



U.S. Department of
ENERGY

**FY 2010
Methane Hydrate Program
Annual Report to Congress**

September 2011

**United States Department of Energy
Washington, DC 20585**

Message from the Secretary

Section 968 of the Energy Policy Act of 2005 requires the Department of Energy to submit to Congress an annual report on the results of methane hydrate research.

I am pleased to submit the enclosed report entitled, *U.S. Department of Energy FY 2010 Methane Hydrate Program Report to Congress*. The report was prepared by the Department of Energy's Office of Fossil Energy and summarizes the progress being made in this important area of research. Pursuant to statutory requirements, this report is being provided to the following Members of Congress:

- **The Honorable Joseph R. Biden**
President of the Senate
- **The Honorable John Boehner**
Speaker of the House of Representatives
- **The Honorable Jeff Bingaman**
Chairman, Senate Committee on Energy and Natural Resources
- **The Honorable Lisa Murkowski**
Ranking Member, Senate Committee on Energy and Natural Resources
- **The Honorable Ralph M. Hall**
Chairman, House Committee on Science and Technology
- **The Honorable Eddie Bernice Johnson**
Ranking Member, House Committee on Science and Technology
- **The Honorable Fred Upton**
Chairman, House Committee on Energy and Commerce
- **The Honorable Henry A. Waxman**
Ranking Member, House Committee on Energy and Commerce

If you need additional information, please contact me or Mr. Jeffrey A. Lane, Assistant Secretary, Office of Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

Steven Chu

Executive Summary

Since 2001, the Department of Energy's Methane Hydrate R&D Program has pursued a range of science and technology development efforts designed to determine energy resource and environmental implications of the potential vast occurrence of gas hydrate in nature. In a congressionally-mandated report released in January, 2010, the National Research Council (NRC) concluded that NETL has been "*consistent and effective*" in leading a "high quality research portfolio that has enabled significant progress toward the Program's long-term goals". Specifically, the review compliments "*the overall high caliber of the research, the breadth of investigations undertaken, the training of new, highly qualified personnel under the program's auspices, and the successful collaboration between federal agencies conducting research on methane hydrate*", and notes that the "*Program has also strengthened the transparency of its activities, notably through implementation of a peer-review process for ongoing research projects and increased communication with the public and the global research community*".

In FY 2010, the program's energy resource evaluation efforts remained focused on the Alaska North Slope and the Gulf of Mexico. Geologic and engineering studies required to obtain alignment between North Slope operators for drilling, sampling, and testing programs within the Prudhoe Bay operating area were completed. The first test, a short-duration field trial of both CO₂-CH₄ exchange as well as production via depressurization, has begun with the installation of a fully-monitored test borehole in April 2011 that will be available for testing during FY 2012. Plans for long-term depressurization tests have been developed, and await resolution of legal issues related to access to the chosen field location. In the Gulf of Mexico, the program continued to evaluate 2009 drilling data and to construct new coring and core analysis devices to support a planned FY 2012 deepwater Gulf of Mexico (GoM) field program. The program also maintained active international R&D collaborations with Japan, India, and Korea throughout FY 2010.

Numerous reports were released in 2010 highlighting the potential role of gas hydrate as a deleterious feedback to ongoing climate change. During the year, the program produced the first quantitative assessment of arctic marine gas hydrate's potential to respond to warming climates, advanced the incorporation of gas hydrate science into global climate models, evaluated methane emissions from arctic permafrost sources, provided the first modeling of the impact of methane release on ocean ecosystems, and evaluate the effectiveness of marine organisms in mitigating deepwater GoM methane releases.

This report outlines key accomplishments of the DOE-led gas hydrates program during FY 2010, and provides: 1) reviews of the status of the program's major field projects with industry; 2) updates on progress in key areas of focus, including gas hydrate exploration/characterization, global carbon cycle modeling, and fundamental scientific studies in both the laboratory and in numerical simulation; 3) the status of international collaborations; 4) updates on the National Energy Technology Laboratory-National Academy of Science Methane Hydrate Fellowship Program; and 5) a review of outreach activities, including a bibliography of refereed papers, articles, and conference presentations that appeared during the year.

FY 2010 METHANE HYDRATE PROGRAM ANNUAL REPORT TO CONGRESS

Table of Contents

I. Legislative Action	3
II. Summary of Progress in FY 2010.....	3
Gulf of Mexico Field Projects.....	3
Alaska North Slope Field Projects.....	5
Gas Hydrate Exploration Technologies	6
Global Environmental and Climate Studies.....	7
Fundamental Experimental and Modeling Studies	9
International Collaboration.....	10
Fellowship Programs	11
Program Management and Oversight	11
Technology Transfer	11
III. Conclusion	12
Appendix A: FY 2010 Publications and Reports	13
Peer-Reviewed Publications	13
Grey Literature	21
Presentations	26

I. Legislative Action

This report describes actions taken in Fiscal Year (FY) 2010 to implement the Methane Hydrate Research and Development Act of 2000, as amended by the Energy Policy Act of 2005 (EPAct). The Energy Policy Act requires that the Secretary of Energy provide this report to Congress annually.

II. Summary of Progress in FY 2010

During FY 2010, DOE's Methane Hydrate Program achieved significant progress through field projects, geophysical research, global and environmental climate studies, and experimental and modeling studies. Progress was also made in international cooperation, fellowship programs, program management and oversight, and technology transfer.

Gulf of Mexico Field Projects

Chevron-led Joint Industry Project

The Gulf of Mexico Joint Industry Project (JIP) is a cooperative research program between the DOE and an international consortium of industry partners under the leadership of Chevron. The overall objective of the project is to understand the nature of gas hydrate occurrence in the deepwater Gulf of Mexico, to develop technology to detect, delineate, and characterize methane hydrate accumulations, and to assess the implications of naturally-occurring gas hydrate for drilling safety and future energy supply.

During FY 2010, the project team continued the evaluation of field data acquired during the FY 2009 exploration drilling program. This program ("JIP Leg II") confirmed the existence of gas hydrate in sand reservoirs in the Gulf of Mexico, validated the prospecting approaches employed by the joint JIP-federal science team, and provided an initial calibration of an earlier (FY 2008) Department of Interior Gulf of Mexico gas hydrate resource assessment. Project results were presented in a special session at the December 2009 Annual Meeting of the American Geophysical Union, as well as in a series of seven papers delivered in a special session at the March 2010 Society of Petroleum Engineers' Offshore Technology Conference. In addition, thirteen detailed technical "Initial Results" reports were provided to the public on the National Energy Technology Laboratory's (NETL's) web site (www.netl.gov/technologies/oil-gas/FutureSupply/MethaneHydrates/JIPLegII-IR). Digital logging data were also made available to the public. A compendium of peer-reviewed reports on the project is being developed and is expected to be completed early in 2012.

Given the funds available, JIP Leg II was limited to 21 days of operation at sea, and as a result, the expedition was designed to maximize the number of sites drilled by focusing on the measurements obtained by a state-of-the-art, logging-while-drilling tool string. The success of the drilling program (in which resource-grade gas hydrates were found in four of seven wells

drilled) enabled the JIP and the DOE to agree to extend the project to enable a follow-on expedition designed to collect and maintain sediment samples under in situ pressures and conduct specific wireline evaluation programs including limited pressure testing in the newly-discovered reservoirs. JIP Leg III is being designed to evaluate both gas hydrate-bearing sand reservoirs and the associated sealing clay sediments through measurement of various petrophysical, hydraulic, and geomechanical properties. These data are not obtainable through laboratory study, and will greatly inform numerical modeling studies of the likely response of gas hydrates-bearing sediments during either natural or induced dissociation.

Also in FY 2010, the JIP Leg III Science Team, which includes science co-leads from NETL and the USGS, initiated preparations for the planned coring program. A full science party was named, and initial drilling, sampling, and sample handling/analysis protocols were developed. As there are no devices currently in existence that can acquire, maintain, subsample, transfer, and gather scientific measurements on the pressurized core samples, the JIP is proceeding with the design and construction of a number of new devices. The coring expedition, originally slated for FY 2011, has now been set for FY 2012, due largely to planning uncertainties related to the aftermath of the *Deepwater Horizon* event, including uncertain future regulatory environments, as well as the development of new industry protocols related to deepwater operations.

Mississippi Canyon 118 Seafloor Observatory

The University of Mississippi continues to lead a consortium working to establish and maintain a seafloor observatory for long-term monitoring of gas hydrate occurrences in Mississippi Canyon Block 118 in the Gulf of Mexico. This project is conducted in conjunction with the National Oceanic and Atmospheric Administration (NOAA) and the Bureau of Ocean Energy Management and Resource Evaluation (BOEMRE).

