

UNDERSTANDING THE OCEAN BELOW THE SEAFLOOR

Scientific ocean drilling: a global infrastructure linking the past and future of Planet Earth

Technological challenges in scientific ocean drilling

**Dave McInroy, British Geological Survey
ESO Science Manager**

June 3rd, Institut de la Mer de Villefranche (IMEV)



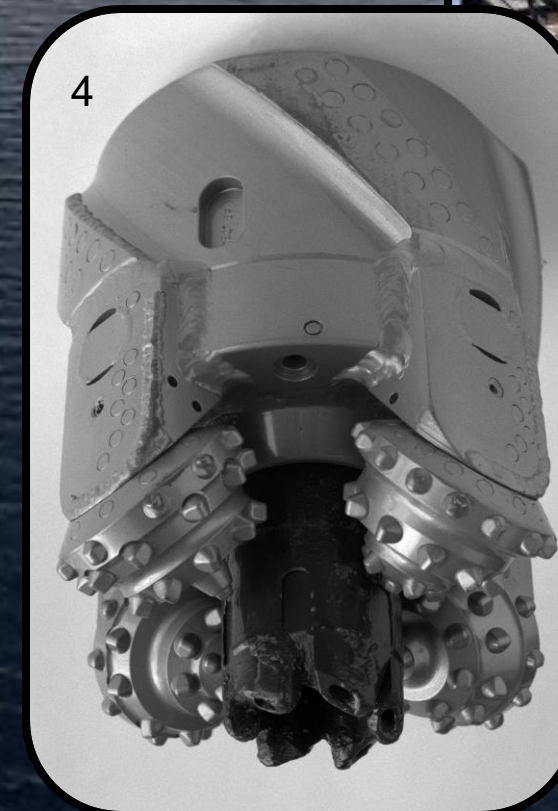
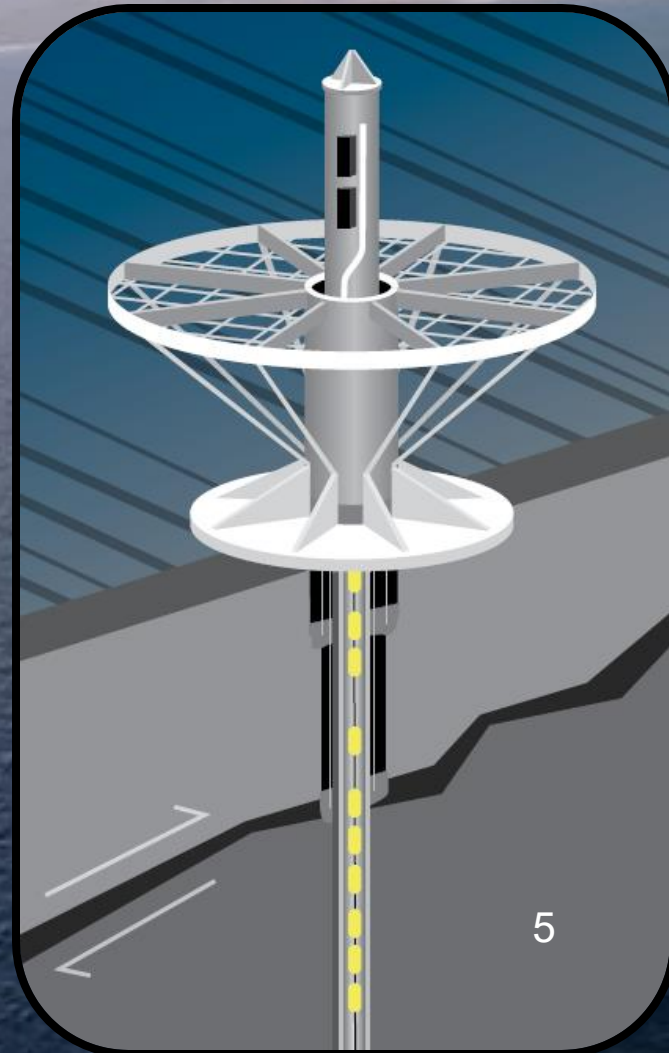
1. Vessels



