Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

MIS22-01 Room:213 Time:April 29 14:15-14:30

Formation evaluation and production interval determination at the 1st offshore methane hydrate production test site

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[1]Japan Oil, Gas and Metals National Corporation

In order to evaluate productivity of gas from marine methane hydrate (MH) by the depressurization method, on March 2013, the first offshore production test form MH concentrated zone (MHCZ) was conducted by the Research Consortium for Methane Hydrate Resource Development in Japan (MH21) at the AT1 site located in the north-western slope of Daini-Atsumi Knoll in the eastern Nankai Trough, Japan.

Before the production test, during the pre-drilling campaign conduced in 2012, extensive geophysical logging and pressure coring using Hybrid Pressure Coring System were conducted at monitoring well (AT1-MC) and coring well (AT1-C), in order to obtain fundamental information about reservoir properties of MH bearing formation for reservoir characterization, and also to decide on the production interval.

The MHCZ confirmed by the geophysical logging at AT1-MC has a thin-turbidite assemblage (from several tens of centimeters to a few meters) with 60 m of gross thickness; it is composed of lobe/sheet type sequences in the upper part, and relatively thick channel sand sequences in the lower part. The MHCZ at AT1-MC is thicker than those found in wells drilled in 2004 (β1, 45 m), which were located about 150 m northeast of MT1-MC. This fact indicates that the predictions provided by a seismic interpretation and an inversion analysis were reasonable. Moreover, we confirmed that the silt-dominant formation just above the MHCZ was more than 20 m thick ; this was expected to be a seal formation. The well-to-well correlation between two monitoring wells (AT1-MC and MT1) in a 40 m distance shows fairly good lateral continuity of these sand layers (upper part of MHCZ), indicating an ideal reservoir for the production test.

In the upper part of the MHCZ, hydrate pore saturation (Sh) estimated from resistivity log showed distinct difference in value between sand and mud layers, compared to Sh from Nuclear Magnetic Resonance (NMR) log. Resistivity log has higher vertical resolution than NMR log, so it is favorable for these kinds of thin bed evaluation. In this part, 50 to 80% of Sh was observed in sandy layer. On the other hand, lower part of the MHCZ, Sh estimated from both resistivity and NMR log showed higher background value and relatively smoother curve than upper part. In this part, 50 to 80% of Sh was observed in sandy layer as well.

On the basis of the above observations, a production interval was planed. When we consider an effective depressurization, the existence of sealing layers is critical both above and below the interval. We expect that thin silty layers within the lower part of MHCZ will serve as a sealing layer that will prevent water coning from water-bearing layers. Therefore, we stopped drilling the production well at about 20 m above BSR, and decided to produce from approximately 40 m from the top of the MHCZ.

Our future (ongoing) work is to integrate reservoir characterizations based on well logs and pressure core data for the history matching of production test results.

This study is a part of the program of the Research Consortium for Methane Hydrate Resources in Japan (MH21 Research Consortium).

Keywords: methane hydrate, offshore production test, formation evaluation, production interval, eastern Nankai Trough, Daini-Atsumi Knoll

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MIS22-02 Room:213 Time:April 29 14:30-14:45

P-wave velocity features of Methane Hydrate-Bearing turbidity sediments sampled by Pressure Core Tool

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Turbidity sediments around the production test site at Daini-Atsumi knoll were deposited under channels and lobes of a submarine fan environment. It implies that sediments contain property difference caused by depositional environment, fundamentally. In addition, MH crystals among sediment grains overprint their original physical properties. Thus, difficulties in MH reservoir arise in clarifying the properties of MH-bearing sediments and normal sediments from logging data. To analyze their physical properties, core samples of MH-bearing sediments were taken at the first offshore production test site using a wireline tool called the hybrid pressure coring system (Hybrid PCS), which prevents dissociation of MH in the sampled cores.

Nondestructive, high-pressure analyses were conducted in both the 2012 summer drilling campaign and the 2013 winter collaboration study. To handle Hybrid PCS cores during the pressure coring campaign in the summer of 2012, a pressure core analysis and transfer system (PCATS) was installed on the research vessel Chikyu (Yamamoto et al., 2012). The measurements can be taken at the in situ water pressure at depth without causing any core destruction or MH dissociation. In January 2013, GT, USGS, AIST, and JOGMEC researchers conducted a collaborative study. In this study, the pressure core characterization tools (PCCTs) developed by GT also measured P-wave velocity of MH-bearing sediments.

In the PCATS analysis, the results showed a difference of more than 1,200 m/s in P-wave velocities between the MH-bearing sandy and muddy layers. This difference in P-wave velocities was confirmed by PCCTs measurements. Also, P-wave velocity of a turbidite interval tend to decrease upward as same as grading of a turbidite. The result implies that MH concentration is related with pore size of sediments.

Acknowledgement

Authors would like to express thanks to Geotek at 2012 pressure core operation/analysis. Authors are grateful to USGS and Georgia Tech members who struggled with PCCTs operation/experiments in AIST Hokkaido. This research is conducted as a part of MH21 research and the authors would like to express their sincere appreciation to MH21 and the Ministry of Economy, Trade and Industry for disclosure permission for this research.

