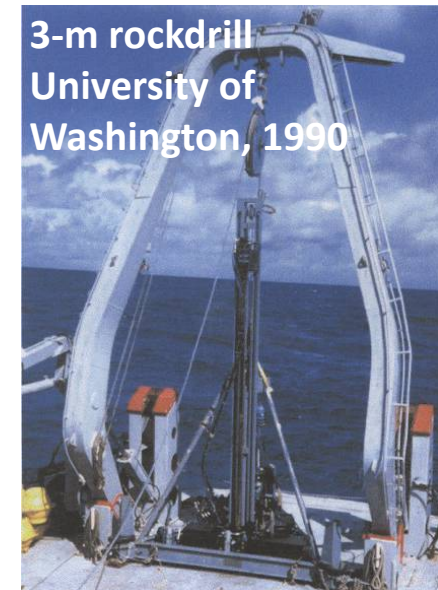
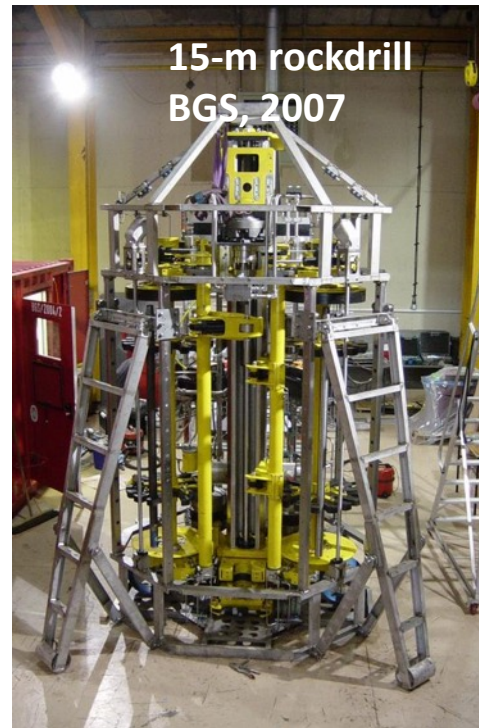
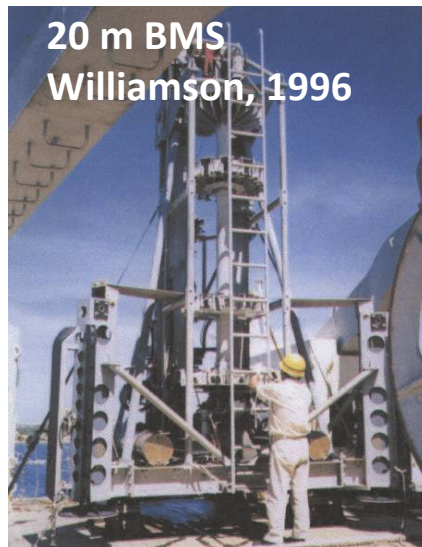
Advantages of sea bed drill rigs