2. Drilling & Coring



3. Observatories & Monitoring



Geotechnical vessels

Geotechnical drill rig, max. ~2 km of drill pipe



*DP Hunter,
IODP Exp. 310, Tahiti*



2

*Greatship Maya,
IODP Exp. 325, Great Barrier Reef*



3

*Greatship Manisha,
IODP Exp. 347, Baltic Sea*



4

*Fugro Synergy
IODP Exp. 381, Gulf of Corinth*

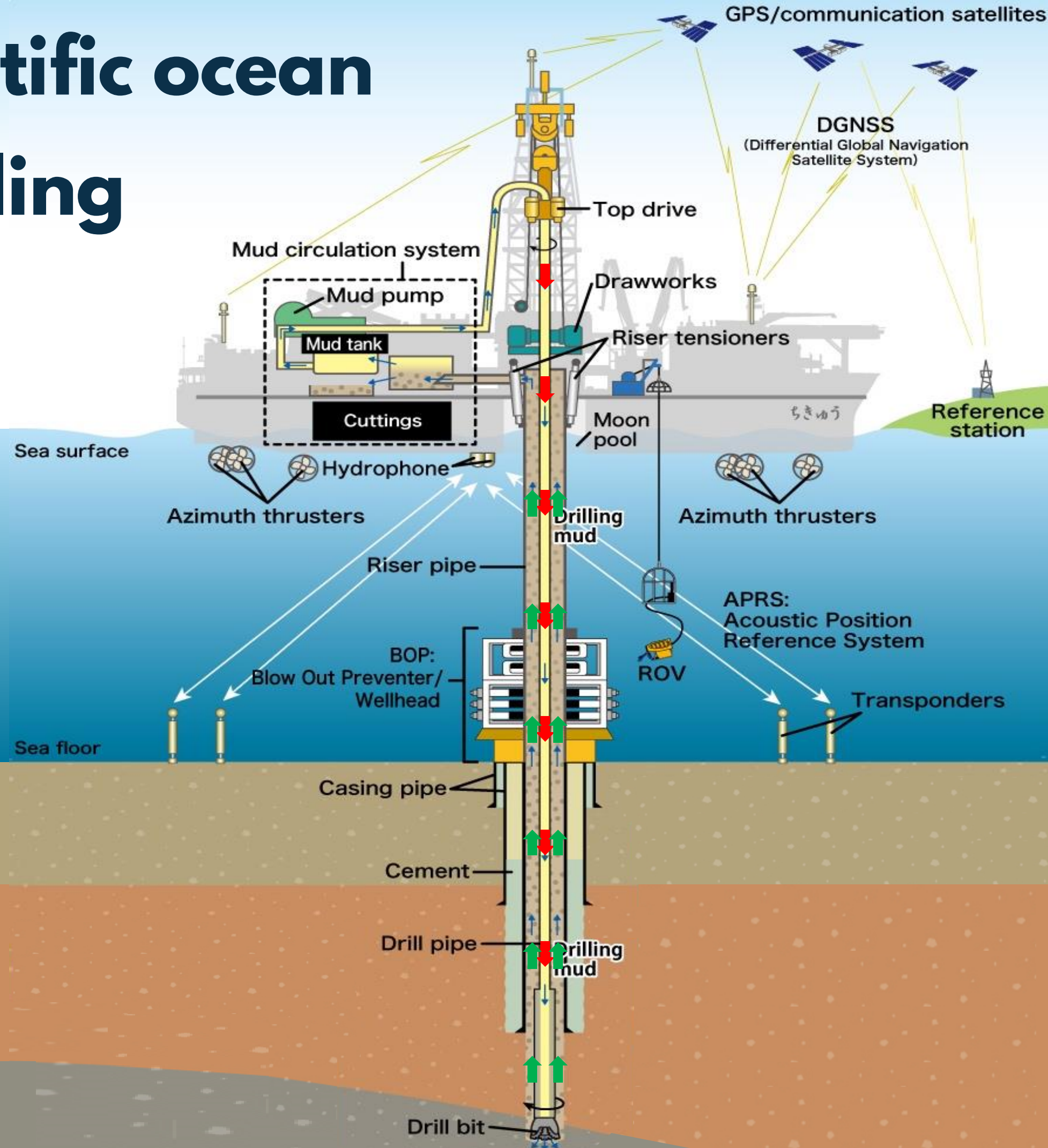


Deep drilling vessels



D/V Chikyu

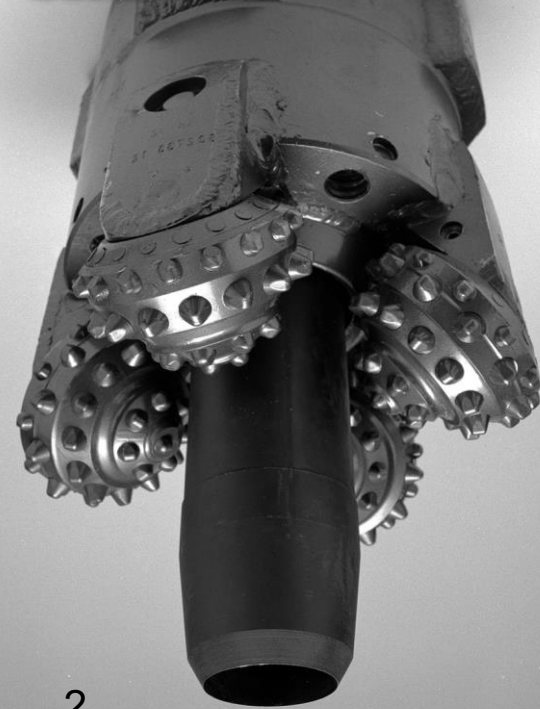
Deep scientific ocean drilling



Geoquip Marine
GMTR120 rig
Exp. 347, 2013
Baltic Sea



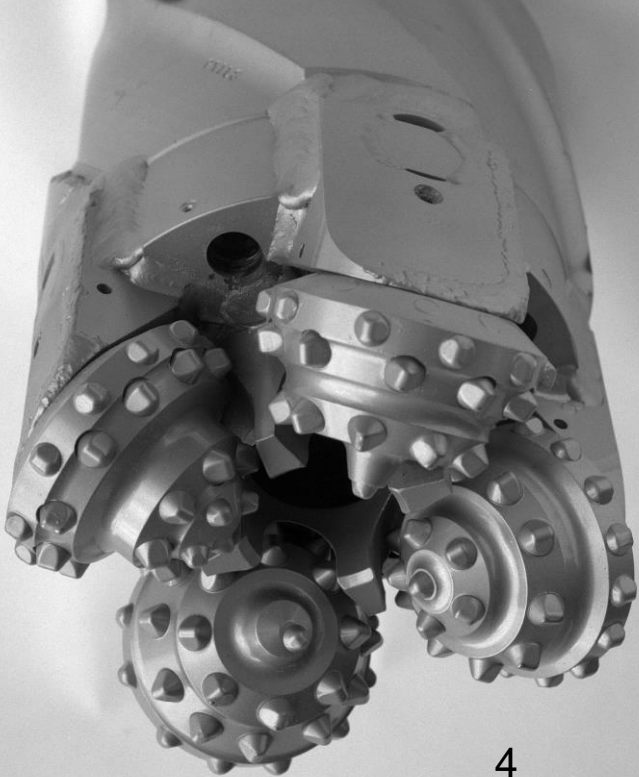
Advanced piston
