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Japan Agency for Marine-Earth Science and
Technology

Integrated Ocean Drilling Program Expedition 337 Deep Coalbed Biosphere off Shimokita: Microbial Processes and Hydrocarbon System Associated with Deeply Buried Coalbed in the Ocean

The deep-sea drilling vessel *CHIKYU*, operated by the Japan Agency for Marine-Earth Science and Technology (JAMSTEC), will embark on her next mission, IODP ([*1](#)) Expedition 337: Deep Coalbed Biosphere off Shimokita-Microbial Processes and Hydrocarbon System Associated with Deeply Buried Coalbed in the Ocean ([see Appendix](#)) - for a total of 68 days from March 15 to May 21, 2011, in the northwestern Pacific Ocean. The expedition is supported in part by "Strategic Fund for Strengthening Leading-Edge Research and Development" by the Japan Society for the Promotion of Science to JAMSTEC.

The major scientific objectives of IODP Expedition 337 are; 1) to understand marine hydrocarbon systems including methane hydrates and natural gases associated with deep-buried coalbeds, 2) to evaluate metabolic processes of subseafloor microbial communities pertinent to diagenesis of organic matter and biogeochemical carbon cycling, and 3) to assess the possibility of carbon dioxide (CO₂) sequestration into the deep subseafloor sediments and subsequent consequences of biogeochemical carbon cycle. During Expedition 337, coring down to a great depth deeper than 2,111 meters below the sea floor (mbsf), which will be the world deepest record ever made in previous scientific ocean drilling, *in-situ* geochemical measurement and sampling of pristine deep formation fluids, pressure coring of methane hydrate-bearing sediments, as well as multidisciplinary shipboard analyses of the retrieved samples are planned.

The onboard research team consists of 32 scientists from U.S., Germany, U.K, France, Austria, Denmark, Canada, China, and Japan, including early career invitees.

***1. The Integrated Ocean Drilling Program (IODP)** is an international marine research drilling program dedicated to advancing scientific understanding of Earth by monitoring, and sampling subseafloor environments. Through multiple platforms, scientists explore IODP principal themes: the deep biosphere, environmental change, and solid Earth cycles. IODP has operated since October 2003, funded jointly by the Japan Ministry of Education, Culture, Sports, Science and Technology and the U.S. National Science Foundation. Additional support is provided by the 17-member

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1. Schedule

15 March, 2011	Departure from the Port of Hachinohe
21 March	Embarkation of scientists via helicopter Commencement of drilling at Site C0019, 80km off Hachinohe
21 May	Disembarkation of the scientists (Completion of Expedition 337 at the Port of Hachinohe)

*The above schedule is subject to change depending on operational requirements or weather.

2. Scientific participants from Japan

Name	Organization	Expertise
Fumio Inagaki	JAMSTEC/Principal Scientist	Co-Chief Scientist
Akira Ijiri	The University of Tokyo	Organic Geochemist
Hiroyuki Imachi	JAMSTEC	Microbiologist
Wataru Tanikawa	JAMSTEC	Physical Properties Specialist
Tatsuhiko Hoshino	JAMSTEC	Microbiologist
Masafumi Murayama	Kochi University/ professor	Sedimentologist
Sumito Morita	National Institute of Advanced Industrial Science and Technology	Physical Properties Specialist
Yuki Morono	JAMSTEC	Microbiologist

Yasuhiro Yamada	Kyoto University/Associate Professor	Logging Specialist
Takanori Ojima	University of Tokyo(Doctoral(Master's degree course)	Logging Specialist (Early Carrier Invitees)
Ryota Tonoue	Osaka University(Master's degree course)	Physical Properties Specialist (Early Carrier Invitees)
Yukihito Yasudomi	Tsukuba University(Master's degree course)	Sedimentologist(Early Carrier Invitees)

3. Expedition overview

Understanding carbon cycle of deep hydrocarbon reservoirs along the continental margins, including methane hydrates and natural gas, is significant not only as an economic issue of energy resources available in Japanese waters, but also as one of the major scientific issues related to the past global warming and the subsequent responses of Earth's ecosystem. Also, it will provide clues to creating a sustainable low-carbon society in human activities. Off Shimokita Peninsula, seismic profiling of the seafloor structure and preliminary drilling surveys showed the presence of natural hydrocarbon gas reservoir associated with deeply buried coalbeds deeper than 2,000 mbsf. Accumulation of gas hydrates was also confirmed in porous sedimentary layers shallower than 365 mbsf. These pilot studies indicate that the study area consists of a widespread hydrocarbon system associated with the deeply buried coalbeds.

During Expedition 337, *CHIKYU* will attempt to drill down to the target drill depth of 2,200 mbsf, extending the depth record of previous scientific ocean drilling explorations, and will recover core samples from the Eocene coalbed lignite and formation fluids. Eocene is a geological stage dating back to approximately 50 million years.

4. Primary drilling operations

Drilling operations will take place at Site C0019, 80 km off-shore from Hachinohe City. The water depth at Site C0019 is approximately 1,180 m. This site was previously drilled down to 650 mbsf during the *CHIKYU* shakedown expedition in 2006, as a test of riser-drilling operations. During Expedition 337, the marine sediment horizon from 650 mbsf to 1,200 mbsf will be first recovered with riser drilling, and then geophysical characteristics will be evaluated by deploying wireline logging tools into the borehole. The hole will then be protected with casing pipes.