FY 2010 DOE-funded activities continued to focus on design and deployment of instrumentation for collection of geophysical, geochemical, and biological data at the Mississippi Canyon 118 hydrate mound. The project team successfully recovered targeted push cores and collected geochemical data and sediment samples from the near-seabed and shallow seabed in the region of the hydrate mound. In addition, a plan for the deployment of various passive seismic array was developed and tested during a cruise to Pensacola Bay. The arrays, which will be used for long-term monitoring of the structural and hydrocarbon fluid dynamics at the site, are scheduled to be deployed during a cruise in 2011. In late March and early April of 2010, scientists from the Naval Research Laboratory successfully deployed the modified, bottom-mounted Deep Towed Acoustics Geophysics System (DTAGS) at MC118 site with the goal of enabling a better understanding of the effects of sediment anisotropy on locating and assessing methane hydrates in deep water sediments.

Alaska North Slope Field Projects

Extended-duration Depressurization Testing Program

The main goals of this project, led by BP Exploration-Alaska (BPXA), are to characterize the nature and commercial implications of methane hydrate resources on the Alaska North Slope through the conduct of an extended-duration depressurization test. This test will enable the first information with which to calibrate numerical models of the potential productivity of gas hydrate bearing reservoirs as well as assess potential environmental impacts associated with gas hydrate production.

In the early stages of the project, BPXA-donated well and seismic data were used in collaboration with the USGS to assess gas hydrate occurrence within the Milne Point Unit, resulting in the delineation of more than 1 dozen drillable prospects. In order to further understand key reservoir properties needed to properly plan an initial production test, and to assess the potential impacts of scientific activities within the operating production area, BPXA and DOE drilled the Mount Elbert stratigraphic test well in 2007. Evaluation of those data provided critical improvements to reservoir modeling capabilities, enabling both the 2008 release by the USGS of the first assessment of technically-recoverable resources from gas hydrates, as well as the decision by BPXA and DOE to move into the planning of a long-term test focused on depressurization. An optimal test location and plan were developed in FY 2009. In addition, DOE has obtained agreement with the North Slope operators for participation in the production test by DOE's international partners, including Japan, Korea, and India.

Throughout early 2010, BPXA successfully worked to identify means by which both DOE-supported gas hydrate testing programs (the BPXA program focused on depressurization and the ConocoPhillips test focused on CO₂ injection and exchange) could be executed from a single surface location on an active gravel production pad in the western Prudhoe Bay Unit. NETL supported this effort through the geologic analysis of reservoir continuity and potential faulting beneath the pad, as well as numerical reservoir simulations designed to assess any interactions between the gas hydrate testing and the many production wells drilled from the pad. In May, 2010, BPXA identified a surface location and available drill rig, and circulated a draft agreement to its partners describing the planned testing activities, which were slated to begin in mid-2011. However, these plans were deferred shortly thereafter due to recognition of BPXA's debarment by EPA from receipt of federal funds for any activities within the Prudhoe Bay Unit stemming from a 2006 pipeline rupture in the unit. This debarment remains in effect at the date of this report, and the timing or nature of its resolution is yet to be determined.

CO₂-CH₄ Exchange Field Trial

NETL is continuing to work with ConocoPhillips, Alaska, to test the feasibility of producing methane from gas hydrate deposits using an approach in which carbon dioxide is exchanged for methane in the hydrate structure. If successful, this production strategy will release methane for production while sequestering carbon dioxide in the hydrate reservoir. A review of the scientific background for the project was provided in FY 2010 in the NETL Newsletter "Fire in the Ice":

http://www.netl.doe.gov/technologies/oil-gas/publications/Hydrates/Newsletter/MHNews_2010_03.pdf#page=19

In FY 2009, the ConocoPhillips project team identified locations in the western part of the Prudhoe Bay Unit as the most appropriate field test site. In FY 2010, approvals were pursued from among the working interest owners. This approval process included full consideration of the potential to merge this testing program with that being evaluated under the DOE's separate agreement with BPXA, who had also determined that the Prudhoe Bay sites were the most favorable locations to conduct their planned long-term depressurization tests (see previous section). Ultimately, it was determined that the BPXA project could not proceed at this time, and ConocoPhillips' request to conduct the test was approved by the Units' operating partners at the end of FY 2010. As ConocoPhillips is not the operator in the Prudhoe Bay Unit, the test will be conducted from a new ice pad built near the production facility. At the time of this report, the initial field program has been completed; with the test well drilled and completed in preparation for CO₂-CH₄ exchange and potential depressurization testing occurring as soon as the winter of FY 2012.

Gas Hydrate Exploration Technologies

In addition to the work ongoing within the major field programs to advance the geophysical evaluation of gas hydrates using existing datasets, a number of projects in partnership with Universities and other federal agencies are nearing completion. These projects, which are working to expand the gas hydrate exploration toolkit, were added to the program portfolio in 2008 and are scheduled to be completed in FY 2011. An effort with Baylor University is evaluating the Direct Current Resistivity (DCR) method for detecting and characterizing marine. During FY 2010, the deep-towed DCR array system was reconfigured to enable a high resolution 3D survey of the shallow seafloor. The new array system is scheduled for testing at the Mississippi Canyon lease block 118 sea-floor observatory in the summer of 2011.

A second project being led by Scripps Oceanographic Institute in partnership with Lawrence Livermore National Laboratory, Massachusetts Institute of Technology and the U.S. Geological Survey, is investigating the feasibility of using marine electromagnetic (EM) surveying to image methane hydrate in marine sediments. During FY 2010, scientists designed and constructed devices to enable conductivity experiments on lab-synthesized methane hydrate. Experimental hydrate conductivity data will be used to calibrate EM data collected during surveys in the Gulf of Mexico in October 2008. Demonstrating the ability of resistivity methods to supplement seismic data in the remote detection and characterization of hydrate occurrences could be an important step in assessing the global inventory of methane hydrates.

During FY 2010, scientists from Oregon State University utilized the extensive scientific database acquired by the government of India in FY 2006 (in collaboration with the DOE and USGS) to develop geologic models to assess the relationship between subsurface heat flow anomalies and continental margin gas hydrates. Preliminary analysis suggests that structural features such as

large-scale faulting contributes significantly to observed anomalies. If successful, this research may lead to a method—when coupled with other geochemical and geophysical data—for assessing the relationship of residual heat flow anomalies to fluid flow and ultimately, to predicting methane hydrate distribution in the subsurface.

Global Environmental and Climate Studies

DOE is supporting a range of studies designed to determine the sources, sinks, and fluxes of methane in arctic and marine gas-hydrate-bearing environments. The portfolio of projects includes field work in a range of geologic settings, as well as the initial attempts to incorporate gas hydrate into global climate and environmental process models.

Lawrence Berkeley National Laboratory (LBNL) is partnering with Los Alamos National Laboratory (LANL) to model the effects of future climate warming on marine hydrate accumulations. Specifically, researchers are investigating the effect of rising ocean temperature on the stability of marine hydrate deposits, the impacts of methane release on ocean ecosystems and ocean acidification, and the quantity of methane that could reach the atmosphere under different forward climate scenarios. During FY 2010, researchers expanded one-dimensional simulations of hydrate dissociation under various conditions of depth, temperature, and rate of warming to large-scale 2-D simulations of dissociating hydrates along continental margins. These initial regional scale simulations are focused on the Sea of Okhotsk, offshore New Zealand, the Gulf of Mexico, and the arctic continental margin.

Also during FY 2010, a team of scientists from the University of Alaska and the USGS collected samples of sediment, water, and gas from Lake Teshekpuk, a freshwater lake near Harrison Bay (North Slope) Alaska. In recent years, methane has been observed to be bubbling from this and other thermokarst lakes in the region. This project is aimed at pinpointing the source of the methane and estimating the quantity being released to the atmosphere. The research team collected samples to evaluate spatial variation in the methane flux compared to that observed in another lake near Barrow, Alaska in 2009. In addition, the USGS conducted multiple geophysical surveys of Lake Teshekpuk – including seismic reflection, ground penetrating radar, and resistivity profiling. The surveys were carried out to map the lake bottom, its underlying stratigraphy, and possible structures that could be responsible for methane seepage. Sediment, water, and gas samples are undergoing laboratory analyses to determine the source and nature of the methane.

Researchers from the University of California, Santa Barbara (UCSB) are investigating biological controls on methane release from subsea sediments to the ocean and atmosphere through case studies in the Santa Monica and Santa Barbara basins off the coast of California. During FY 2010, project scientists completed field surveys and analyses of the water turnover and methane oxidation rates in the water column. Additionally, genetic sequencing of benthic microbial mats collected from the seafloor in 2009 was initiated. These microbial mats are being studied for their role in subsea, biological oxidation of methane. The next step is to quantify the efficacy of microbial communities in metabolizing methane so that this mechanism of biofiltering

can be incorporated into models of the global carbon cycle. Utilizing the methodologies developed for this project, researchers from UCSB also joined a team of scientists in the summer of 2010 to investigate the biofilter efficacy and the fate of a methane associated with the Macondo well release in the deepwater Gulf of Mexico, resulting in the publication of results that suggested enormous capacity of marine microorganisms to rapidly adjust to, and consume, methane emitted into deep waters.