corer



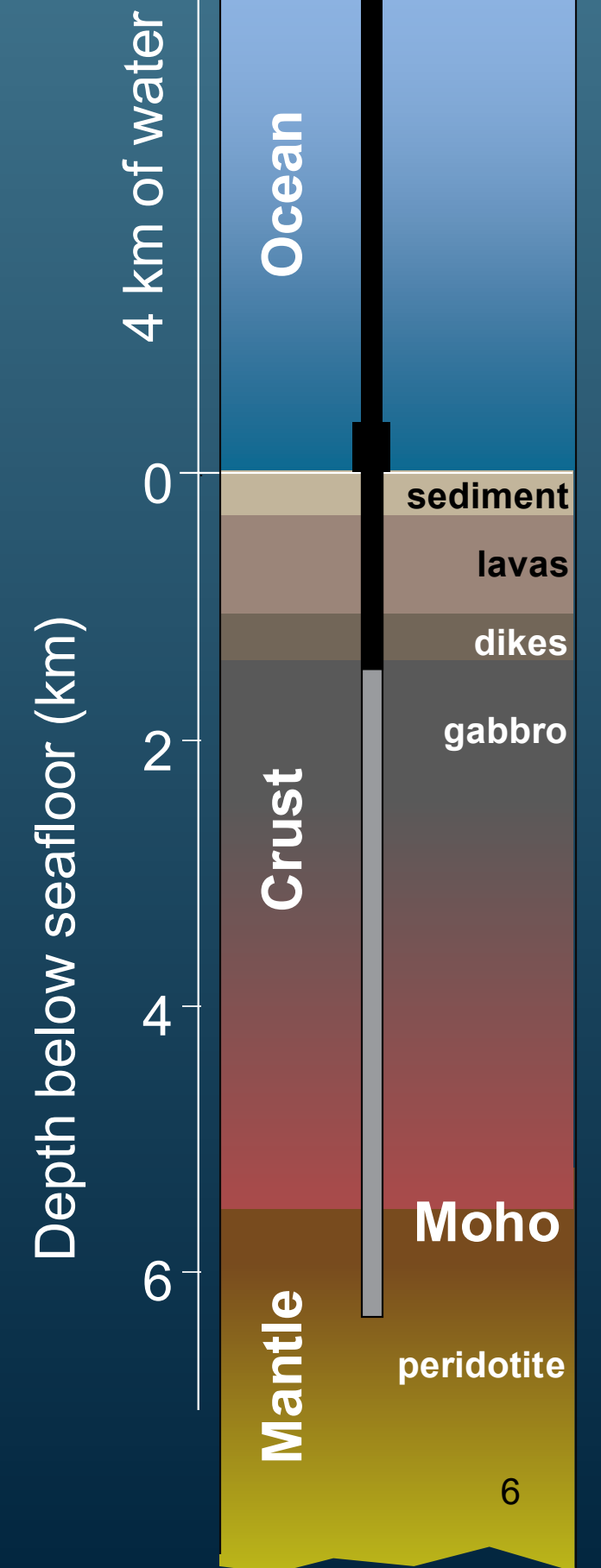
Extended
nose corer



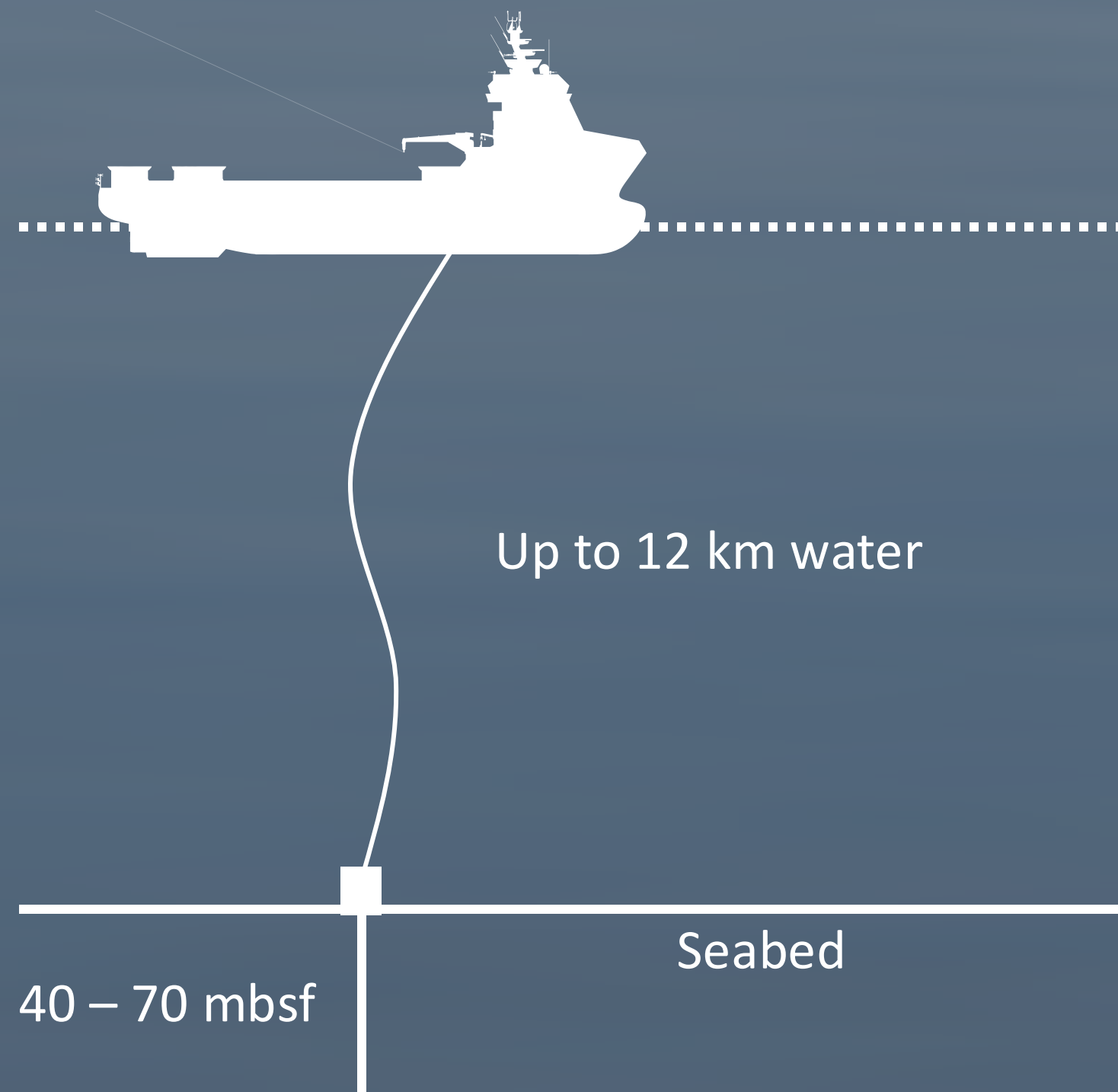
Rotary corer



Extended Nose
Sampler (Fugro)



Giant Piston Corer (GPC)



OSIL Giant Piston Corer
Operated by JAMSTEC
IODP Exp. 386: Japan Trench
Paleoseismology

Seafloor Drill (SFD)