Keywords: Gas hydrate, P-wave velosity, Turbidite, Pore-filling type, Grain size distribution

Japan Geoscience Union Meeting 2014
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MIS22-03 Room:213 Time:April 29 14:45-15:00

Reservoir Characterization and geological modeling for methane hydrate-bearing sediments around the 1st Offshore Product

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The eastern Nankai trough is considered as an attractive potential resource of methane hydrates (MHs) and the first offshore production test was performed around the Atsumi-oki in 2013. The objective of this study is to conduct MHs reservoir characterization of methane hydrate (MH)-bearing turbidite sediments around the test site.

The depositional environment of MH-bearing sediments around the production test site is a deep submarine-fan turbidite system (e.g., Takano et al., 2009). To evaluate MH dissociation and gas production performance, we require precise geological models that describe facies variations of turbidite sediments and their corresponding petrophysical properties. In this study, we performed MHs reservoir characterization integrated from well log, core and 3D seismic data, and the 3D geological models were constructed based on geostatistical approach.

In accordance with the geological modeling workflow, (1) layering and gridding along the geological horizon and facies variations (framework modeling) and (2) defining internal properties (property modeling) were performed for the reservoir. Property modeling includes calculation of the distribution of facies and petrophysical properties such as hydrate saturation, porosity, and permeability, which are required as input to the reservoir flow simulation for predicting gas production performance.

This study is a part of the program of the Research Consortium for Methane Hydrate Resource in Japan (MH21 Research Consortium).

Japan Geoscience Union Meeting 2014
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MIS22-04 Room:213 Time:April 29 15:00-15:15

Source of iodine and methane in gas hydrate layers in the Kumano Basin, Nankai Trough

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Because iodine has a strong biophilc behavior in marine system, pore waters in methane hydrate layers are often enriched in iodine as well as methane. The presence of long-lived radioisotope of iodine in nature therefore provides the potential age of source formations for methane. We have determined iodine isotopic ratios of pore waters collected frequently form sandy methane hydrate zone between 200 and 400 m below the seafloor in the Kumano Basin, Nankai Trough to examine the loci of source formations and processes to deliver and accumulate methane in the present methane hydrate stability.

Concentrations of iodine dissolved in pore waters peak at the top of sandy gas hydrate layers at 200 mbsf, where the iodine isotopic ratios also show the lowest/oldest values. Methane and iodine could have been derived from the landward old sediments through the sandy aquifers to the present methane hydrate zone. Transport of methane from old organic-rich sediments to the hydrate stability preferentially accumulates methane hydrates in thick sandy layers in the Kumano Basin.

Keywords: Methane hydrate, Iodine isotope, Pore water

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Trials of the methane hydrate observations in the local governments

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Nine prefectures of 1 local government prefecture of the Sea of Japan side established ”Association of Ocean Energy Exploitation of Resources Promotion Sea of Japan” (the following, Association of Sea of Japan) in September, 2012. They support methane hydrate exploitation of resources of the government and aim at the local activation and job creation. Niigata and Hyogo that were members of the association of Sea of Japan carried out a prefecture original methane hydrate investigation. They appeal to the government for development promotion of the government by showing the result. On the other hand, Wakayama located on the Pacific side wants to appeal to the government for the reexamination of the development sea area by showing that outer layer type methane hydrate exists to the sea area that is nearer the landside than the sea area that the government develops. The Independent Institute carried out collaborative investigation each with Niigata, Hyogo and Wakayama in 2013. I show the results of research.

In the joint investigation with Niigata, plural plumes were observed in Mogami trough east slope (from depth of the water 200m 600m) .

In the joint investigation with Hyogo, I carried out observation of a methane plume and the structure and the seafloor topography under the sea bottom in Oki east sea area. Furthermore, I performed a piston core ring and gathered five samples and confirmed plural traces of the methane hydrate.

In the joint investigation with Wakayama, plural plumes were observed in Shionomisaki canyon (from depth of the water 1,700m 2,200m). There is hardly the report of the plume on the Pacific side so far. Therefore I want to continue observing it in future.

Keywords: methane hydrate, methane plume, quantitative echo shounder, piston core

Japan Geoscience Union Meeting 2014
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MIS22-06 Room:213 Time:April 29 15:30-15:45

Quantify methane seeping flux from Ashizuri knoll, Nankai Trough

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The Ashizuri Knoll is located on the southern margin of Tosa Basin (ca. 1000 m depth) in the western Pacific Ocean. The top of the knoll is 534 m depth.The BSR have been detected around the knoll. Beside, seepage methane bubbles were found at top of the knoll. Extensive geochemical surveys on the water column around Ashizuri Knoll were done in September, 2013.The primary purpose of the study was to quantify the seeping flux of methane from the knoll by measuring the spatial distribution of methane around the knoll. Besides, we akso tried to clarify the origin of methane by determining both δ13C and δD values.

Enrichment of thermogenic methane up to 145 nmol/L was detected just above the top of knoll. Besides, the methane enriched plume spread northeastward of the knoll at the water depth of 450- 660 m. The calculated methane flux was almost the same with that of off Joetsu hydrate area.