Texas A&M University – Corpus Christi, in conjunction with Florida State University, is leading an effort to develop a new method for detecting and quantifying natural hydrocarbon seeps in the using satellite imagery. During FY 2010, project scientists continued their efforts to map natural oil and gas seeps in the Gulf of Mexico. In addition, researchers began the analysis of water, sediment, and gas samples collected from the locations of vent sites previously identified on the imagery to determine rates of gas release from the seafloor and volumes that might survive the transit through the water column and be released into the atmosphere. Researchers, in collaboration with a German team, are attempting to use these same methods to detect and verify the locations of seeps in the Batumi region of the Eastern Black Sea. Project results should lead to more accurate global estimates of methane flux from submarine seeps and associated methane hydrate deposits, and these estimates should ultimately provide better inputs for climate models.

Researchers from the University of Chicago and University of California-Berkeley are developing a two-dimensional model for deep marine environments to simulate the formation and dissociation of methane hydrate in marine sediments over geologic time-scales. The project was designed to address the question of whether methane released from subsea sediments is likely to escape to the ocean or the atmosphere or remain in place below the seafloor. In FY 2010 researchers worked to develop models of hydrate formation and dissociation on active and passive continental margins. Simulations are being conducted to assess the sensitivity of the models to organic carbon concentrations, flow anisotropy, and 50 million-year cycles in ocean temperature. The 2-D basin scale models will ultimately be subjected to warming of the overlying water column, and will result in predictions of the response of the methane hydrate inventory to climate change.

Late in FY 2009, an International science team conducted a variety of sampling programs designed to quantify methane fluxes emanating from sediments in the Arctic Beaufort Shelf and slope regions. The expedition was led by the U.S. Naval Research Laboratory in collaboration with DOE/NETL, the Royal Netherlands Institute for Sea Research, the University of Delaware (UD), and a team of scientists from the U.S., Netherlands, Belgium, and Germany. Water column samples indicated elevated methane levels throughout shallow water regions of the Beaufort Sea. Elevated methane near the seafloor and in the shallow sediments was only observed at three locations near the shelf-slope break, coincident with subsurface features that indicate the presence of free-gas and/or gas hydrate accumulations associated with shallow faulting. Researchers from UD conducted extensive genetic sequencing of the microbial communities found within the sediment cores and leveraged through metagenomic sequence data from DOE's Joint Genome Institute Community Sequencing Program (CSP). These combined analyses have

revealed a complete pathway for sulfate reduction at depths. Ultimately, these data will be combined with other microbial and biogeochemical data to obtain a complete picture of methane degradation and other biogeochemical processes in these methane-rich Arctic sediments.

In August 2010, USGS and NETL-NAS scientists began geophysical imaging of the shallow Beaufort Sea shelf. The purpose of this study was to investigate high-latitude climate effects on the shallow shelf permafrost and to determine if hydrates may be degassing as the recently inundated permafrost retreats. This 2010 USGS reconnaissance effort will provide the basic data that is needed to determine if a larger-scale effort with more substantial geophysical imaging capabilities, coring, sediment and water column oxidation rate studies, and ocean atmosphere flux measurements is merited to quantify the various sources and sinks of methane and particularly the role of degassing hydrates in the shallow offshore northern Alaska.

Fundamental Experimental and Modeling Studies

DOE continued support of a number of experimental and modeling efforts within the DOE National Laboratory system and other federal agencies. These studies access unique facilities and capabilities to address fundamental knowledge gaps related to the nature of gas hydrate in sediments and the response of hydrate-bearing sediments to various natural or induced perturbations.

The USGS continued its investigation of a unique fingerprinting method to distinguish gas released from methane hydrates from other methane sources (e.g., wetlands, soils, coal or leaky hydrocarbon reservoirs). The technique accounts for the preferential partitioning of the noble gases krypton (Kr) and xenon (Xe) that is hypothesized to occur as hydrates form. Analysis conducted in 2010 support a unique noble gas fractionation pattern for the gas hydrates. Future work will expand on these initial findings and investigate the conditions controlling this partitioning phenomenon. Ultimately, tests will be conducted on natural hydrate samples and if successful, a new method of characterizing methane hydrate occurrence will become available to scientists and industry.

The USGS also continued laboratory studies of gas hydrate formation from dissolved methane, a process responsible for much marine gas hydrate occurrences but previously very difficult to realize in the laboratory setting. Tests in 2010 were designed to establish parameters for efficient hydrate formation and to automate the formation control and data acquisition processes. USGS scientists involved in this research continue to engage in and lead protocol comparisons in collaboration with experimentalists at Georgia Tech, Oak Ridge National Lab (ORNL), Lawrence Berkeley National Lab (LBNL), Pacific Northwest National Lab (PNNL), and NETL regarding formation of gas hydrate from dissolved phase methane. In addition, ORNL in collaboration with Georgia Tech, conducted experiments within the Seafloor Process Simulator (SPS) to assess the effects of sediment heterogeneity on hydrate accumulation processes. Different sediment configurations (e.g., large void spaces, sand lenses, fine/coarse grain material in different geometries) have been assembled within the SPS to create model sediment columns.

Gas hydrate production modeling and laboratory studies continued to be focused at LBNL, NETL, and PNNL. LBNL-NETL lab efforts continued to optimize techniques for estimating relative permeability and capillary pressure and for the collection of enhanced geophysical, geomechanical and hydrological properties of hydrate bearing sediments. Numerical simulation work at LBNL in FY 2010 included code enhancements to both serial and parallel versions of the Tough + Hydrate simulator and unification of code architecture between two code versions. Simulations completed during the year included production potential of promising Alaskan deposits, production from hydrates from Korean offshore deposits, and assessment of resource recoverability from oceanic deposits in the Gulf of Mexico.

Simulations were also performed to assess the geomechanical response of the reservoirs to the identified production. NETL modeling of the thermal disturbance of gas hydrates by existing wellbores was central to the approval of Alaska North Slope operators of planned field production tests. In the lab, thermal property measurements of CO₂ hydrates were evaluated, and results of these studies were published. In addition, CO₂-CH₄ molecular dynamic models and thermodynamic relationships were developed and advanced. PNNL utilized a new version (jointly supported by DOE-NETL and Korean Institute of Geoscience and Mineral Resources (KIGAM)) of the STOMP simulator to consider the exchange of gas hydrate guest molecules as a kinetic process. This version of the simulator solves separate conservation equations for the mobile and immobile guest molecules for a combined carbon dioxide/methane hydrate system as well as considering carbon dioxide and methane components in the aqueous, gas, and liquid-CO₂ phases separately from the same components in the hydrate phase.

In FY 2010, researchers from the University of Texas at Austin and the Massachusetts Institute of Technology extended grain-scale numerical models to investigate methane migration through sediments within the gas hydrate stability zone. The team also conducted the initial numerical models of the process by which free gas accumulations in Alaska may be converted to gas hydrates during recent imposition of Arctic temperature conditions.

International Collaboration

DOE maintained active collaborations with several nations in FY 2010. Formal agreements continued with government entities in Japan, Korea, and India. Entities from each of these countries are participants in the DOE's Gulf of Mexico JIP lead by Chevron, and are prepared and enabled to participate in future DOE Alaska North Slope extended duration field tests. In addition to these Departmental-level agreements, NETL maintains active collaborations with gas hydrate efforts in New Zealand, China, Canada, and Taiwan.

During FY 2010, NETL participated as part of expert panels invited to Korea and India to assist in the evaluation of potential drill sites for each nation's second marine gas hydrate evaluation expedition. Korea conducted its UBGH-2 program in the summer of 2010, and NETL contributed a geochemist to the field party. U.S.-Korea co-funded research programs enabling further

evaluation of 2010 field samples are underway at NETL, as are research programs in numerical simulation with LBNL and PNNL. A workshop to discuss the findings of these collaborative programs occurred in Daejeon, Korea, in early 2011.

Fellowship Programs

DOE awarded its only FY 2010 NETL-NAS National Methane Hydrate R&D Program Fellowship to Dr. Laura Brothers. Dr. Brothers will work with the USGS to conduct geophysical studies related to the evaluation of the nature, extent, and methane releases from submerged (relict) permafrost and associated gas hydrates on the shallow Beaufort Shelf (north Alaska). These research fellowships are awarded through a partnership between DOE and the National Academies of Sciences. Six fellowships have been awarded since the fellowship program was initiated in 2007.

Program Management and Oversight

Throughout FY 2010, DOE/NETL continued to monitor a broad portfolio of R&D projects as specified by the Energy Policy Act (EPAAct) of 2005. The effectiveness of this management was positively reviewed in a report released by the National Academies in January 2010. A week-long review meeting of all ongoing efforts within the program was held in Atlanta in early 2010 with the intent of furthering collaboration and integration of research efforts within the program. Throughout the fiscal year, the Program continued to utilize its interagency coordination committee to ensure integration of methane hydrate research activities across the collaborating Federal agencies. Two meetings of the Technical Coordination Team were held in FY 2010. In addition, the Program continued to utilize its Federal Advisory Committee for advice and consultation on program direction as needed.