Up to 4 km water

Seabed

Typical max. 125 mbsf
Exceptionally 200 mbsf

Benthic PROD5
IODP Exp. 389: Hawaiian
Drowned Reefs

Oceanographic research vessels can carry GPCs and SFDs



R/V Kaimei, IODP Exp. 386: Japan Trench Paleoseismology

Shallow water drilling using elevating liftboats

L/B Robert
IODP³ - NSF Exp. 501:
New England Hydrogeology
May-Aug 2025

Drill rig ↓

Drill pipe ↗

Drilling in moving sea ice using an icebreaker fleet

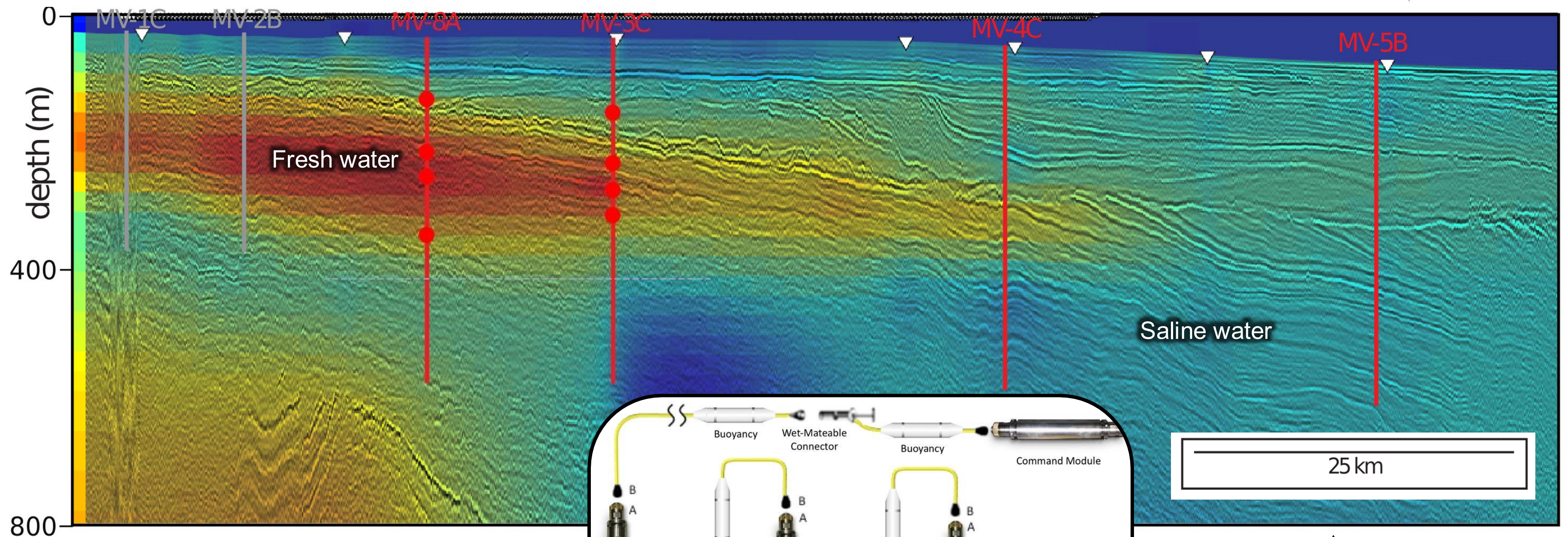


(1) *Vidar Viking*, (2) *Oden* and (3) *Sovietsky Soyuz*
IODP Exp. 302: Arctic Coring Expedition

