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Multi-Well Drilling Campaign Meti “Tokai-Oki To Kumano-Nada” in 2004 for Methane Hydrate Evaluation in the Nankai Trough Area, off Central Japan

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The Nankai Trough is a depression between the Philippine Sea Plate to the southeast and the Eurasian Plate to the northwest, extending along central Honshu to Shikoku in the south and to the east of Kyushu. From late 1999 to early 2000, a series of MITI “Nankai Trough” research wells were drilled to assess the energy resource potential of methane hydrates off central Honshu at the water depth of 945m.

A total of six holes, including two pilot holes, the main hole and three post survey wells, were drilled within a 100m radius of the main hole. Data from these wells clarified the occurrence of methane hydrate at the drilling site by wireline logging, LWD and/or coring. Four zones characterized by high methane-hydrate concentrations were identified based on the log responses (high resistivity, high sonic velocity, combinable magnetic resonance and porosity). FMI (Formation Micro Images) result and core samples suggested that the methane-hydrate-bearing zones are sand rich intervals of turbidite fan deposits. The methane hydrate which fills the pore spaces among the sand grains, an advantage from resource point of view, was visually confirmed by cores from two wells.

Although the MITI “Nankai Trough” wells revealed the existence of methane hydrates in the pores of turbiditic sands, there remain many issues to be clarified regarding the occurrence of hydrates in the deep sea off Central Japan, including the volume and the relationship with the BSR distribution.

To collect data and information to be used in the evaluation of the resource potential of methane hydrate, a multi-well drilling campaign the METI “Tokai-oki to Kumano-nada” program was planned and carried out. For the preparation of the drilling, 2D and 3D seismic surveys targeting BSRs were accomplished and BSR distribution had been carefully examined and interpreted. A total of 16 drill sites at water depths of 700 to 2000 m were selected from distribution and characteristics of BSRs (Fig. 1). The sites were located not only with BSRs, but also without them; some were in areas with double BSRs and others are with high sonic velocity intervals predicted by velocity analysis.

The campaign was carried out in early 2004 using the JOIDES Resolution, which had experienced drilling of methane hydrate in the ODP. LWD (Logging While Drilling) wells were drilled at all of the sites, and two WL (Wireline Logging) wells, two full coring wells, and wells for spot coring of methane hydrate were drilled after the evaluation of LWD results. Existence of methane hydrates was confirmed at sites with BSRs by LWD and WL records and/or cores. It is suggested that methane hydrate occurred as both pore space filling in sandstone and layered or nodular form in mudstone.

The logging data as well as the core data will be evaluated and related to the 3D seismic data. The occurrences of methane hydrate and sonic velocity and seismic attributes will be examined and compared. Resource assessment studies are planned to provide a methodology for estimating the volume of the methane hydrate and its energy resource potential.

* The drilling campaign was carried out by the effort of many geologists, geophysicists, drilling engineers and people related to the project. Especially Takatoshi Namikawa, Tetsuya Fujii, Koji Ochiai, Masao Hayashi, Masaru Nakamizu, Shoshiro Shimizu, Nobutaka Oikawa, Jun Matsushima, Tatsuo Saeki, Toshiharu Okui, Ryuta Kitamura and Masayuki Kawasaki of JOGMEC and Tomonori Mori and Takashi Sugiura of METI played important roles in preparation and operation. Japan Petroleum Exploration Co., Ltd. and Teikoku Oil Co. Ltd. jointly worked as the operating company. Discussion in MH21 consortium of Japan Methane Hydrate Exploitation Program helped the planning. Without JOIDES Resolution, we could not obtain the fruitful results. METI and JOGMEC approved the presentation of this paper.

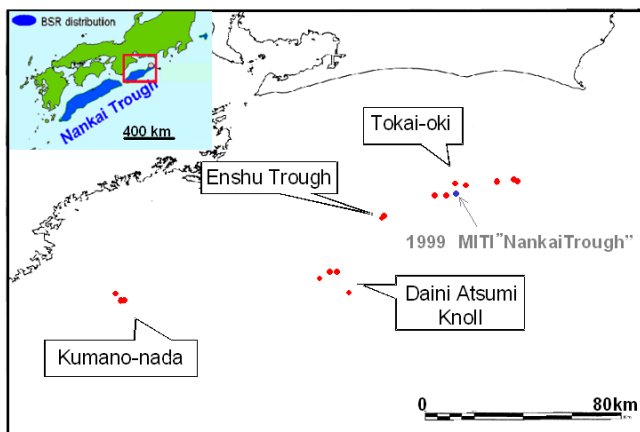


Fig. 1.
Well site localities of MITI “Nankai Trough”
and METI “Tokai-oki to Kumano-nada”