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MIS22-07 Room:213 Time:April 29 15:45-16:00

Characteristics of natural gas hydrates retrieved off the southeastern and southwestern Sakhalin Island

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Gas hydrate samples were retrieved at the southeastern and southwestern Sakhalin Island in the cruises of LV59 and LV62 (R/V Akademik M. A. Lavrentyev). Sakhalin Slope Gas Hydrate (SSGH) project started in 2007, and we retrieved sediment cores including gas hydrates off northeastern Sakhalin Island in 2009-2011. In the recent cruises (2012-2013), we sampled sediment cores at the Terpeniya Ridge and the Tatarsky Trough (SE and SW Sakhalin Island, respectively). We found a lot of gas plumes ascend from the sea bottom and the dissolved methane in sediment pore water was rich. Gas hydrate crystals were recovered from both areas and stored into liquid nitrogen tank. Their dissociation heat and hydration number were measured by a calorimeter and Raman spectrometer, respectively. Dissociation heat of gas hydrates was almost the same as that of pure methane hydrate. Raman spectra showed that the hydrate crystals of both Terpeniya Ridge and Tatar Trough belonged to the structure I, and the hydration number was estimated about 6.0. Molecules of hydrogen sulfide were detected in both large and small cages of the structure I. Therefore, the hydrate crystal is similar to that obtained from NE Sakhalin Island in our previous cruises.

We obtained hydrate-bound gas and dissolved gas in pore water on board and measured their molecular and stable isotope compositions. Empirical classification of the methane stable isotopes; δ^{13}C and δD indicated that the gases obtained at the Terpeniya Ridge are microbial origin via carbonate reduction, whereas some cores at the Tatarsky Trough showed typical thermogenic origin. We retrieved three sediment cores with gas hydrate at the Tatarsky Trough, and their δ^{13}C of hydrate-bound methane were -47.5 ‰, -44.2 ‰, and -68.8 ‰, respectively. Therefore, gas hydrates encaged both microbial and thermogenic gases yield at the Tatarsky Trough. Ethane-rich (up to 1% of the total guest gas) hydrates were found at the Terpeniya Ridge and the Tatarsky Trough, and encaged ethane was also detected in their Raman spectra. Ethane δ^{13}C of the all gas samples suggested their thermogenic origin.

Keywords: gas hydrate, stable isotope, Sea of Okhotsk, Raman spectroscopic analysis, Calorimetry

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MIS22-08 Room:213 Time:April 29 16:15-16:30

First attempt to drill down hydrate mound and gas chimney by BGS Rockdrill 2

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[1]Meiji University-Gas Hydrate Laboratory, [2]British Geological Survey

A series of shallow piston coring (PC) has identified dense accumulation of massive gas hydrates in the upper part of hydrate mounds and gas chimneys in Japan Sea since 2004, however, because of limited penetration of PC, distribution and resource potential of gas hydrate below ˜10 mbsf have not been clearly answered as yet. On the other hand, 3D seismic profiles have revealed significant pull-up structure, a characteristic velocity pseudo-structure, in gas chimneys, suggesting an accumulation of significant amount, probably 20 to 30 vol.%, of gas hydrates in gas chimneys. In the summer 2013, Meiji University and British Geological Survey deployed BGS benthic drilling machine, Rockdrill 2, on hydrate mounds in Joetsu basin, Japan Sea, and successfully drilled through inhomogeneous, gas hydrate- and carbonate-bearing hard sediments and occasional soft and gassy sediments down to 32 mbsf. Core recovery was unfortunately low throughout the coring due to extensive dissociation of gas hydrate and gas expansion during and after coring. However, we could recover massive gas hydrate samples, 5 to 12 cm long, from a number of horizons down to 32 mbsf. Several 2 to 7 m thick zones of gas hydrate accumulation have been inferred from integrated profiles of drill logs, video-monitor observation, and discontinuous sediment core record. Shallow drilling of Rockdrill 2 is likely to have proved a dense distribution of gas hydrates in deeper part of hydrate mounds and gas chimneys.

Keywords: gas hydrate, Japan Sea, hydrate mound, gas chimney, Rockdrill 2

Japan Geoscience Union Meeting 2014
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MIS22-09 Room:213 Time:April 29 16:30-16:45

Formation of shallow gas hydrates and geochemistry of gas and pore water from UT13 cruise in the Japan Sea

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Active gas venting and distribution of massive gas hydrates are largely observed on the summits of the Umitaka Spur and Joetsu Knoll in the eastern margin of the Japan Sea, where the fault system associated with strong anticline structure constrains the accumulation of gas and following gas hydrate formation. The UT13 cruise has conducted to collect shallow sediments from the Oki Trough, north eastern of Noto Peninsula, and offshore Akita-Yamagata areas, where gas chimney structure and strong backscatter indicate migration of gas-charged fluid and potential formation of gas hydrates near the seafloor. Geochemistry of pore water, dissolved gas, and hydrate-dissociated gas reflect the geochemical environments associated with the delivery of gas and fluid and formation/dissociation of gas hydrates in the shallow sediments.

Flake-like and nodular gas hydrates were observed at 1-6 mbsf in the Oki Trough and offshore Akita-Yamagata, respectively. Concentrations of methane dissolved in pore water are high, comparable to those in the Umitaka Spur and Joetsu Knoll area, and the SMI depths are accordingly shallow at ~2.7 mbsf in the entire research area, indicating high potential of gas hydrate accumulation in the shallow sediments. Concentrations of chloride are sporadically low in all areas due to gas hydrate dissociation during core recovery, accumulations of small gas hydrates with saturations up to 20% were observed, reflecting ubiquitous formation of gas hydrates in the research area. Concentrations of calcium and magnesium show fine increase and decrease in response to sulfate changes at deeper than SMI, reflecting the change of the methane flux mainly, the formation/dissociation of gas hydrates may have changed seafloor topography and geochemical properties of pore water and gas in the shallow sediments.