.....or deploy GPC or SFD using research icebreakers



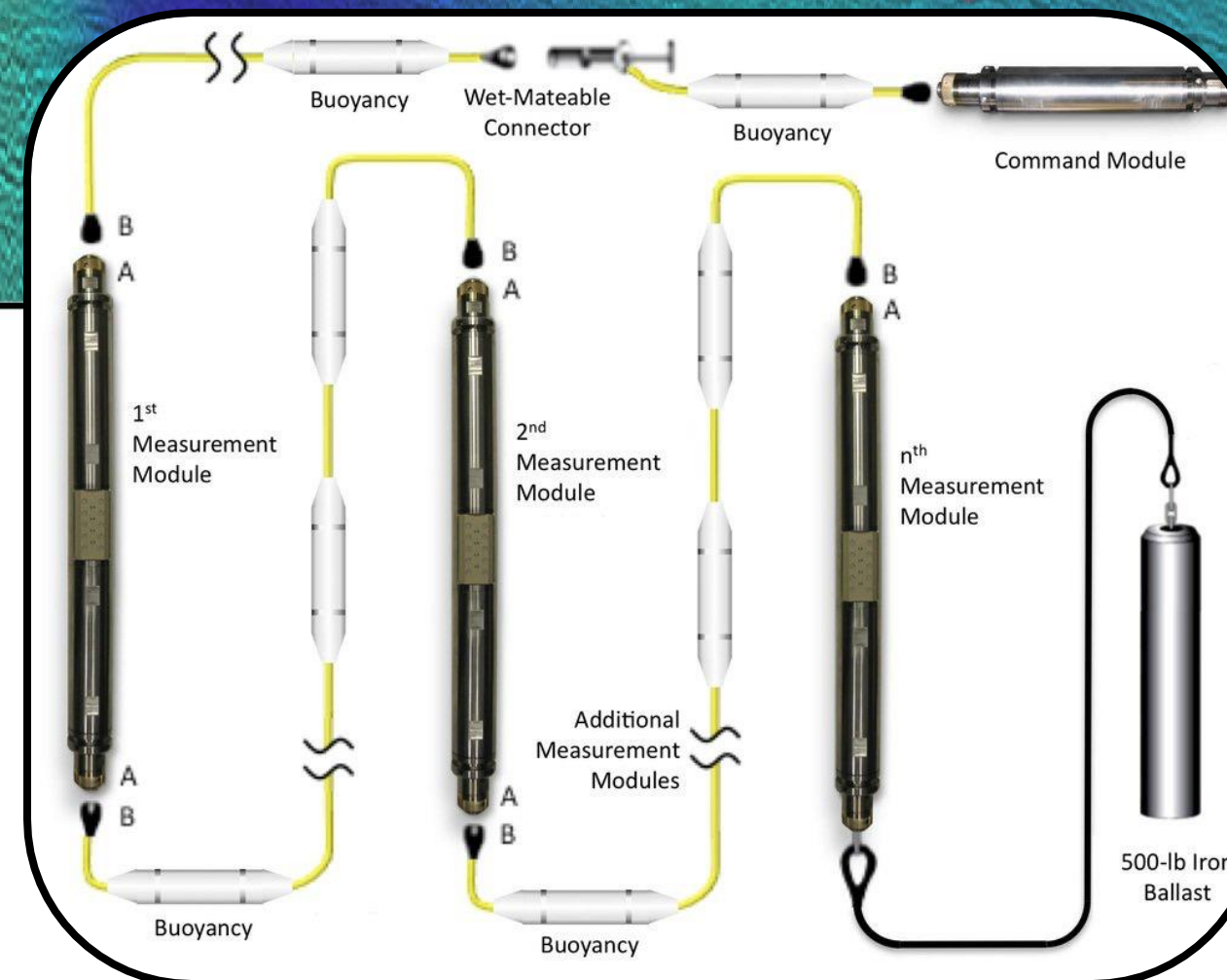
Observatories and monitoring



SCIMPI

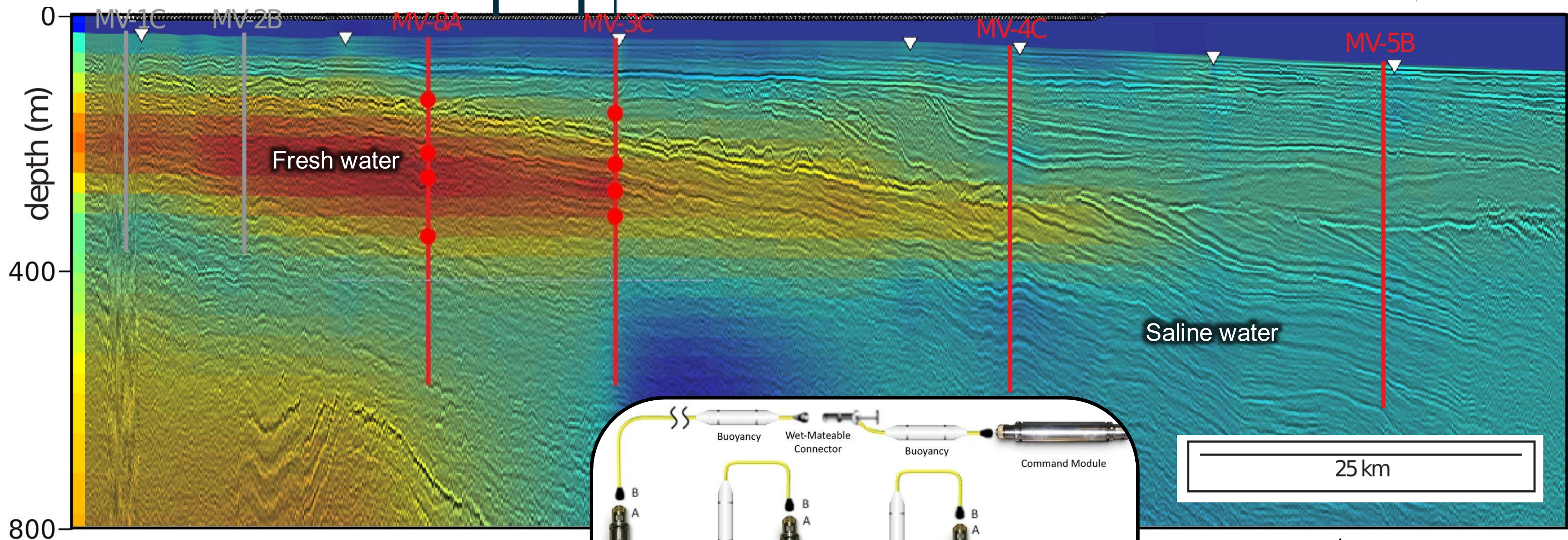
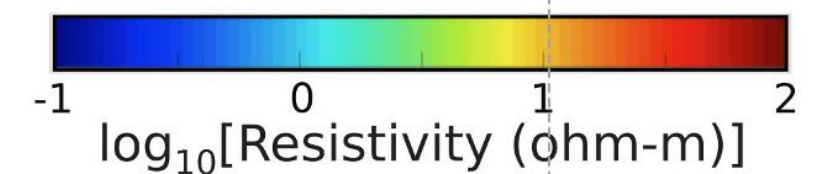
Measurement modules:

- remains in borehole, shown as red dots above
- 3 sensors per module: pressure, temperature, resistivity
- 42" long, 3' diameter per module



Profile from Gustafson *et al.* 2019, Aquifer systems extending far offshore on the U.S. Atlantic margin, *Scientific Reports*
<https://doi.org/10.1038/s41598-019-44611-7>

