



Operational options for offshore drilling

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Two potential vessels for new SOD



DV CHIKYU
Riser/Riserless Drilling



RV KAIMEI
Giant Piston Core System (GPC)
Boring Machine System (BMS)

Deep-Sea Scientific Drilling Vessel Chikyu



Principle Particulars

Length overall	210.0m
Breadth	38.0m
Depth	16.2 m
Height	130.0m
Draft	9.2 m
Gross Tonnage	56752 ton
Accommodation	200 people
Transit Speed	11.5knots

50 science berth (incl. lab technicians)

ROV (max. 3,000mbsl) available

UWTV (max. 7,000mbsl) available

Riser operation WD limit: 2,500m

Max. pipe length: 9,000m

Six azimuth thrusters



Riser drilling and Riserless drilling

Riser drilling



Riserless drilling



① Drilling depth limits

Riser drilling : The best way to drill deep well is by using "Riser drilling". This "closed-circuit" method allows better borehole cleaning, control of drilling mud conditioning, control of down hole pressures, and enables the drilling of deeper wells.

Riserless drilling : This is a standard method allowing rapid drilling of multiple wells in a short time; however, it has limits to how deep a hole can be drilled.

② Cuttings treatment

Riser drilling : The rock "cuttings", resulting from the boring action of the drill bit must be removed from the borehole to drill deeper – otherwise the borehole becomes clogged and drilling cannot continue. Cuttings are recovered on Chikyu with the drilling mud through the riser pipe and are used as geological samples. The drilling mud is reused after filtering and adjusting the rheology of the mud.

Riserless drilling : Cuttings are pumped out of the borehole by seawater onto the seafloor; neither they nor the seawater-based drilling mud are recovered on Chikyu.

③ Drill pipe & Riser pipe

Riser drilling : This method uses the riser pipe as an "extension" of the well from the seafloor back to Chikyu. The drill pipe runs down into the borehole inside this riser pipe, so that the drilling mud and cuttings can be recovered on Chikyu. The BOP on the seafloor acts as a safety "valve" to prevent pressure "blow back" from the formation from affecting Chikyu.

Riserless drilling : This method uses only drill pipe and the drill bit to drill a new well or borehole.

① Riser pipe

The riser pipe connects the ship to the BOP on the seabed, and the borehole below that. Drilling mud is cycled from the bottom of the borehole back to the ship through the riser pipe. The drill pipe also passes through the riser pipe.



② Drill pipe

Drill pipe is used to drill the well, rotated by the top drive in the derrick. The drill bit at the end of the drill pipe "diggs" the borehole. The drill pipe passes through the riser pipe and casing pipe.



③ Casing pipe

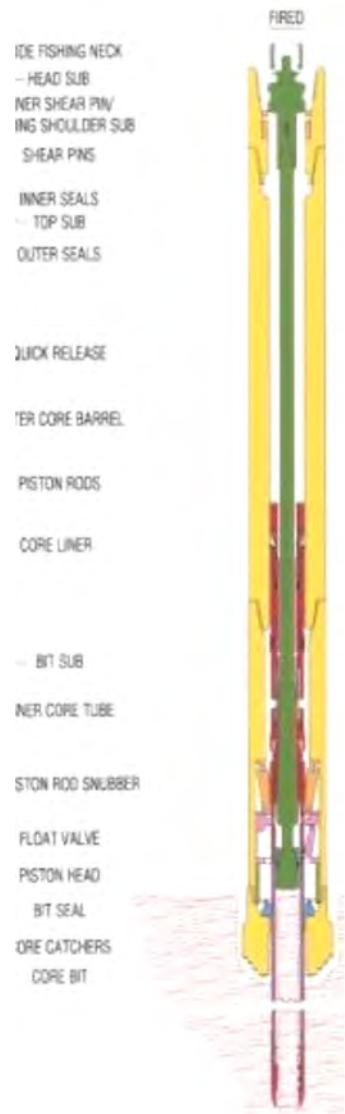
Casing pipe prevents borehole collapse. The casing pipe is run into the borehole and cemented to the sediments or rock formations below the seabed.