Contrary to the Umitaka Spur and Joetsu Knoll area where thermogenic gas dominates in the shallow gas hydrates, chemical and isotopic compositions of gas indicate that the majority of gas is of biogenic origin with minor contribution from thermogenic ethane and hydrogen sulfide, the latter may result in expanding gas hydrate stability and forming gas hydrates near the seafloor.

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Keywords: Shallow gas hydrates, pore water, dissolved gas, SMI

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Distribution of methanogenic and methanotrophic archaea in subseafloor sediment collected during UT12

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Methane hydrate is now one of the most popular energy sources in the world, and various amounts are presumed to be buried around Japan's continental margins. Methane contained in methane hydrate in the deep sea sediment is produced by microbial or thermogenic system. In the microbial system, methanogenic and methanotrophic archaea play an important role in this environment. However, the studies on characteristics and abilities of these microorganisms are still underway in the Sea of Okhotsk. Therefore, this study focuses on isolation of the methanogenic archaea and analysis of community construction and diversity of these microorganisms.

Sediment samples were collected from the subseafloor by the piston coring, during UT12 (Umitaka-maru Gas Hydrate Research Cruise 2012). Samples were collected from each core sample at appropriate intervals. The samples were stored at 4 ℃ for the microbiological cultivation experiment use, and at -80 ℃ for the microbiological diversity analysis use, respectively.

For the isolation, cultivation was carried out by enrichment culture using H_2/CO_2 medium. The cultivation temperatures were 15 ℃ and 30 ℃, respectively. We successfully isolated several methanogenic archaea from the samples of the surface of the subseafloor. The result of the 16S rRNA gene sequence analysis showed that some of the strains were identified as closely related strains of *Methanogenium marinum*. In a previous literature, *M. marinum* was isolated from the cold marine sediment from the Scan Bay, Alaska. We also conducted the experiment to measure the methane productivity of our isolates by the range of the cultivation temperature.

For the analysis of community structure and diversity of methanogens, DNA was extracted from each sediment sample, using the ISOIL kit following the manufacturer's protocol. The 16S rRNA gene of methanogenic archaea and the mcrA gene of methanogenic and methanotrophic archaea were amplified by PCR. The PCR product was purified by FastGene Gel/PCR Extraction Kit following the manufacturer's protocol. The purified products were analyzed by T-RFLP method and clone library method. The results of the T-RFLP analysis showed that the various fragments were observed. Clone library sequencing analysis of mcrA genes indicated that some of them were identified as related sequences to *Methanogenium*. Also, results from T-RFLP method were used for MDS (Multi-Dimensional Scaling) analysis.

This experiment was supported by grants-in-aid for scientific research <KAKENHI>(Ryo Matsumoto, Meiji University).

Keywords: shallow gas hydrate, methanogenic archaea, methanotrophic archaea

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Environmental variability of the Japan Sea clarified by

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Environmental variability of the Japan Sea was presumed using MD179 Cruse 3312 sediment core by inorganic and organic geochemical analysis. Analysis of this study went focusing on mainly thin-laminated dark layer (TL-1 to 3). TOC was about 0.8% in TL-2 and 3, on the other hand, the TL-1 layer showed nearly 2%. In the central part of TL-2 to the upper part, all the samples of a C/S ratio are 1 or less. This has suggested strong reduction environment at the upper part of TL-2 layer.

The Pristane/Phytane ratio (Pr/Ph ratio) traditionally used as an oxidation-reduction index is shown that most analysis data are <3.0 and it was the reductive environment. Pentamethylicosane (PMI) which is the membrane lipid origin of the anaerobic methanotrophic archaea (ANME), C18-isoprenoid ketone characteristically detected to a cold-seep carbonate and hop-22 (29) ene (diploptene) also the origin were not clear, characteristically found out at a methane seeping point, those depth distribution was plotted and considered. Distribution of the AMNE marker in the inside of TL layers is heterogeneous, and the possibility of the sudden methane eruptions during the TL-2 deposition was suggested.

This study was supported by MH21, Research Consortium for Methane Hydrate Resources in Japan.

Keywords: Japan Sea, biomarker, TL layer, sulfur isotope compositon, anoxic environment, C/S ratio

Japan Geoscience Union Meeting 2014
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MIS22-P01 Room:Poster Time:April 29 18:15-19:30

Overview of well logging operations at the 1st offshore methane hydrate production test in the eastern Nankai Trough

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Overview of well logging operations at the 1st offshore methane hydrate production test in the eastern Nankai Trough

T.Takayama*, T.Fujii, K.Suzuki, K.Yamamoto (JOGMEC)

Objective

The objective of well logging operations at the 1st offshore methane hydrate production test is to evaluate the formation lithology and reservoir properties. We will construct an integrate reservoir model based on the well logging data for assessing an accurate prediction of production performances for the methane hydrate (MH) production test.

Well logging results

Our focused area around the offshore production test site comprised unconsolidated turbidite formations with a thickness of thin turbidite sand and mud layers according to the previous well logging data. These formations typically show significant washed out after the drilling and its effect of the quality of data is serious issues for the formation evaluation by well logging data.