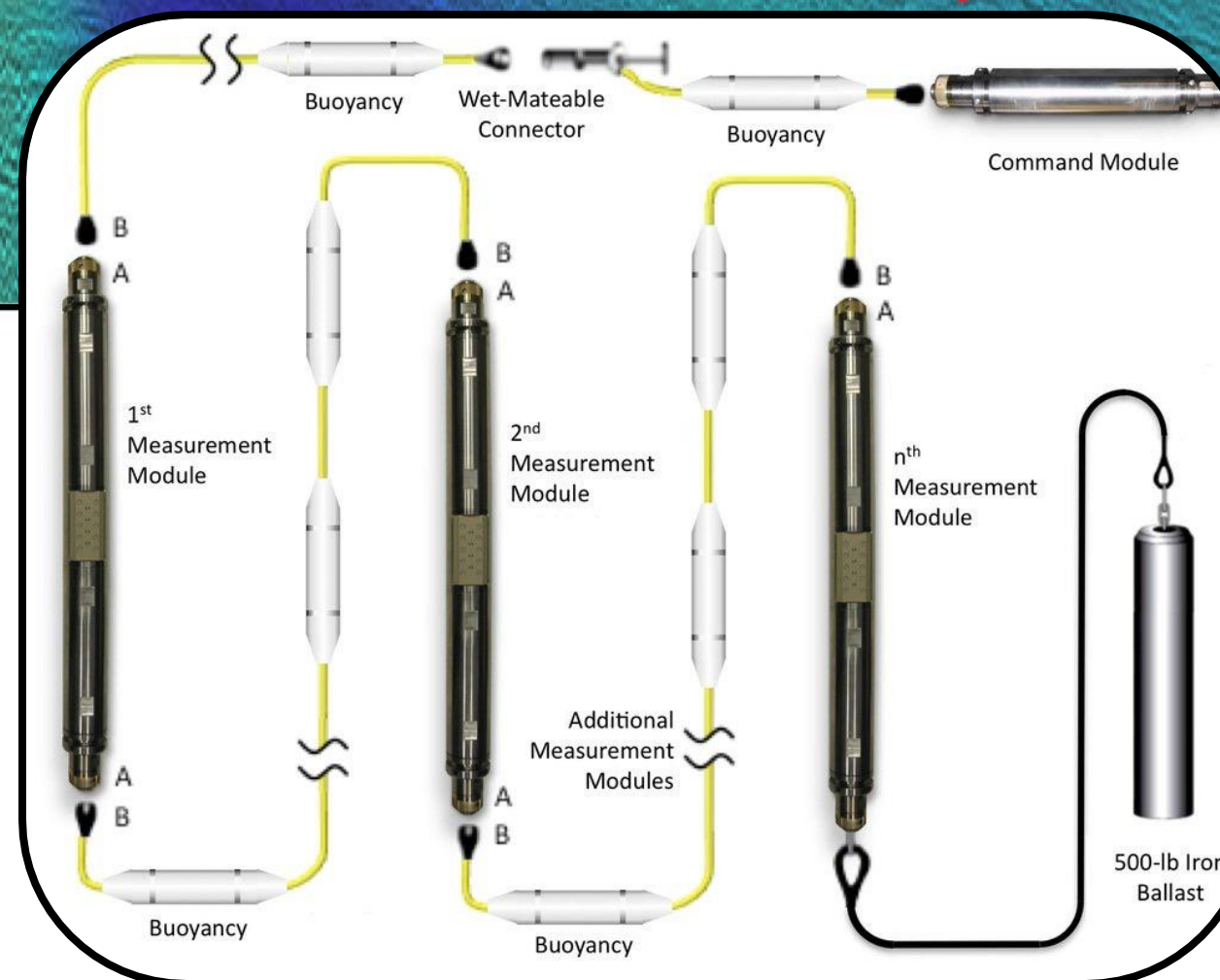
IODP Expedition 341S Scientific Prospectus, Figure F1,
http://publications.iodp.org/scientific_prospectus/341S/341ssp_f1.htm



SCIMPI

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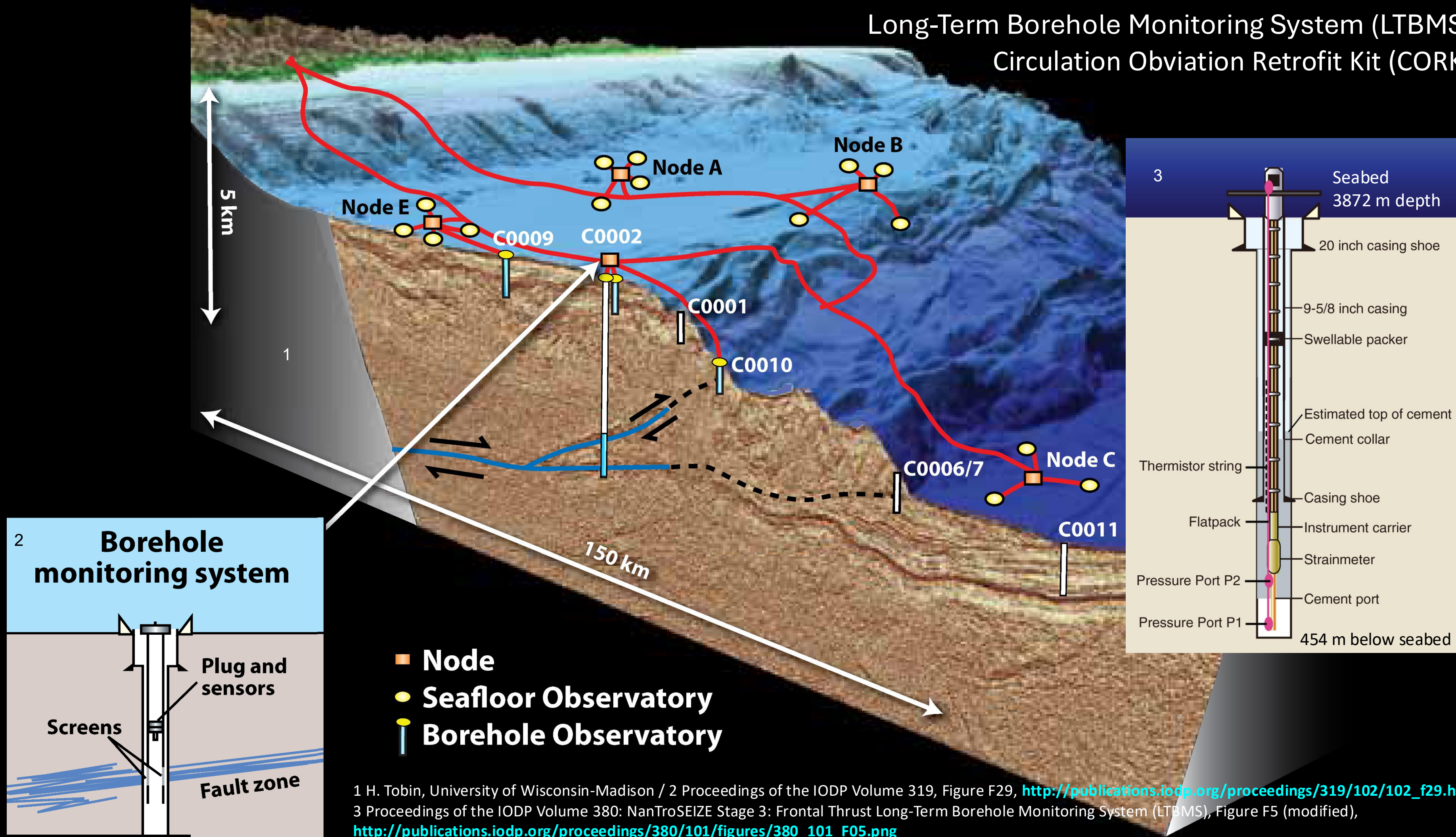
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IODP Expedition 341S Scientific Prospectus, Figure F1,
http://publications.iodp.org/scientific_prospectus/341S/341ssp_f1.htm