Coring tools (flexible selection)

Soft Sediment



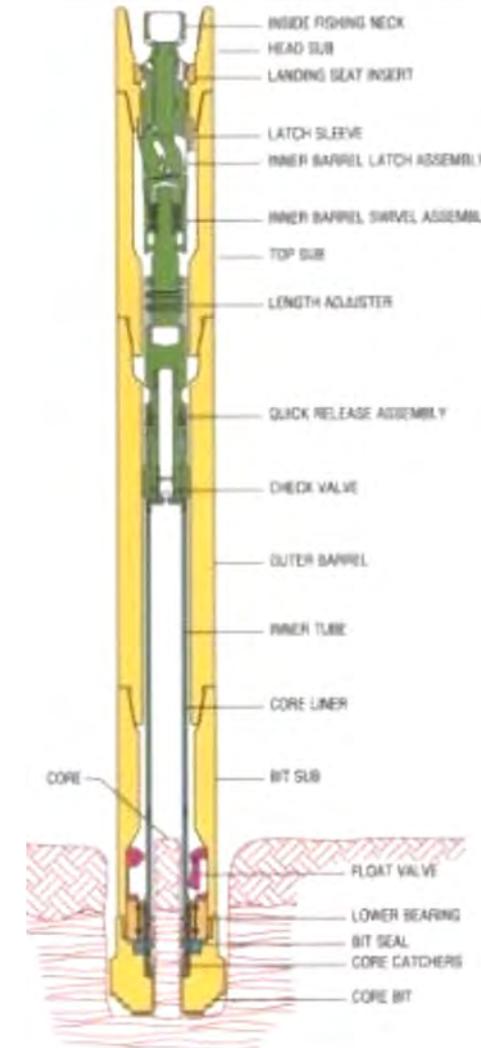
Hard Formation



HPCS:

Hydraulic Piston Coring System

- EPSC:
Extended Punch
Coring System
- ESCS
Extended Shoe
Coring System



RCB:

Rotary Core Barrel

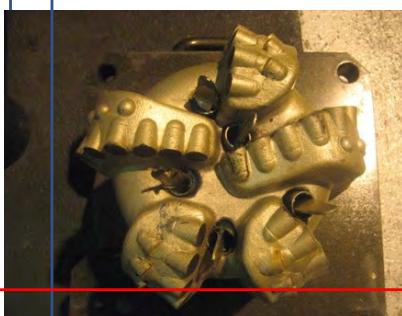
Coring and Drilling bits (flexible selection)



Roller Cone type



Fixed Cutter Type



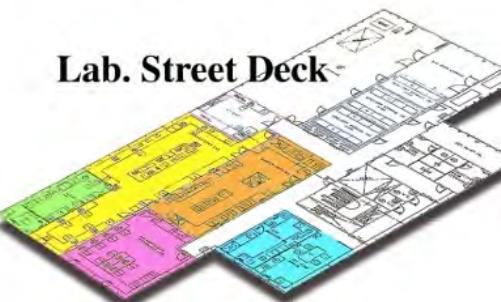
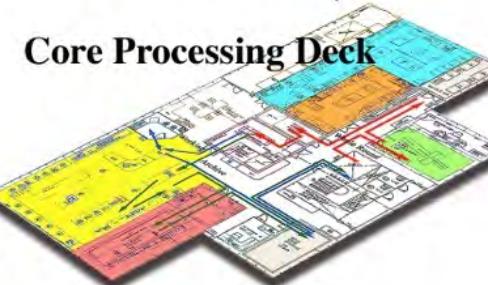
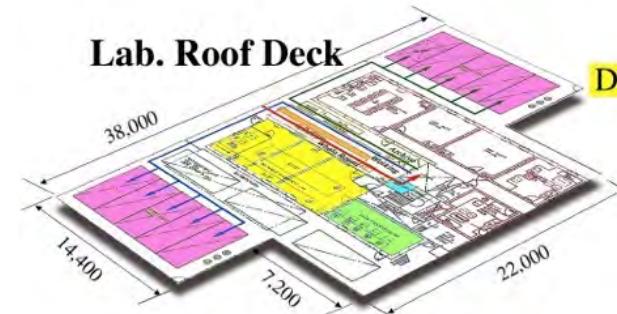
Coring bits