Technology Transfer

DOE and its research partners continued to disseminate research results to the scientific community during FY 2010. Appendix A provides a list of 93 peer-reviewed publications, 60 grey literature publications, and 95 professional conference presentations during the fiscal year. In particular, 23 peer-reviewed articles detailing the Scientific Results of the 2007 BPXA-DOE-USGS Mount Elbert Stratigraphic Test well were released on-line in advance of compilation into a *Special Issue of Marine and Petroleum Geology (Elsevier)* that was published in hard copy form in February, 2011. An additional 14 articles were included in AAPG Memoir 86, published in December 2009.

A review of the status of gas hydrate resource evaluation was published in the high-impact journal *Energy & Environmental Science*, and an NETL co-authored review of gas hydrate exploration technologies was included as a chapter in a new book published by the Society of

Exploration Geophysicists. The grey literature list includes a series of thirteen technical reports detailing the findings of the 2009 Gulf of Mexico gas hydrate exploration drilling program that were published on the NETL website and seven additional full-length reports included in the proceedings of the SPEs Offshore Technology Conference. The DOE/NETL Methane Hydrate Newsletter, *Fire in the Ice*, continued to report on global developments in gas hydrate R&D in FY 2010. This periodical publication is distributed to 1,500 subscribers in more than 40 countries.

Information on the DOE Methane Hydrate Program, including detailed summaries of all active and completed projects and reports and publications resulting from DOE-funded investigations, are available at www.netl.doe.gov. Information on the Methane Hydrate Program, including program reports and activities of the Methane Hydrate Advisory Committee, are available at www.fe.doe.gov.

DOE-HQ Program Contact

Guido DeHoratiis
Office of Fossil Energy FE-30
U.S. Department of Energy
Washington, DC 20585
(202) 586-5600
Guido.dehoratiis@hq.doe.gov

NETL Program Contact

Dr. Ray Boswell
National Energy Technology Laboratory
U.S. Department of Energy
P.O. Box 880
Morgantown, WV 26507
(304) 285-4541
Ray.boswell@netl.doe.gov

III. Conclusion

Since 2001, the Department of Energy's Methane Hydrate R&D Program has pursued a range of science and technology development efforts designed to determine energy resource and environmental implications of the potential vast occurrence of gas hydrate in nature. In FY 2010, the program's resource evaluation efforts remained focused on the Alaska North Slope and the Gulf of Mexico while supporting research in the areas of methane hydrate behavior, reservoir characterization, exploration technologies, and environmental effects. This report outlines key accomplishments of the DOE-led gas hydrates program during FY 2010.

Appendix A: FY 2010 Publications and Reports

Peer-Reviewed Publications

- Addison, A., Battista, B., Knapp, C., 2009. "Improved Hydrogeophysical Parameter Estimation from Empirical Mode Decomposition Processed Ground Penetrating Radar Data," *Journal of Environmental and Engineering Geophysics* vol. 14, no. 4, pp. 171-178.
- Allison, E., Boswell, R., 2009. Overview of the Department of Energy Gas Hydrate Research Program; in Collett, T., Johnson, A., Knapp, C., Boswell, R., eds, *Natural Gas Hydrates: Energy Resource and Associated Geologic Hazards*; American Association of Petroleum Geologists Memoir **89**.
- Anderson, B., Hancock, S., Wilson, S., Enger, C., Collett, T., Boswell, R., Hunter, R., 2010. "Modular Formation Dynamics testing at the Mount Elbert-01 stratigraphic test well, Milne point unit, North Slope Alaska: Operational summary, history matching, and interpretation," *Marine Petroleum Geology*, doi:10.1016/j.marpetgeo.2010.02.012.
- Anderson, B.J., Kurhiara, M., Wilson, S., Pooladi-Darvish, M., White, M., Moridis, G., Gaddipati, M., Masuda, Y., Collett, T., Hunter, R., Narita, H., Rose, K., Boswell, R., 2010. Regional long-term production modeling from a single well test, Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope, *Marine and Petroleum Geology*, Vol. 28 (2), 493-501, ISSN 0264-8172, DOI: 10.1016/j.marpetgeo.2010.01.015.
- Barth, G. A., D. W. Scholl, and J. R. Childs, 2009. "Bering Sea velocity amplitude anomalies: Exploring the distribution of natural gas and gas hydrate indicators," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Battista, B. M., A. D. Addison, and C. C. Knapp, 2009. "Empirical Mode Decomposition Operator for Dewowing GPR Data," *Journal of Environmental and Engineering Geophysics*, Vol. 14, No. 4, pp.163-169.
- Boswell, R., Collett, T., 2010. Current perspectives on gas hydrate resources. *Energy and Environmental Science*. doi: 10.1039/c0ee00203h (on-line: hardcopy available Q2 FY2011)
- Boswell, R., Saeki, T., 2010, Motivations for the geophysical investigation of gas hydrates: in Riedel, M., Willoughby, E., Chopra, S., eds., *Geophysical Characterization of Gas Hydrates*; Society of Exploration Geophysicists Geophysical Developments Series **12**, 23-32.
- Boswell, R., Shelander, D., Lee, M., Latham, T., Collett, T., Geurin, G., Moridis, G., Reagan, M., and D. Goldberg, 2009. "Occurrence of gas hydrate in Oligocene Frio sand: Alaminos Canyon Block 818: northern Gulf of Mexico," *Marine and Petroleum Geology*, Vol. 26, pp. 1499-1512, doi:10.1016/j.marpetgeo.2009.03.005.
- Boswell, R., Rose, K., Collett, T.S., Lee, M.W., Winters, W.F., Lewis, K., and Agena, W.F., 2010. "Geologic controls on gas hydrate occurrence in the Mount Elbert prospect, Alaska North Slope, *Marine and Petroleum Geology*," DOI: 10.1016/j.marpetgeo.2009.12.004. (on-line: hardcopy available Q2 FY2011)

- Bowles, M.W., and S.B. Joye, 2010. "High rates of denitrification and nitrate consumption in cold seep sediments." *The ISME Journal*, doi:10.1038/ismej.2010.134.
- Bowles, M.W., V. A. Samarkin, K. L. M. Bowles, and S.B. Joye, 2010. "Weak coupling between sulfate reduction and the anaerobic oxidation of methane in methane-rich seafloor sediments in ex situ incubations," *Geochimica et Cosmochimica Acta*, doi:10.1016/j.gca.2010.09.043.
- Brooks, L.A., Gerstoft, P., 2009. "Green's function approximation from cross-correlation of active sources in the ocean," *Journal of Acoustical Society of America*, Vol. 126, pp. 46-55.
- Camilli, R., Bowen, A., Farr, N., 2010. "Bright Blue: Advanced Technologies for Marine Environmental Monitoring and Offshore Energy" *Oceans 2010*. pp 1-7.
- Chen, P-C., Huang, W-L., and Stern, L.A., 2010. "Methane hydrate synthesis from ice: Influence of pressurization and additives on optimizing formation rates and hydrate yield," *Energy & Fuels*, Vol. 24, pp. 2340-2403, DOI:10.1021/ef901403r.
- Collett, T.S., Johnson, A., Knapp, C., Boswell, R., 2009. "Natural gas hydrates – a review," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Collett, T.S., Lewis, R.E., Winters, W.F., Lee, M.W., Rose, R., and Boswell, R., 2010. "Downhole well log and core montages from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.03.016. (on-line: hardcopy available Q2 FY2011)
- Collett, T.S., Lee, M.W., Agena, W.F., Miller, J.J., Lewis, K.A., Zyrianova, M.V., Boswell, R.M., Inks, T.L., 2010. "Permafrost-associated natural gas hydrate occurrences on the Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2009.12.001. (on-line: hardcopy available Q2 FY2011)
- Colwell, F.S. and W. Ussler, III., 2010. "Global scale consequences of biological methane production," pgs 3056-3065. In K. Timmis, T. McGenity, J.R. van der Meer, V. de Lorenzo, ed. *Handbook of Hydrocarbons and Lipid Microbiology*. Springer-Verlag. New York, New York.
- Colwell, F., Briggs, B., Schwartz, 2010. "Microbial community distribution in sediments from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2009.12.012. (on-line: hardcopy available Q2 FY2011)
- Cortes, D. D., A. I. Martin, T. S. Yun, F. M. Francisca, J. C. Santamarina, and C. Ruppel, 2009. "Thermal conductivity of hydrate-bearing sediments," *Journal of Geophysical Research*, Vol. 114, B11103, doi:10.1029/2008JB006235.
- Dai, S., Lee, C., and Santamarina, A., 2010, "Formation history and physical properties of sediments from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.03.005. (on-line: hardcopy available Q2 FY2011)