The well logging results in the monitoring wells indicate that the significant washed out was found particularly in the intervals of thin bed turbidite formations above the reservoir interval and below the BSR(Bottom Simulating Reflectors). However, other intervals exhibit stable caliper logging data, which indicating there are no significant washed out effect even in the WL(Wireline Logging) data. This is probably due to the tight formation of the mud-rich and MH-rich intervals.

Conclusions and Future works

a) Operation of both LWD(Logging While Drilling) and WL was successfully completed without any significant trouble.

b) Borehole condition was bad due to the borehole washed out above the reservoir interval and below the BSR. This was mainly due to the unconsolidated turbidite formation with the thin thickness of sand and mud layers. In spite of the washed out effect, reservoir and seal intervals showed good quality of well logging results which correspond to significant tight formations of mud-rich and MH-rich sediments.

c) In LWD operation, we used pulse neutron generator without radioactive sources. This operation was quite rare in the world and we could successfully obtain fairly good well logging data in the seal and reservoir intervals.

d) In the drilling of the MH reservoirs in the offshore exploration, the borehole washed out is inevitable because it exists in the shallow marine unconsolidated sediments. Hence, several challenging and technical issues are significantly important for our future study.

Acknowledgment

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Keywords: methane hydrate, offshore methan hydrate production test, Nankai Trough, Well logging

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MIS22-P02 Room:Poster Time:April 29 18:15-19:30

Depicting Thermal History of the Forearc Basin Pleistocene Turbiditic Sedimentary Sequences around Daini Atsumi Knoll

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Thermal history of sedimentary basin is a key to understand hydrocarbon maturation and generation of the source rock within the basin. In terms of gas hydrate accumulation, high pressure and low temperature boundaries, the gas hydrate stability zone, is mandatory to simulate in order to understand accumulation mechanisms of gas hydrate in the studied basin. We have determined heat flow history of Pleistocene sedimentary sequences in the forearc basin round the Daini Atsumi knoll, along the eastern Nankai Trough, Japan, by simulating gas hydrate stability zone. World first offshore production test of gas hydrate was successfully done in the vicinity area of Daini Atsumi knoll during March 2013.

Simulation in 3D gas hydrate petroleum systems of the forearc basin filling with Pleistocene turbiditic sedimentary sequences around the Daini Atsumi knoll was firstly performed by applying assumed heat flow of 45 mW/m2. Temperature at seabed is applied as 3.5 C throughout the model area and depositional period. Simulated sedimentary sequences consist of Pleistocene Ogasa Group of sand and shale alternative turbiditic sedimentary layers. Older upper Kakegawa Group is also included between the model basement and Ogasa group. Lithologies are interpreted from grain size analysis of cores data. Lateral facies distribution are based on seismic facies analysis. Global sea level changes are considered in applying paleo-water depths of the geologic horizons.

Simulated hydrostatic pressure matches hydrostatic pressure calculated from XPT data at well A1-L. Simulated temperature was calibrated by DTS (distributed temperature sensor) Temperature of gas hydrate reservoir zone at well AT1-MC. Calibration result reveals that heat flow has to low down to 32 mW/m2 in order to fit pressure and temperature at well. Result of simulated temperature using calibrated heat flow matches with a resolution of ˜1C of the well data. This heat flow value is lower than the reported value (˜50 mW/m2, Harris et al., 2014) around the vicinity of the studied area. Validation of this heat flow value requires 1) to reanalyze model layer thickness and total thickness of model, and 2) to reanalyze thermal conductivity of applied lithology.

In addition to above works, model is planned to update with paleo-water depth based on paleo-bathymetry from structural restoration, and reported depth from foraminiferal measurement of core samples at A1-L well. Because mass and lateral distribution of gas hydrate accumulation are considerably affected by tectonic uplift at Daini Atsumi Knoll.

This study is a part of the program of the Research Consortium for Methane Hydrate Resources in Japan (MH21 Research Consortium).

Keywords: Gas Hydrate Petroleum Systems, Daini Atsumi Knoll, Heat Flow, Pleistocene Ogasa Group, 3D, Simulation

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Methane Hydrate trapping system of the turbidite channel complex in Daini-Atsumi Knoll, eastern Nankai Trough, Japan

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The 1^{st} offshore gas hydrate production test was conducted at gas hydrate concentrated zone (reservoir) of the Eastern Nankai Trough, which is considered stratigraphic accumulation. However, the accumulation mechanism for this concentrated zone is not yet well understood.

In this study, in order to examine gas hydrate trapping system in the accumulation mechanism, we identify the depositional process and controlling factors based on facies analysis and sequence stratigraphy using the core and geophysical log data.

Seven depositional sequences are identified based on grain size, bed thickness, sedimentary structure, and stacking pattern in this study. The sequence boundaries are also identified by terminations of seismic reflection. These sequences are attributed to a fourth to fifth-order eustatic sea-level changes, because the stacking pattern cycle is in phase with global oxygen isotope curves, the cycle is also identified in the onshore formation during the same period. The reservoir was interpreted as Falling-Stage Systems Tract (FSST) and Lowstand Systems Tract (LST).

In the reservoir, it was observed the channel complex set characterized by relatively strong reflections and paleocurrent flowing from northeast to southwest on 3-D seismic data. The channel complex set changes into muddy facies in the south direction. The channel complex set is characterized by hemipelagic setting or slope (F1), abandonment mud drape (F2), nonamalgamated channel element (F3), and semiamalgamated channel element (F4). The channel elements (F3, 4) are the fundamental unit and record a single phase of downcutting and filling. The muddy deposits (several 10 m; F1) above reservoir are interpreted as condensed section because they are consistent with a peak of foraminifer abundance. The condensed section divide different sediments of gas hydrate saturation.