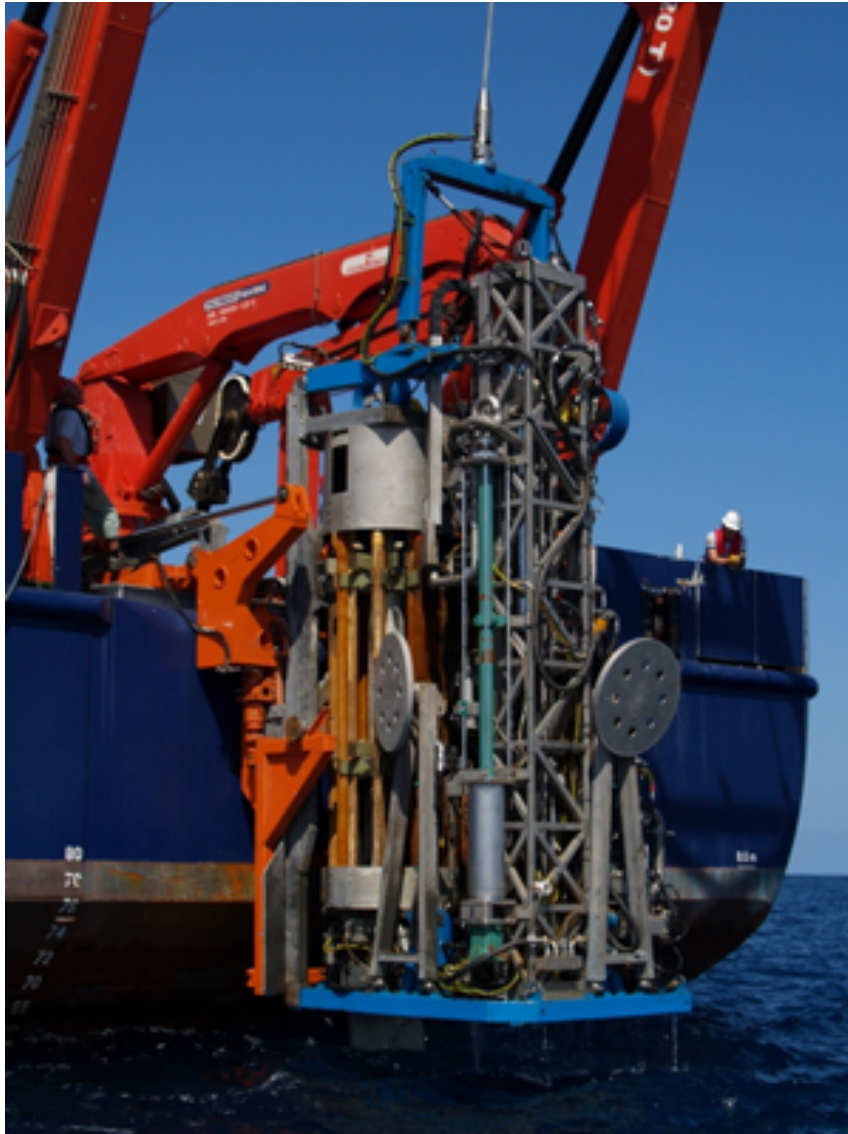
- Stable platform – optimal drill bit control
- No need for drill pipe through the water column
- Operation from multipurpose research vessels