From 1,200 mbsf onward, *CHIKYU* will re-start riser drilling down to the target depth of 2,200 mbsf and obtain core samples. The cores will be recovered from the selected horizons, including the boundary of marine and terrestrial

sediments as well as Eocene coalbeds. After the completion of riser-drilling, the second wireline logging operation will run through the hole from 1,200 to 2,200 meters. During the logging operation, not only the precise geophysical measurements, but also in-situ chemical measurement and sampling of deep formation fluids around the lignite layers will be carried out.

During the riser drilling operations, scientists will routinely monitor the circulation riser-drilling mud and study chemical and carbon isotopic composition of hydrocarbon gas through the mud gas. Following the riser drilling, non-riser operations will take place to take shallow sediment samples from the seafloor to 365mbsf. Using a newly equipped Hybrid-PCS (pressure coring system), methane hydrate-bearing sediments will be sampled under the in-situ pressure condition. These cores will be transferred into other pressure chambers, and then non-destructive measurements including shipboard X-ray CT scanning will be carried out onboard. The high-pressure core samples will also be used for shore-based multidisciplinary investigations at the Kochi Institute for Core Sample Research, JAMSTEC.

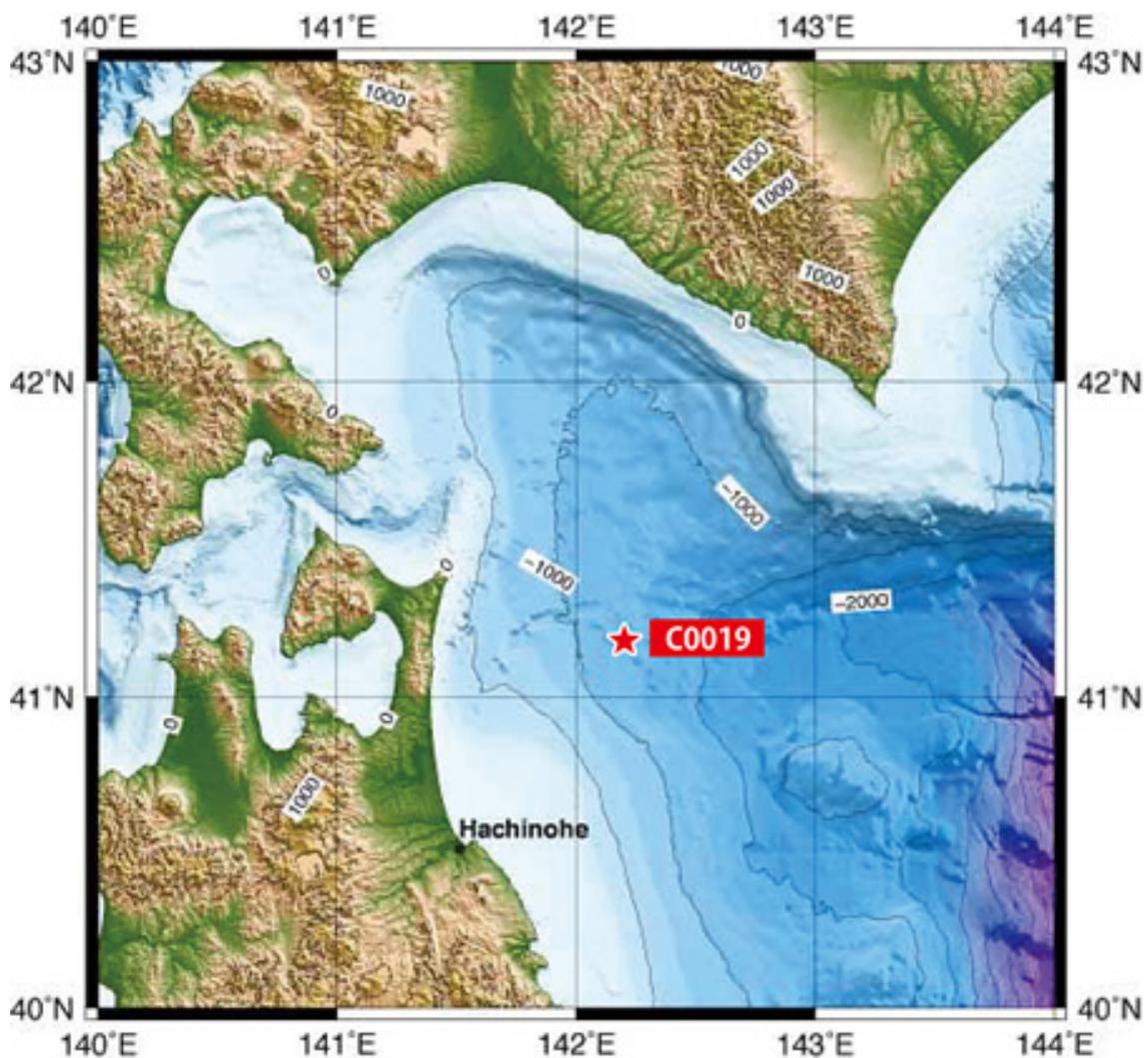


Figure 1: Study area of IODP Expedition 337

5. Expected scientific achievements

Expedition 337 will allow scientists to 1) gain insights into the hydrocarbon systems associated with the deep coalbed, 2) understand processes of organic matter diagenesis and metabolic functioning of deep subseafloor

microbial communities, and 3) assess the possibility of CO₂ sequestration into the deep seafloor sediments and the subsequent impact of biogeochemical carbon cycle.

◆ JAMSTEC has launched a special website for Expedition 337 (<http://www.jamstec.go.jp/chikyu/exp337/>). The website features a detailed expedition outline, profiles of the participating scientists, and daily reports from *CHIKYU*.

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