These features suggest that condensed section deposits become top seal and channel deposits interpreted as FSST and LST become reservoir in gas hydrate trapping formation. The trapping system has the ability to seal lateral gas leakage because the channel reservoir is located around structural wing, the direction of sand pinch-out to structural highs becomes oblique to the direction of sediment supply. Consequentially, gas hydrate trapping system is constrained by sedimentary facies, systems tracts, and geographic and tectonic setting. Concepts and data generated in this study can be used for gas hydrate petroleum system analysis such as basin simulation.

Keywords: gas hydrate system, sequence stratigraphy, sea level change, submarine channel, sedimentary facies

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Relationship of permeability and particle breakage of experimental fault -Evaluation for the methane-hydrate reservoir-

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Methane hydrate is expected to be an energy resource in the future. As results of coring and logging, the existence of a large amount of methane-hydrate is estimated in the east Nankai Trough, offshore central Japan, where many folds and faults have been observed. Permeability in methane hydrate-bearing sediment is important factors for estimating the efficiency of methane gas production. In this study, we use a ring-shear apparatus to examine the relationship between the permeability and grain size reduction of silica sand sample after large displacement shearing under tested effective normal stresses ranging from 0.5 MPa to 8.0 MPa. The grain size distribution in the shear zone of sand specimen after ring-shearing at each normal stress level is analyzed by laser particle analyzer. The permeability and grain size reduce with the increasing the effective normal stress due to particle breakage. The relationship between permeability and grain size distribution after ring-shearing is expressed well by a curve in each sand, silt and clay size content. In the first group, the sand size content is up to about 80 %, permeability drastically decreases by two orders of magnitude. In the second group, the sand size content is less than about 80 %, the permeability is almost constant. In the silt and clay size, the both contents are up to about 10 %, the permeability abruptly decreases, while, the permeability gradually decreases over about 10 %. The results are indicated that the grain size reduction and the effective normal stress during shearing are one of the controlling factors of the permeability in fault of sand. This study is financially supported by METI and Research Consortium for Methane Hydrate Resources in Japan (the MH21 Research Consortium).

Keywords: Fault, Particle breakage, Permeability, Grain size distribution, Ring-shear test

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Methane seepage and possibility of hydrate-bearing layers around Kuroshima Knoll, SW Ryukyu

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A reconnaissance survey expedition of Kuroshima Knoll, located south of Ishigaki Island, southwest Ryukyu Islands, was carried out for the first time in 1996. During the expedition dead Calyptogena shells were identified on the summit plane of the knoll. Several advanced reconnaissance survey expeditions afterwards for the geological study in this area by 2001 revealed an active eruption of methane, which suggested a methane hydrate layer beneath the knoll. In this study, we carried out a mapping of the bottom sediment on the top flat plane of Kuroshima Knoll from the video images obtained by JAMSTEC submersibles and ROVs since 2002 in order to create a complete geological route map. The result shows that the whole area of the summit plane of the knoll with the water depth of around 640m was covered by dead Calyptogena community and calcareous rocks. Live Bathymodiolus community was located densely around 24deg. 07min. 48sec.N, 124deg. 11min. 33sec.E. Bubble eruption was located at 35 sites. The area of the suggested methane seepage was estimated to be 40,000 square meters.

Next, the vertical profile of the sea water temperature with its seasonal variability around the knoll was examined in order to verify if methane hydrate exists stably beneath the seafloor of the knoll by use of the JODC data catalogue. It is, however, hard to expect a methane hydrate layer underneath the knoll considering the water temperature at the seafloor in this area. Examination of the vertical profiles of the sea water temperature along the whole Ryukyu Arc also shows that a possible methane hydrate layer is confined to the area with more than 700m in water depth in the fore-arc area.

Keywords: methane hydrate, Kuroshima Knoll

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Hydrogen isotope of hydrate-bound hydrocarbons at Lake Baikal

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Natural gas hydrates exist in sublacustrine sediments of Lake Baikal. Gas hydrates were first obtained from sub-bottom depths of 121 and 161 m in the Baikal Drilling Project well located at the southern Baikal basin. Recently, MHP (Multi-phase Gas Hydrate Project, 2009-2013) revealed distribution of gas hydrate in sub-bottom sediment at the southern and central Baikal basins. We obtained gas hydrate crystals from more than 25 places, and retrieved hydrate-bound gas onboard. We measured molecular and isotopic compositions of hydrate-bound gas.

According to the δ^{13}C-δD diagram for methane (Whiticar, 1999), high and low methane δ^{13}C values indicate thermogenic and microbial origins, respectively, and methane δD provides information on methyl-type fermentation or CO_2 reduction in the microbial field. Kida *et al.* (2006) and Hachikubo *et al.* (2010) reported that hydrate-bound methane of Lake Baikal was microbial origin via methyl-type fermentation, because methane δD was about -300 ‰. We found heavier methane (δ^{13}C ranged from -50 ‰ to -40 ‰) in the Kukuy Canyon area (central Baikal basin), indicating thermogenic origin. Methane δD was distributed from -330 ‰ to -270 ‰. Generally, δD of thermogenic methane of marine gas hydrates is much more heavier (more than -200 ‰). Methane δD of Lake Baikal gas hydrate seems to be about 100 ‰ smaller than that of marine gas hydrate. Matveeva *et al.* (2003) reported that δD of the lake bottom water was about -133 ‰. Possiblely, methane δD of hydrate-bound methane derives from δD of water.