Laboratory Area (flexible spacing)



Laboratory Stack



Core Register Rm

Core Cutting Area

Downhole Measure. Lab

Core Storage Space

(20ft container)

DATA Process.Rm

Microbiology Lab

QA/QC Lab

X-Ray CT-Scanner Lab

Core Lab

Paleomag. Lab

Chemistry Lab

Sample Prep. Rm

Thin Sect. Rm

Paleo/Petro. Lab

Clean.Rm

Conference Rm

Computer User Rm

Library

Data Integrated Rm

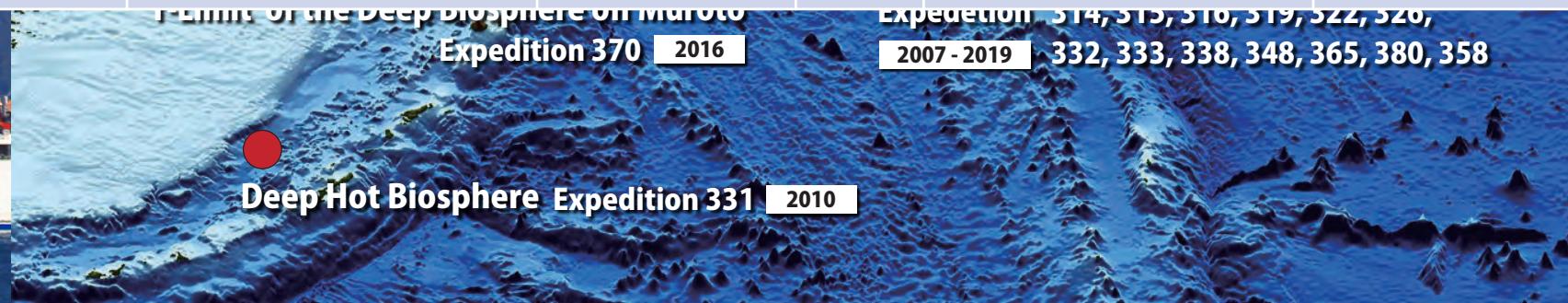
Office

Lounge

Previous IODP Expeditions (flexible duration)



Expedition		Duration (days)	Expedition		Duration (days)
314	NanTro SEIZE	56	348	NanTro SEIZE	139
315	NanTro SEIZE	33	365	NanTro SEIZE	32
316	NanTro SEIZE	50	380	NanTro SEIZE	27
319	NanTro SEIZE	114	358	NanTro SEIZE	176
322	NanTro SEIZE	31	331	Deep Hot Biosphere	34
326	NanTro SEIZE	33	343	JFAST	54
332	NanTro SEIZE	48	343T	JFAST	15
333	NanTro SEIZE	30	337	Deep Coalbed Biosphere	67
338	NanTro SEIZE	105	370	T-Limit	75



Expedition duration is flexible, 15 days to 176 days

Giant Piston Coring System (RV Kaimei)