- Daigle, H., Dugan, B., 2010. "Origin and evolution of fracture-hosted methane hydrate deposits," *Journal of Geophysical Research*, 115, B11103, doi:10.1029/2010JB007492.
- Daigle, H., Dugan, B., 2010. "Effects of multiphase methane supply on hydrate accumulation and fracture generation," *Geophysical Research Letters*, 37, L20301, doi:10.1029/2010GL044970.
- Gamwo, I.K., Liu, Y., 2010. "Mathematical Modeling and Numerical Simulation of Methane Production in a Hydrate Reservoir," *Industrial Engineering & Chemical Research*, 49 (11), pp 5231–5245.
- Geresi, E., R. Chapman, T. McGee, B. Woolsey, 2009. "Monitoring seafloor instability caused by the presence of gas hydrate using ocean acoustical and geophysical techniques in the Northern Gulf of Mexico," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Gupta, A., G. Moridis, T. Kneafsey, and E. D. Sloan, 2009. "Modeling Pure Methane Hydrate Dissociation Using a Numerical Simulator from a Novel Combination of X-ray Computed Tomography and Macroscopic Data," *Energy & Fuels*, 23(12): 5958-5965, DOI: 10.1021/ef9006565.
- Hardage, B., H. Roberts, P. Murray, R. Remington, D. Sava, W. Shedd, J. Hunt Jr., 2009. "Multicomponent seismic technology assessment of fluid-gas expulsion geology and gas hydrate systems: Gulf of Mexico," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Holtzman, R., R. Juanes, 2010. "Crossover from fingering to fracturing in deformable disordered media," *Physical Review*, 82(4), 046305, doi:10.1103/PhysRevE.82.046305.
- Hunter, R., Collett, T., Boswell, R., Anderson, B., Digert, S., Pospisil, G., Baker, R., Weeks, M., 2010. "Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope: Overview of scientific and technical program," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.02.015. (on-line: hardcopy available Q2 FY2011)
- Hutchinson, D., Hart, P., Ruppel, C., Snyder, F., Dugan, B., 2009. "Seismic and thermal characterization of a bottom simulating reflection in the Northern Gulf of Mexico," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Ingram, W., Meyers, S., Brunner, C., Martins, C., 2010. "Evaluation of Late Pleistocene-Holocene sedimentation surrounding an active seafloor gas hydrate and cold seep field on the Northern Gulf of Mexico Slope," *Marine Geology*, Vol. 278, no. 104, p. 43-53.
- Inks, T., Lee, M., Agena, W., Taylor, D., Collett, T., Hunter, R., Zyrianova, M., 2009. "Seismic prospecting for gas hydrate and associated free-gas prospects in the Milne Point area of northern Alaska," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Jain, A., Juanes, R., 2009. "Preferential mode of gas invasion in sediments: grain-scale mechanistic model of coupled multiphase fluid flow and sediment mechanics," *Journal of Geophysical Research*, 114, B08101, doi:10.1029/2008JB006002.

- Jaiswal, P., C.A. Zelt, R. Dasgupta, and K. K. Nath, 2009. "Seismic imaging of the Naga Thrust using multiscale waveform inversion," *Geophysics*, v. 74; no. 6; p. WCC129-WCC140
- Jaiswal, N., A. Dandekar, S. Patil, R. Hunter, and T. Collett, 2009. "Relative permeability measurements of gas-water-hydrate systems," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Johnson, A., Patil, S. Dandekar, A., 2010. "Experimental investigation of gas-water relative permeability for gas-hydrate-bearing sediments from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2009.10.013. (on-line: hardcopy available Q2 FY2011)
- Kaneko, M., Shingai, H., Pohlman, J.W., Naraoka, H., 2010. "Chemical and isotopic signature of bulk organic matter and hydrocarbon biomarkers within mid-slope accretionary sediments of the northern Cascadia margin gas hydrate system," *Marine Geology*. Vol. 275: 166-177.
- Kirchman, D. L., Cottrell, M. T. and Lovejoy, C., 2010. "The structure of bacterial communities in the western Arctic Ocean as revealed by pyrosequencing of 16S rRNA genes," *Environmental Microbiology*, 12: 1132–1143.
- Kneafsey, T., Liu, H., Winters, W., Boswell, R., Hunter, R., Collett, T., 2009. "Analysis of core samples from the BPXA-DOE-USGS Mount Elbert gas hydrate stratigraphic test well: Insights into core disturbance and handling," *Marine and Petroleum Geology*, doi:10.1016/j.marpetgeo.2009.10.009. (on-line: hardcopy available Q2 FY2011)
- Kneafsey, T.J., Y. Seol, G.J. Moridis, L. Tomutsa, B.M. Freifeld, 2009. "Laboratory measurements on core-scale sediment and hydrate samples to predict reservoir behavior", in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Kowalsky, M.B., S. Nakagawa, and G.J. Moridis, 2010. "Feasibility of monitoring gas hydrate production with time-lapse vertical seismic profiling," *SPE Journal*, SPE-132508-PA, doi: 10.2118/132508-PA.
- Kurihara, M., Sato, A., Funatsu, K., Ouchi, H., Masuda, Y., Narita, H., and Collett, T.S., 2010. "Analysis of formation pressure test results in the Mount Elbert methane hydrate reservoir through numerical simulation," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.01.007. (on-line: hardcopy available Q2 FY2011)
- Lapham, L. L., Chanton, J. P., Chapman, R. and Martens, C. S., 2010. "Methane under-saturated fluids in deep-sea sediments: Implications for gas hydrate stability and rates of dissolution," *Earth and Planetary Science Letters*, 298 275-285. doi:10.1016/j.epsl.2010.07.016
- Lee, J. Y., J. C. Santamarina, and C. Ruppel, 2010. "Volume change associated with formation and dissociation of hydrate in sediment," *Geochem. Geophys. Geosyst.*, 11, Q03007, doi:10.1029/2009GC002667.

- Lee, M.W., Collett, T.S., and Agena, W.F., 2009. "Integration of vertical seismic, surface seismic, and well log data at the Mallik 2L-38 Gas Hydrate Research Well, Mackenzie Delta, Canada," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Lee, M.W., Collett, T.S., and Inks, T.L., 2009. "Seismic attribute analysis for gas-hydrate and free-gas prospects on the North Slope of Alaska," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Lee, M., Agena, W., Collett, T., Inks, T., 2010. "Pre- and post-drill comparison of the Mount Elbert gas hydrate prospect, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2009.08.007. (on-line: hardcopy available Q2 FY2011)
- Lee, M.W. and Collett, T.S., 2010. "In-situ gas hydrate hydrate saturation estimated from various well logs at the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2009.06.007. (on-line: hardcopy available Q2 FY2011)
- Li, G., Moridis, G. J., Zhang, K., Li, X. S., 2010. "Evaluation of Gas Production Potential from Marine Gas Hydrate Deposits in Shenhu Area of South China Sea," *Energy & Fuels*, 24, 6018-6033. DOI: 10.1021/ef100930m
- Lloyd, K. G., D. Albert, J. F. Biddle, J. Chanton, O. Pizarro, and A. Teske. 2010. "Spatial structure and activity of sedimentary microbial communities underlying a *Beggiatoa* spp. mat in a Gulf of Mexico hydrocarbon seep," *PLoS One*, 5(1): e8738.
- Lloyd, K., B. J. MacGregor, and A. Teske. 2010. "Quantitative PCR methods for RNA and DNA in marine sediments: Maximizing yield while overcoming inhibition," *FEMS Microbiology Ecology*, 72.
- Long, P. E., M. Holland, P. Schultheiss, M. Riedel, J. L. Weinberger, A. M. Trehu, and H. T. Schaef. 2010. "Infrared (IR) Imaging of Gas Hydrate-Bearing Cores: State-of-the-Art and Future Prospect," in *Geophysical Characterization of Gas Hydrates*, Riedel, M., et al., eds., Society of Exploration Geophysicists Special Publication.
- Lorenson, T.D., Collett, T.S., and Hunter, R.B., 2010. "Gas geochemistry of the Mount Elbert Gas Hydrate Test Well, Milne Pt. Alaska: Implications for gas hydrate exploration in the Arctic," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.02.007. (on-line: hardcopy available Q2 FY2011)
- Lorenson, T.D., Collett, T.S., and Whiticar, M.J., 2009. "Hydrocarbon gas composition and origin of gas hydrate from the Alaska North Slope, USA," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Lu, H., Lorenson, T.D., Moudrakovski, I.L., Ripmeester, J.A., Collett, T.S., Hunter, R.B., and Ratcliffe, C.I., 2010. "The characteristics of gas hydrates recovered from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.01.002. (on-line: hardcopy available Q2 FY2011)