Hachikubo A, Khlystov O, Krylov A, Sakagami H, Minami H, Nunokawa Y, Yamashita S, Takahashi N, Shoji H, Nishio S, Kida M, Ebinuma T, Kalmychkov G, Poort J (2010) Molecular and isotopic characteristics of gas hydrate-bound hydrocarbons in southern and central Lake Baikal. *Geo-Mar Lett* **30**: 321-329. doi:10.1007/s00367-010-0203-1

Kida M, Khlystov O, Zemskaya T, Takahashi N, Minami H, Sakagami H, Krylov A, Hachikubo A, Yamashita S, Shoji H, Poort J, Naudts L (2006) Coexistence of structure I and II gas hydrates in Lake Baikal suggesting gas sources from microbial and thermogenic origin. *Geophys Res Lett* **33**: L24603. doi:10.1029/2006GL028296

Matveeva TV, Mazurenko LL, Soloviev VA, Klerkx J, Kaulio VV, Prasolov EM (2003) Gas hydrate accumulation in the subsurface sediments of Lake Baikal (Eastern Siberia). In: Woodside JM, Garrison RE, Moore JC, Kvenvolden KA (eds) Proc 7th Int Conf Gas in Marine Sediments, 7-11 October 2002, Baku, Azerbaijan. *Geo-Mar Mett* **23(3/4)**: 289-299. doi:10.1007/s00367-003-0144-7.

Whiticar MJ (1999) Carbon and hydrogen isotope systematics of bacterial formation and oxidation of methane. *Chem Geol* **161**: 291-314. doi:10.1016/S0009-2541(99)00092-3

Keywords: gas hydrate, crystallographic structure, Lake Baikal, methane, stable isotope

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Sedimentary environments and pore properties of subseafloor sediments in the eastern margin of Japan Sea

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Sediment samples below the seafloor were retrieved as long as 40 meters at the Umitaka Spur, Joetsu Channel, Toyama Trough, Japan Basin, Nishi Tsugaru and Okushiri Ridge areas in the east margin on Japan Sea. Small amounts of sandy sediment have been retrieved as thin intercalations in Pleistocene and Holocene muddy layers, where trace fossils and strong bioturbations are commonly observed. Those sandy sediments consist of very fine- to fine-grained sands, and are sometimes tuffaceous. These sandy sediments might have been transported approximately around 3 to 30 ka according to the tephra ages, where supplying sediments might have not been abundant due to sea level fluctuation during the Pleistocene ice age.

It is important to clarify the relationship between burial depths and absolute porosities of the argillaceous sediments. Therefore, macroscopic observations and descriptions, measurements of porosities and the pore size distributions, thin-section observations, SEM (scanning electron microscope) observations, and the X-ray diffraction analyses have been performed. They consist of silt- to clay-grained particles, and they sometimes contain very fine- to medium-grained thin sandy layers. Average porosities are 50 % in all study areas, but mean pore sizes in the Nishi Tsugaru are around 1000 nm while 100 nm in the other areas, which tend to decrease as increasing of depths. It is suggested that repacking of the muddy particles dominantly advances by physical compaction in early diagenesis.

They generally contain much opal-A, quartz, feldspar, illite and smectite that do not change definitely with depth, because they are tuffaceous and are suffered only from early diagenesis. By optical and microscopic observations, diatom tests, foraminifers and framboidal pyrites are commonly observed, and, in particular, the shapes of diatom are usually various, dominantly fragmental and infrequently preserved.

The sedimentological properties of subseabottom argillaceous sediments in early diagenesis can be discussed in terms of physical and geochemical aspects such as porosity, permeability, pore size distribution, diagenetic mineral composition as well as microscopic observation. It is remarked that the physical diagenesis proceeds first as repacking of clastic grains due to mechanical compaction, whereas the chemical diagenesis advances very slowly in early diagenesis.

This study was performed as a part of the MH21 Research Consortium on methane hydrate in Japan.

Keywords: hydrate, Japan Sea, pore

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Isotopic and microbial compositions of carbonate nodules from sea bottom sediments in the Japan Sea

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Carbonate precipitates on sea bottom sediments and shallow core in methane seep areas are often associated with methanogens. Anoxic methane oxidization is a particularly important metabolism for carbonate precipitation in terms of raising local alkalinity and supersaturation. We recovered carbonate nodules from sea bottom sediments from Umitaka Spur, Joetsu Knoll and Akita offshore during an expedition fro gas hydrate in the Japan Sea in August-October 2013. We investigate microbial metabolisms for carbonate precipitation based on textural observation, isotopic measurement, and gene analysis.