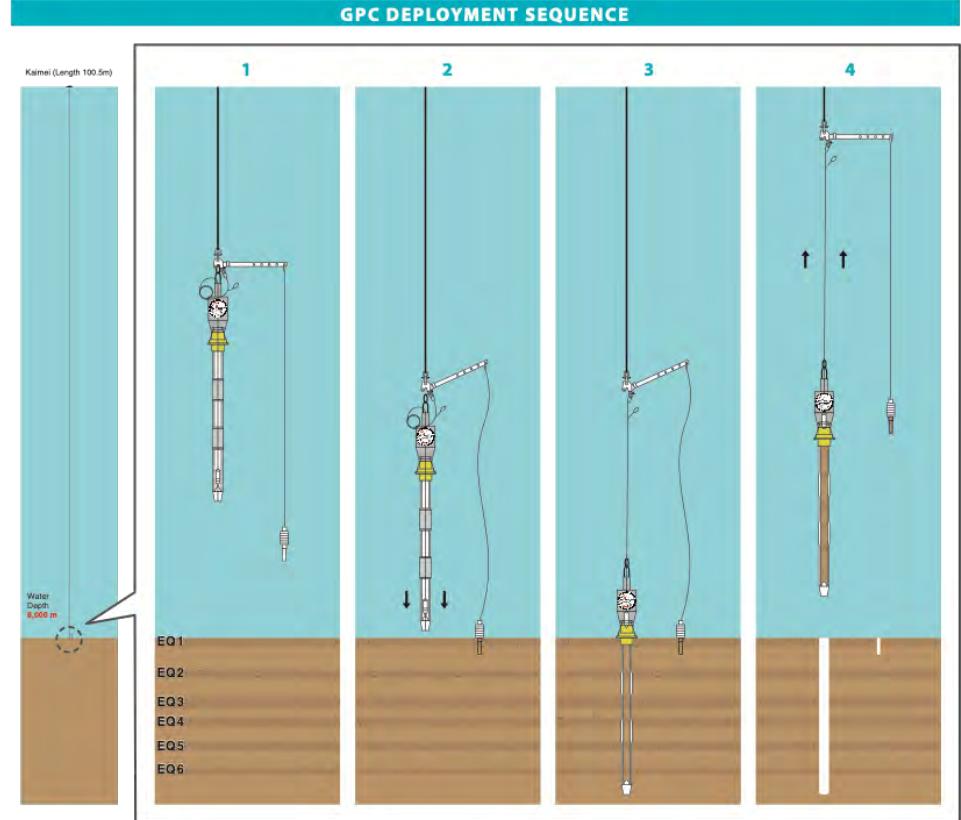
ECORD/IODP/JAMSTEC

Main weight: 2 – 6 ton

Barrel length: 10 – 40 m

Core size: 110mm

Main cable: 12,000 m



Exp. 386 Japan Trench

The deepest site ever drilled and cored: 8,023 mbsl

The deepest sub-sea level sample taken at 8,061 mbsl.

Boring Machine System : BMS (RV Kaimei)



[Cellula Robotics \(Canada\)](#)



Principal Particulars

W x D x H	3.1x3.1x5.7m
Maximum depth	3,000m
Weight in air	13tf
Hydraulic source	40 hp x 2
Power source	3300V 3phase
Thruster	Hydraulic drive system x 4
Observation	8 cameras & Lights
Boring Performance	Coring
Diameter x Excavation	H8:φ61.1mm × 60m 146T:φ123mm × 7.5m
	Casing φ450mm × 2.0m
Boring Equipments	Drill-head, Wireline, Tool arms, Carousel, Foot clamp, Mud water system
Navigation Sensors & Positioning	Depth, Heading, Altitude, Altitude, Acoustic Responder

Chikyu Facts

18 expeditions completed (2007-2019)

Deepest water: 6,897.5 mbsl (+844.5mbsf coring)

Deepest penetration: 3,262.5mbsf (riser operation)

Highest current experienced: > 6 knots

Longest expedition (176 days)

Shallowest limit of operation: 600m

Long-time borehole measurement system installation: 3 sites

Drilled boreholes: 114 (incl. 21 LWD holes)

Core recovered: 5,777m



Chikyu is a crucial MSP for deep water/deep penetration operation in post-2024 SOD

Thank you!

Any questions?

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