- Mau S, Heintz, M.B., Kinnaman, F.S., Valentine, D.L., 2010. "Compositional variability and air-sea flux of ethane and propane in the plume of a large, marine seep field near Coal Oil Point, CA," *Geo-Marine Letters* 30(3-4) 367-378. DOI 10.1007/s00367-010-0185-z.
- McGee, T., C. Lutken, R. Rogers, C. Brunner, J. Dearman, F. Lynch, and J. Woolsey, 2009. "Can fractures in soft sediments host significant quantities of gas hydrates?," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- McGee, T., L. Macelloni, C. Lutken, A. Bosman, C. Brunner, R. Rogers, J. Dearman, K. Sleeper and J. R. Woolsey, 2009. "Hydrocarbon gas hydrates in sediments of the Mississippi Canyon Area, northern Gulf of Mexico," in *Sediment Hosted Gas Hydrates: New Insights on Natural and Synthetic Systems*, Geo. Soc. London, Spec Pub 319.
- Morley, M.G., Dosso, S.E., Chapman, N.R., 2009. "Array element localization using ship noise," *Journal of Acoustical Society of America*, Volume 125, Issue 3, pp. 1403-1409.
- Moridis, G.J., Reagan, M.T., Kim, S.-J., Seol, Y., and Zhang, K. 2009. "Evaluation of the Gas Production Potential of Marine Hydrate Deposits in the Ulleung Basin of the Korean East Sea," *SPE Journal*. SPE-110859-PA
- Moridis, G.J., and M.T. Reagan, "Gas Production From Class 2 Hydrate Accumulations in the Permafrost," *SPE Journal*, SPE 110858.
- Moridis, G.J., T.S. Collett, R. Boswell, M. Kurihara, M.T. Reagan, C. Koh and E.D. Sloan, 2009. "Toward Production From Gas Hydrates: Current Status, Assessment of Resources, and Simulation-Based Evaluation of Technology and Potential," *SPE Reservoir Evaluation & Engineering*, 12 (5): 745-771, doi: 10.2118/114163-PA
- Moridis, G.J, Silpngarmlet, S, Reagan, M.T., Collett, T.S., and Zhang, K., 2010. "Gas production from a cold, stratigraphically-bounded gas hydrate deposit at the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope: Implications of uncertainties," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.01.005. (on-line: hardcopy available Q2 FY2011)
- Pecher, I.A., S.A. Henrys, W.T. Wood, G. Crutchley, A.R. Gorman, R. Coffin, N. Kukowski, J. Greinert, and K. Faure, 2010. "Focused Fluid Expulsion on the Hikurangi Margin, New Zealand - Evidence from Possible Local Upwarping of the Base of Gas Hydrate Stability," *Marine Geology*, 272:99-113.
- Pohlman, J.W., Kaneko, M., Heuer, V., Coffin, R., Whiticar, M., 2009. "Methane sources and production in the northern Cascadia margin gas hydrate system," *Earth and Planetary Science Letters*, 287: 504-512.
- Phirani, J., Mohanty, K. K. & G. Hirasaki, 2009. "Warm Water Flooding of Unconfined Gas Hydrate Reservoirs," *Energy & Fuels*, doi:10.1021/ef900291j.0/1.3158602.
- Pooladi-Darvish, M., Hong, H., 2010. "Use of formation pressure test results over a hydrate interval for long-term production forecasting at the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope: Implications of uncertainties," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.01.006. (on-line: hardcopy available Q2 FY2011)

- Radich, J., R.E. Rogers, W.T. French, and G. Zhang, 2009. "Biochemical reaction and diffusion in seafloor gas hydrate capillaries: Implications for gas hydrate stability," *Chemical Engineering Science* 64, pp 4278-4285.
- Reagan, M., Moridis, G., 2009. "Large-scale simulation of methane hydrate dissociation along the West Spitsbergen Margin," *Geophysical Research Letters*, 36, L23612, doi: 1029/2009GL041332
- Redmond, M., Valentine, D, Sessions, A., 2010. "Novel Methane, Ethane, and Propane Oxidizing Bacteria at Marine Hydrocarbon Seeps Identified by Stable Isotope Probing," *Applied and Environmental Microbiology* 76(19) 6412-6422.
- Rose, K., Boswell, R., Collett, T., 2010. "Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope: Coring operations, core sedimentology, and lithostratigraphy," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.02.001. (on-line: hardcopy available Q2 FY2011)
- Rutqvist, J., Moridis, G., Grover, T., Collett, T., 2009. "Geomechanical responses of permafrost-associated hydrate depositis to depressurization-induced gas production," *Journal of Petroleum Science and Engineering*, v. 67, p. 1-12.
- Sassen, R., H. Roberts, W. Jung, B. Phaneuf, A. Milkov, C. Lutken, D. DeFreitas, S. Sweet, and N. Guinasso, 2009. "Geologic and geochemical setting of the Mississippi Canyon 118 gas hydrate site, Gulf of Mexico: significance to hydrate volume?," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Schwalenberg, K., W. Wood, I. Pecher, L. Hamdan, S. Henrys, M. Jegen, and R. Coffin, 2010. "Preliminary interpretation of CSEM, heatflow, seismic, and geochemical data for gas hydrate distribution across the Porangahau Ridge, New Zealand," *Marine Geology*, 272:79-88.
- Seol, Y., Kneafsey, T., 2009. "X-ray computed-tomography observations of water flow through anisotropic methane hydrate-bearing sand," *Journal of Petroleum Science and Engineering* 66, pp. 121–132, doi:10.1016/j.petrol.2009.01.008.
- Shelander, D., Dai, J. Bunge, G., 2010. "Predicting saturation of gas hydrates using pre-stack seismic data, Gulf of Mexico," *Marine Geophysical Researches* v. 31 (1-2), 39-57.
- Stern, L., Lorenson, T., Pinkston, J., 2010. "Gas hydrate characterization and grain-scale imaging of recovered cores from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2009.08.003. (on-line: hardcopy available Q2 FY2011)
- Sun, Y., Goldberg, D., Collett, T., Hunter, R., 2010. "High-resolution well-log derived dielectric properties of gas-hydrate-bearing sediments, Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.03.001. (on-line: hardcopy available Q2 FY2011)
- Taboada-Serrano, P., Ulrich, S., Syzmcek, P., McCallum, S., Phelps, T., Palumbo, A., Tsouris, C., 2009. "Multi-phase, micro dispersion reactor for the continuous production of methane gas hydrate," *Industrial and Engineering Research*. 48(13):6448-6452

- Teske, A. 2009. "Sulfate-reducing and methanogenic hydrocarbon-oxidizing microbial communities in the marine environment. Part 21: Microbial Communities based on hydrocarbons, oils and fats: Natural habitats." pp. 2203-2223. In K. Timmis (ed.), *Handbook of Hydrocarbon Microbiology*, Springer., DOI 10.1007/978-3-540-77587-4_160.
- Torres, M., Embley, R., Merle, S., Trehu, A., Collier, R., Suess, E., Heeschen, K. 2009. "Methane sources feeding cold seeps on the shelf and upper continental slope off central Oregon, USA." *Geochemistry, Geophysics, Geosystems*, v. 10 doi:10.1029/2009GC002518.
- Torres, M., Collett, T., Rose, K., Sample, J., Agena, W., Rosenbaum, E., 2010. "Pore fluid geochemistry from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2009.10.001. (on-line: hardcopy available Q2 FY2011)
- Valentine D., Kessler, J., Redmond, M., Mendes, M., Heintz, M., Farwell, C., Hu, L., Kinnaman, F., Yvon-Lewis, S., Du, M., Chan, E., Garcia-Tigueros, F., Villanueva, C., 2010. "Propane respiration jump starts microbial response to a deep oil spill," *Science Express*. DOI: 10.1126/science.1196830.
- Waite, W., J. C. Santamarina, D. D. Cortes, B. Dugan, D. N. Espinoza, J. Germaine, J. Jang, J. W. Jung, T. J. Kneafsey, H. Shin, K. Soga, W. J. Winters, and T. S. Yun, 2009. "Physical properties of hydrate-bearing sediments," *Reviews of Geophysics*, **47**, RG4003, doi:10.1029/2008RG000279, 38p.
- Walsh, M., Hancock, S., Wilson, S., Patil, S., Moridis, G., Boswell, R., Collett, T., Koh, C., Sloan, E., 2009. "Preliminary report on the commercial viability of gas production from natural gas hydrates," *Journal of Energy Economics*, v. 31 (5), p. 815-823.
- Weitemeyer, K., G. Gao, S. Constable, and D. Alumbaugh, 2010. "The practical application of 2D inversion to marine controlled source electromagnetic data," *Geophysics*, 75(6).
- White, M., Wurstner, S., McGrail, P., 2010. "Numerical studies of methane production from Class 1 gas hydrate accumulations enhanced with carbon dioxide injection," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2009.06.008. (on-line: hardcopy available Q2 FY2011)
- Wilson, S., Hunter, R., Collett, T., Hancock, S., Boswell, R., Anderson, B., 2010. "Alaska North Slope regional gas hydrate production modeling forecasts," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.03.007. (on-line: hardcopy available Q2 FY2011)
- Winters, W., W. Waite, and D. Mason, 2009. "Effects of methane hydrate on the physical properties of sediment," in T. Collett, A. Johnson, C. Knapp, and R. Boswell, eds., *Natural gas hydrates—Energy resource potential and associated geologic hazards: AAPG Memoir 89*.
- Winters, W., Walker, M., Hunter, R., Collett, T., Boswell, R., Rose, K., Waite, W., Patil, S., Dandekar, A., 2010. "Physical properties of sediment from the Mount Elbert Gas Hydrate Stratigraphic Test Well, Alaska North Slope," *Marine and Petroleum Geology*, DOI: 10.1016/j.marpetgeo.2010.01.008. (on-line: hardcopy available Q2 FY2011)
- Zhang, J., Gerstoft, P., and Bromirski, P., 2010. "Pelagic and coastal sources of P-wave microseisms: Generation under tropical cyclones," *Geophys. Res. Lett.*, doi:10.1029/2010GL044288.

