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

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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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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