Long-Term Borehole Monitoring System (LTBMS) Circulation Obviation Retrofit Kit (CORK)



1 H. Tobin, University of Wisconsin-Madison / 2 Proceedings of the IODP Volume 319, Figure F29, http://publications.iodp.org/proceedings/319/102/102_f29.htm

3 Proceedings of the IODP Volume 380: NanTroSEIZE Stage 3: Frontal Thrust Long-Term Borehole Monitoring System (LTBMS), Figure F5 (modified),

http://publications.iodp.org/proceedings/380/101/figures/380_101_F05.png

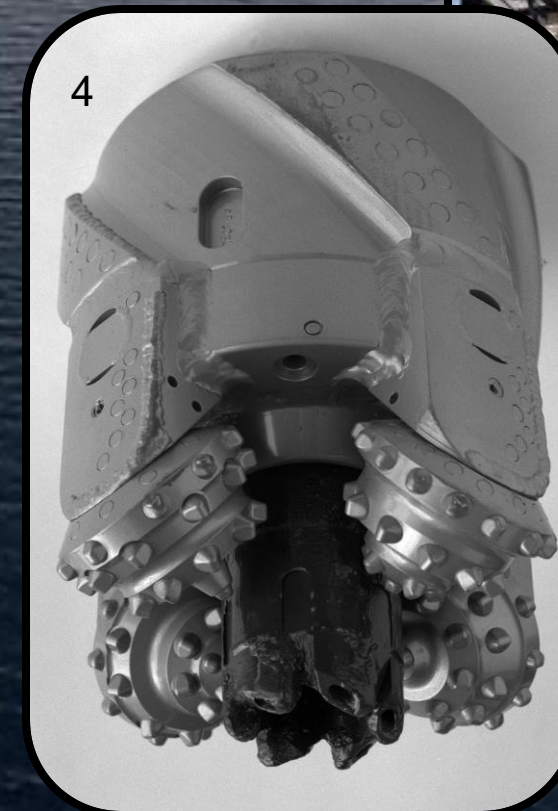
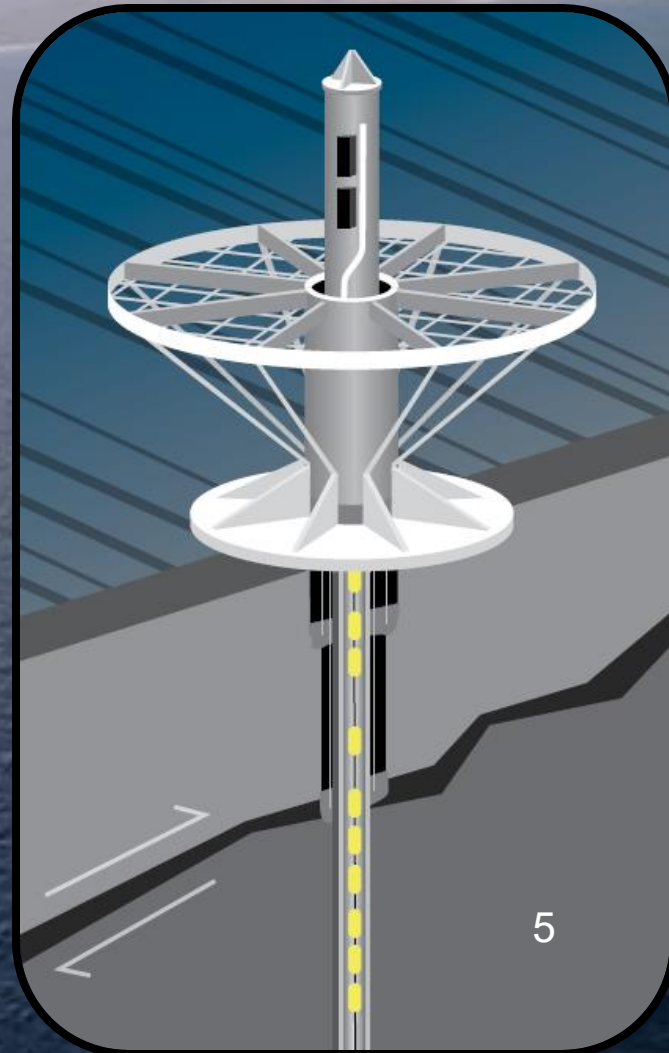
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**Thank you
Any questions?**

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