Zhang, J., Gerstoft, P., Shearer, P., 2010. "Resolving P-wave travel-time anomalies using seismic array observations of oceanic storms," *Earth and Planetary Science Letters*, **292**, 419-427, doi:10.1016/j.epsl.2010.02.014.

Grey Literature

Archer, D., 2010. "The Role of Methane Hydrates in the Earth System: 'Burps of Death' or Seductive Irrelevance?" *U.S. DOE-NETL Fire in the Ice Newsletter*, August, pgs. 12-14.

Beaudoin, Y., 2010. "Global Assessment of Methane Gas Hydrates." *Semi-Annual Progress Report*, Stiftelsen GRID-Arendal, DOE Award No.: DE-FE0003060. September 2010.

Birchwood, R., Dai, J., Shelander, D., Boswell, R., Collett, T., Cook, A., Dallimore, S., Fujii, K., Imasato, Y., Fukuhara, M., Kusaka, K., Murray, D., Saeki, T., 2010. Developments in Gas Hydrates: *Schlumberger Oilfield Review* **22** (1) 18-33.

Boswell, R., Collett, T.S., McConnell, D., Frye, M., Shedd, B., Godfriaux, P., Dufrene, R., Mrozewski, S., Guerin, G., Cook, A., Shelander, D., Jianchun, D., and Jones, E., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II: Overview of Leg II LWD Results," OTC 20560. *Proceedings 2010 Offshore Technology Conference*, Houston, Texas May 3-6, 2010, 12 p.

Boswell, R., Collett, T.S., Frye, M., Shedd, W., Mrozewski, S., Guerin, G., and Cook, A., 2009. "The 2009 Gulf of Mexico Gas Hydrate Joint Industry Project - Leg II: Technical Summary." *Proceedings of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project - Leg II*.

Boswell, R., Collett, T.S., McConnell, D., Frye, M., Shedd, B., Godfriaux, P., Dufrene, R., Mrozewski, S., Guerin, G., Cook, A., Shelander, D., Jianchun, D., and Jones, E., 2009. "Initial results of Gulf of Mexico Gas Hydrate Joint Industry Project Leg II logging-while-drilling operations," *Proceedings of the 29th Annual Gulf Coast Section Foundation*, Bob F. Perkins Research Conference, December 6-8, 2009, Houston, Texas, 21 p. (on CD-ROM).

Boswell, R., T. Collett, B. Anderson, and C. Ruppel, 2010. "Relative gas volumes for free gas and gas hydrate accumulations." *U.S. DOE-NETL Fire in the Ice Newsletter*, Summer 2010. pp. 9-11.

Coffin, R., J. Smith and W. Wood. 2010. Biogeochemical Evaluation of Vertical Methane Fluxes in the Beaufort Sea Shelf/Slope Sediments. *International Polar Year, Oslo, Norway*. June 2010.

Coffin, R., Rose, K., Greinert, J., Wood, W., and the Shipboard Scientific Party, 2010. "First Trans-Shelf-Slope Climate Study in U.S. Beaufort Sea Completed," *U.S. DOE-NETL Fire in the Ice Newsletter*, March, pgs. 1-5.

Collett, T.S., Boswell, R., Frye, M., Shedd, W., Godfriaux, P., Dufrene, R., McConnell, D., Mrozewski, S., Guerin, G., and Cook, A., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II: Logging-While-Drilling Operations and Challenges," OTC 20452. *Proceedings 2010 Offshore Technology Conference*, Houston, Texas May 3-6, 2010, 12 p.

Collett, T.S., 2009. "Gas hydrate petroleum systems in marine and Arctic permafrost environments," *Proceedings of the 29th Annual Gulf Coast Section Foundation*, Bob F. Perkins Research Conference, December 6-8, 2009, Houston, Texas, 12 p. (on CD-ROM).

- Collett, T.S., Boswell, R., Mrozewski, S., Guerin, G., Cook, A., Frye, M., Shedd, W., and McConnell, D., 2009. “Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Operational Summary,” *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Constable, S., and Weitemeyer, K., 2010. “Mapping shallow geology and gas hydrates with marine CSEM surveys,” *First Break*, Vol. 28, 97-102.
- Cook, A., Guerin, G., Mrozewski, S., Collett, T.S., Boswell, R., 2009. “Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Walker Ridge 313 LWD Operations and Results,” *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Dunbar, J., A. Gunnell, P. Higley, M Lagmanson, 2010. “Seafloor resistivity investigation of methane hydrate distribution in Mississippi Canyon, Block 118, Gulf of Mexico,” *Symposium on the Application of Geophysics to Engineering and Environmental Problems*, v. 23, p. 835-844, May 2010.
- Farrell, H., Boswell, R., Howard, J., Baker, R., 2010. “CO₂-CH₄ Exchange in Natural Gas Hydrate Reservoirs: Potential and Challenges,” *U.S. DOE-NETL Fire in the Ice Newsletter*, March 2010.
- Frye, M., Shedd, W., Godfriaux, P., Collett, T.S., Lee, M., Boswell, R., Dufrene, R., 2009. “Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Alaminos Canyon 21 Site Summary,” *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Frye, M., Shedd, W., Godfriaux, P., Dufrene, R., McConnell, D., Boswell, R., Collett, T.S., Mrozewski, S., Guerin, G., Cook, A., Shelander, D., Dai, J., 2010. “Gulf of Mexico Gas Hydrate Joint Industry Project Leg II: Initial Results From the Alaminos Canyon 21 Site”, OTC 20552 Houston, Texas, Proceedings of the 2010 Offshore Technology Conference, May 3-6, 2010.
- Ghezzehei, T.A. and T.J. Kneafsey, 2010. “Measurements of the Capillary Pressure-Saturation Relationship of Methane Hydrate Bearing Sediments, OTC-20550-PP,” *Proceedings of the 2010 Offshore Technology Conference*, Houston, Texas, USA, 3–6 May.
- Guerin, G., Cook, A., Mrozewski, S., Collett, T.S., Boswell, R., 2009. “Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Green Canyon 955 LWD Operations and Results,” *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Guerin, G., Cook, A., Mrozewski, S., Collett, T.S., Boswell, R., 2009. “Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Alaminos Canyon 21 LWD Operations and Results,” *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Hancock, S., G.J. Moridis, S. Wilson and A. Robinson, 2010. “Well Design Requirements For Deepwater And Arctic Onshore Gas Hydrate Production Wells,” OTC 19435, *Proceedings of the 2010 Offshore Technology Conference*, Houston, Texas, May 3-6, 2010.

- Hutchinson, D., Boswell, R., Collett, T.S., Dai, J., Dugan, B., Frye, M., Jones, E., McConnell, D., Rose, K., Ruppel, C., Shedd, W., Shelander, D., Wood, W., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Walker Ridge 313 Site Selection," *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Hutchinson, D., Boswell, R., Collett, T.S., Dai, J., Dugan, B., Frye, M., Jones, E., McConnell, D., Rose, K., Ruppel, C., Shedd, W., Shelander, D., Wood, W., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Green Canyon 955 Site Selection," *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Hutchinson, D., Boswell, R., Collett, T.S., Dai, J., Dugan, B., Frye, M., Jones, E., McConnell, D., Rose, K., Ruppel, C., Shedd, W., Shelander, D., Wood, W., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Green Canyon 781 Site Selection," *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Jain, A. K., 2009. "Preferential mode of gas invasion in sediments: grain-scale mechanistic model of coupled multiphase fluid flow and sediment mechanics," M.S. Thesis, Massachusetts Institute of Technology.
- Juanes, R., and Bryant, S. L., 2009. "Models provide clues to how methane gas and hydrate coexist in nature," *U.S. DOE-NETL Fire in the Ice Newsletter*, Vol. 9, Issue 4, pgs. 7-11.
- Kirchman, D., 2009. "Microbial Ecological Work on the 'Methane in the Arctic Shelf/Slope (MITAS)' Expedition." *Cruise Report*. October 30, 2009.
- Kneafsey, T. J., Rees, E.V.L., Nakagawa, S., and Kwon, T.H., 2010. "Examination of Hydrate Formation Methods: Trying to Create Representative Samples." *Progress Report*, Lawrence Berkeley National Laboratory, DOE Award No.: ESDO5-048. June 2010.
- Kneafsey, T. J., and Rees, E.V.L., 2010. "X-ray CT observations of methane hydrate distribution changes over time in a natural sediment core from the BPX-DOE-USGS Mount Elbert Gas Hydrate Stratigraphic Test Well." *Progress Report*, Lawrence Berkeley National Laboratory, DOE Award No.: ESDO5-048. March 2010.
- Li, G., Moridis, G.J., Zhang, K., Li, X., 2010. "Evaluation of Gas Production Potential from Marine Gas Hydrate Deposits in the Shenhu Area of the South China Sea: Depressurization and Thermal Stimulation Methods," OTC 20548. *Proceedings of the 2010 Offshore Technology Conference*, Houston, TX, May 2010.
- Li, G., G.J. Moridis, K. Zhang, X. Li, 2010. "The Use of Huff and Puff Method in a Single Horizontal Well in Gas Production from Marine Gas Hydrate Deposits in the Shenhu Area of the South China Sea, Paper SPE 131160," *Proceedings of the 2010 CPS/SPE International Oil & Gas Conference and Exhibition*, Beijing, China, 8–10 June 2010.
- Long, P.E., K.K. Rose, H. T. Schaefer, M.E. Torres, E.S. Solomon, M. Kastner, J.E. Johnson, L. Giosan, W.J. Winters, S. Dewri and P. Kumar, 2009. "Gas hydrate occurrence in marine sediments and volcanic ash of the Andaman Arc: Results from NGHP Expedition 01, Site 17," *Prepr. Pap. Am. Chem. Soc., Div. Fuel Chem.* 2009, 54 (1), p. 135-136