Many specimens appear grapestone textures consisting of aggregated small nodules, which indicate multiple generation of carbonate precipitation. Aragonite needles are commonly observed on outer margin and in pore spaces in the grapestone. Core part of the nodules are often black color due to concentration of organic substance. Isotopic compositions were measured for sub-samples that were micro-drilled from the section of the nodules. Some of the Umitaka specimens exhibit large variation in carbon isotope, which generally decrease from core to margin. Methanogenesis is only accountable microbial processes for the highest values up to +12 permil. This metabolism can separate organic carbon into 13C-depleted methane and 13C-enriched carbon dioxide species. On the other hand, nodules from Joetsu and Akita are relatively homogenous and very low (-45 to -60 permil) in carbon isotope. This indicate that carbonate carbon in the nodules was largely originated from methane. Gene analysis for an Umitaka specimen extracts many sulfate resucers, but no methanogens. This specimen was calcified by sulfate reduction of organic matter.

We would like to thank onboard scientists and crews for their kind support during the expedition. We appreciate British Geological Survey for drilling.

Keywords: gas hydrate, carbonate nodule, stable isotope, microbes

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Microstratigraphic studies using UT13 piston cores around methane seep areas, eastern margin of the Japan Sea

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1. Introduction

Microbiostratigraphy is important for the submarine resoueces survey to research the chronology and paleoceanography. Furthermore, benthic foraminiferal studies are also useful to clear the environmental impacts caused by the dissociation of subsurface methane hydrate in shallow sediments of the Umitaka Spur and Joetsu Knoll of the Joetsu basin 30 km off Joetsu city, Niigata Prefecture (Matsumoto et al., 2009). It is possible to estimate the age and environments of core sediments in detail, because the Microbiostratigraphy during the past 130 ka could be evident in the giant piston cores recovered by MD179 cruise in June 2010.

In this poster, we introduce the late Quaternary microbiostratigraphy of diatom and foraminifera off Joetsu in the eastern part of the Japan Sea, and applied these results and foraminiferal ^{14}C dates to the core sediments in the other hydrate areas of the Japan Sea.

2. Microbiostratigraphy of diatom and foraminifera off Joetsu

12 foraminiferal biozones (Biozone I to XII in descending order) in the last 32 ka and 8 diatom zones (A-H diatom zones) in the last 130 ka were recognized based on some piston cores off Joetsu and indicate the paleoenvironmental changes of the surface and bottom sea water, respectively (Nakagawa et al., 2009; Akiba et al., 2014).

3. UT13 studies

In July 2013, Umitaka-maru sailed to two new areas to delineate the entire sequence of gas hydrate mound in the Oki-Trough and the Mogami-Trough. Piston corer penetrated down to 6-8 mbsf on hydrate mounds and recovered some massive methane hydrate and 13 core sediments. We analyzed microfossil assemblages and ^{14}C dating of these sediments and estimated each sedimentation rate by comparing with the previous studies.

3-1. Result 1 - Sedimentation rates of Oki Trough

Main core sediments in the Oki Trough have similar sedimentation rates (about 15 cm/kyr) from 3-4 ka to present, but PC1302 reduced top sediments has a higher rate and PC1305 included methane hydrates a relative lower rate. The sediment age upon massive hydrates from the bottom of PC1305 was calculated ca. 40 ka.

3-2. Result 2 - Microbiostratigraphic features in Mogami Trough

Three cores in the Mogami Trough indicate the lack of sediments around LGM because of older ^{14}C dates and occurrences of the extinct benthic foraminifera, *Epistominella pulchella*. In particular, whole foraminiferal assemblages of PC1311 sediments are characterized by the distributions of *E. pulchella* and poor preserved specimens, whereas mixed the well-preserved subtropical planktonic species. These features might indicate the gas hydrate activities from the deep seafloor.

Keywords: the eastern margin of the Japan Sea, methane hydrate, microbiostratigraphy, stable isotope, sedimentation rate, extinct species

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Deposition process based on foraminiferal stratigraphy

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There are mound called Joetsu Knoll and Umitaka Spur which was associated with the formation of methane hydrate off the coast of Joetsu city, Niigata Prefecture. There are valley in east side of Joetsu Knoll, there have a very special geographical features. In this area, previous researches recognized 12 foraminiferal biozones and 8 diatom biozones. These are the good stratigraphic indicators in contrast of sediment core. Sediment core I use to study (MD179-3308) collected from the valley. The length of this core is 30.9m and water depth is 1224m. This core recognized 4 diatom biozones and at 5 layers of this core, radiometric age was measured. From these researches, it was estimated that there was a large age gap around 1620cmbsf in the sediment core.In the valley, it is considered that landslides and flows from the shallow occurred. For clarify depositional process and relationship of valley and mound, in this study, foraminifera in this sediment core was analysed.

Around 1620cmbsf in the sediment core, benthic foraminifera association and planktonic foraminifera numbers are changed. It is considered that the layer of 0 ˜1620cm have a sedimentary record of about 30,000 years. In this layer, benthic foraminifera associations are similar to previous researches. It is considered that layer of 1620cm˜2820cm have a sedimentary record of about 70,000 years ˜110,000 years. Benthic foraminifera is alternated crowd in which Brizarina pacifica is priority species, and crowd in which Eilohedra rotunda, Islandiella sp are priority species. In particular, foraminifera in 1700cmbsf is characterized by Brizarina pacifica and maximum number of foraminifera.

Rutherfordoides rotundata output from 1000 ˜1800cmbsf and 2280cmbsf. It is the related species of Rutherfordoides corunata which is methane-related species. Therefore, it is considered that sediment of these layers are derived from the methane seep.

Keywords: benthic foraminifera, planktonic foraminifera, foraminiferal number, methane hydrate, Deposition process