Seabed Rig AS

Existing seabed drill rigs



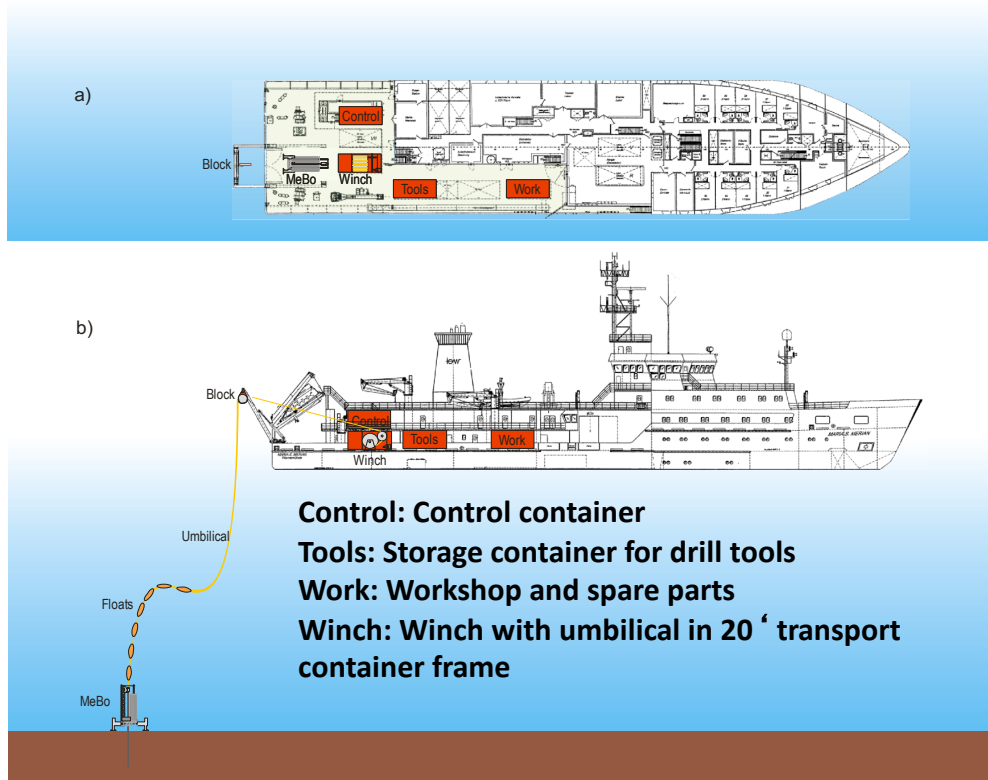


MeBo specifications

- 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

Concept of MeBo

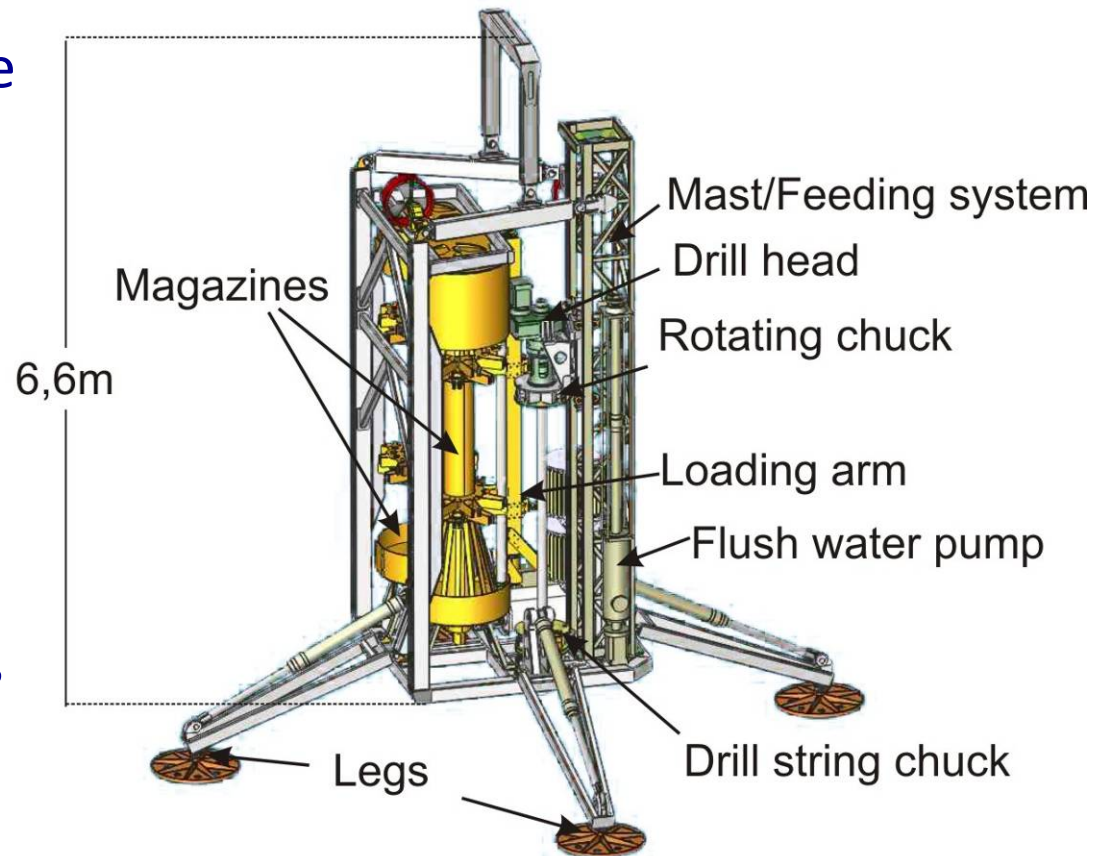
- Umbilical is used to lower the drill rig to the sea floor
- Umbilical is used for energy supply and remote control from the vessel



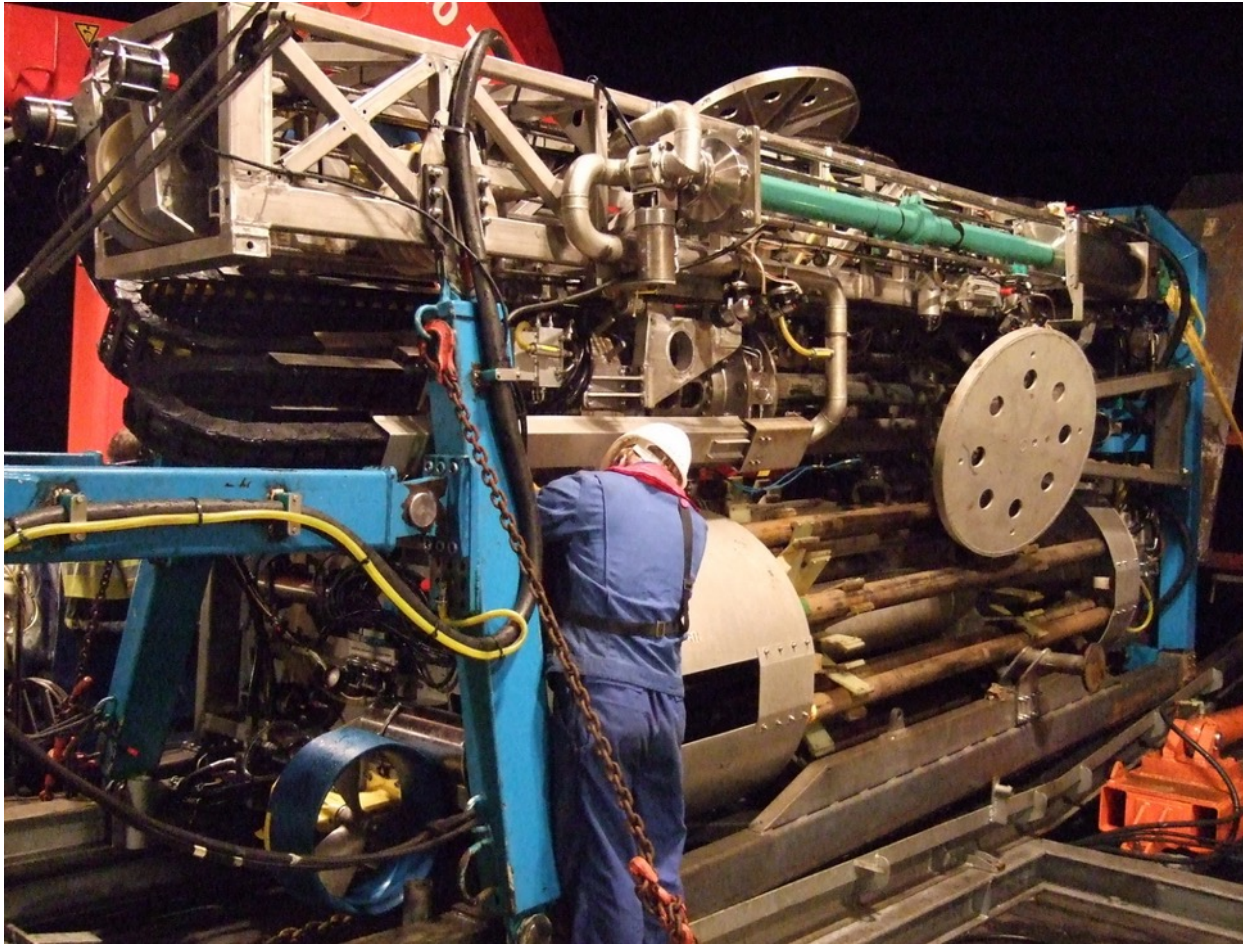
- Transport of the System within 20' shipping containers, that are mounted on the working deck of the research vessel

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



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.

System



Winch

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

System



Control Unit

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

System



Workshop

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

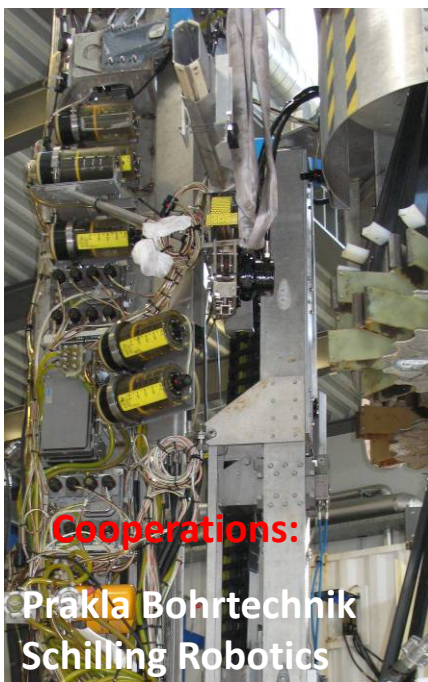
System



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.

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)