- MacDonald, I., 2009. "The HYFLUX Sea-Truth Expedition, 4-19 July 2009." *U.S. DOE-NETL Fire in the Ice Newsletter*, Vol. 9, Issue 4, pgs. 12-15.
- McConnell, D., Boswell, R., Collett, T.S., Frye, M., Shedd, W., Guerin, G., Cook, A., Mrozewski, S., Dufrene, R., and Godfriaux, P., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Walker Ridge 313 Site Summary," *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- McConnell, D., Boswell, R., Collett, T.S., Frye, M., Shedd, W., Guerin, G., Cook, A., Mrozewski, S., Dufrene, R., and Godfriaux, P., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — Green Canyon 955 Site Summary," *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- McConnell, D., Collett, T.S., Boswell, R., Frye, M., Shedd, W., Dufrene, R., Godfriaux, P., Mrozewski, S., Guerin, G., Cook, A., Jones, E. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II: Initial Results From the Green Canyon 955 Site," OTC 20801, Proceedings of the 2010 Offshore Technology Conference, Houston, TX, May 3-6, 2010.
- Moridis, G.J., M.T. Reagan, K. Boyle, K. Zhang, 2010. "Evaluation of a deposit at the PBU-L106 Site, North Slope, Alaska, for a potential long-term test of gas production from hydrates," SPE 133601, *Proceedings of the 2010 Western Regional Meeting*, Anaheim, California, May 27-29, 2010.
- Moridis, G.J., M.T. Reagan, R. Boswell, T. Collett, K. Zhang, 2010. "Preliminary Evaluation of the Production Potential of Recently Discovered Hydrate Deposits in the Gulf of Mexico," OTC 21049, *Proceedings of the 2010 Offshore Technology Conference*, Houston, Texas, May 3-6, 2010.
- Moridis, G.J., T.S. Collett, M. Pooladi-Darvish, S. Hancock, C. Santamarina, R. Boswell, T. Kneafsey, J. Rutqvist, M. Kowalsky, M.T. Reagan, E.D. Sloan, A.K. Sum and C. Koh, 2010. "Challenges, Uncertainties and Issues Facing Gas Production From Hydrate Deposits in Geologic Systems," SPE 131792, *Proceedings of the 2010 Unconventional Gas Conference*, February 23-25, Pittsburgh, Pennsylvania.
- Mrozewski, S., Cook, A., Guerin, G., Goldberg, D., Collett, T.S., Boswell, R., Jones, E., Roy, R., 2010. "Gulf of Mexico Gas Hydrates Joint Industry Project: LWD Logging Program Design, Data Acquisition and Evaluation," OTC 21023, *Proceedings of the 2010 Offshore Technology Conference*, Houston, Texas, May 3-6, 2010.
- Mrozewski, S., Guerin, G., Cook, A., Collett, T.S., Boswell, R., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — LWD Methods," *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Phirani, J., Pitchumani, R., & Mohanty, K. K., "Transport Properties of Hydrate Bearing Formations from Pore-Scale Modeling," SPE 124882, *Proceedings of SPE ATCE*, New Orleans, LA, Oct. 4-7, 2009.
- Phirani, J. & Mohanty, K. K., 2010. "Kinetic Simulation of CO₂ Flooding of Methane Hydrates," SPE 134178, *Proceedings of SPE ATCE*, Florence, Italy, September 19-22, 2010.

- Reagan, M.T., Moridis, G.J., Kowalsky, M.B., Silpngarmert, S., 2010. "The Effect of Reservoir Heterogeneity on Gas Production From Hydrate Accumulations in the Permafrost." SPE 132649, *Proceedings of the 2010 SPE Western North American Regional Meeting*, Anaheim, California, 27-29 May 2010.
- Reagan, M.T., Moridis, G.J., Elliott, S.M., Maltrud, M., and Jones, P., 2010. "Global Climate and the Response of Oceanic Hydrate Accumulations," *U.S. DOE-NETL Fire in the Ice Newsletter*, March, pgs. 9-12.
- Ruppel, C., J. Pohlman, and C. Worley, 2009. "Studying the link between Arctic methane seeps and degassing methane hydrates," *Sound Waves*, USGS National Newsletter, October edition, cover article.
- Ruppel, C., 2009. "Methane hydrates and global climate change: a status report," *Proceedings of the ACS National Meeting*, Salt Lake City.
- Rutqvist, J. and Moridis, G., J., 2010. "Evaluation of Geohazards of In Situ Gas Hydrates Related to Oil and Gas Operations," *U.S. DOE-NETL Fire in the Ice Newsletter*, August, pgs. 1-4.
- Santamarina, J.C., and Jang, J., 2009. "Gas Production from Hydrate-Bearing Sediments: Geomechanical Implications." *U.S. DOE-NETL Fire in the Ice Newsletter*, Vol. 9, Issue 4, pgs. 18-22.
- Scandella, B. P., 2010. "Numerical modeling of methane venting from lake sediments," M.S. Thesis, Massachusetts Institute of Technology.
- Seol, Y. and R. Boswell, 2009. "Methane Hydrate: Fire in the ice," *G.I.T. Laboratory Journal Europe*, September/October.
- Shedd, W., Hutchinson, D., Boswell, R., Collett, T.S., Dai, J., Dugan, B., Frye, M., Jones, E., McConnell, D., Rose, K., Ruppel, C., Shelander, D., and Wood, W., 2009. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II — East Breaks 991 and Alaminos Canyon 21 Site Selection," *Proceedings of the Drilling and Scientific Results of the 2009 Gulf of Mexico Gas Hydrate Joint Industry Project Leg II*.
- Shedd, B., P. Godfriaux, M. Frye, R. Boswell, and D. Hutchinson, 2009. "Occurrence and variety in seismic expression of the base of gas hydrate stability in the Gulf of Mexico," *U.S. DOE-NETL Fire in the Ice Newsletter*, Winter 2009.
- Shedd, W., Frye, M., Godfriaux, P., Dufrene, R., McConnell, D., Boswell, R., Collett, T.S., Mrozewski, S., Guerin, G., Cook, A., Shelander, D., Dai, J., 2010. "Gulf of Mexico Gas Hydrate Joint Industry Project Leg II: Initial Results from the Walker Ridge 313 site," OTC 20806. *Proceedings of the 2010 Offshore Technology Conference*, Houston, TX, May 3-6, 2010.
- Su, Z., Moridis, G.J., Zhang, K., Wu, N., 2010. "Numerical Investigation of Gas Production Strategies for the Hydrate Deposits in the Shenhu Area," OTC 20551, *Proceedings of the 2010 Offshore Technology Conference*, Houston, TX, May 2010.
- Valentine, D., 2010. "An Opportunity to Assess the Behavior of Methane Released in the Deep Ocean," *U.S. DOE-NETL Fire in the Ice Newsletter*, August, pg. 5.

Weitemeyer, K., and Constable, S., 2010. "Tests of new marine EM survey method at Mississippi Canyon 118, Gulf of Mexico," *U.S. DOE-NETL Fire in the Ice Newsletter*, March, pgs. 13-17.

Zhang, K., G.J. Moridis, N. Wu, and X. Li, 2010. "Evaluation of Alternative Horizontal Well Designs for Gas Production From Hydrate Deposits in the Shenhu Area, South China Sea," Paper SPE 131151, *Proceedings of the 2010 CPS/SPE International Oil & Gas Conference and Exhibition in China*, Beijing, China, 8–10 June 2010.

Zhang, Z., McConnell, D. "Seismic Modeling Analysis and Characterization for a Gas Hydrate and Free Gas Mixed System in Green Canyon, Gulf of Mexico," *Offshore Technology Conference*, OTC 20659, Houston, Texas, May 3-6, 2010.

Presentations

Anderson, B.J., "The Role of Molecular Level Modeling in Gas Hydrate Studies," *Centre Européenne de Calcul Atomique et Moléculaire/Atlantic Centre for Atomistic Modelling*, Dublin, Ireland, May 6-8, 2010.

Anderson, B.J., "Hydrate Reservoir Simulator Code Comparison Project: 7 problems from simple 1-D to complex 2-D simulations," *WV Regional Society of Petroleum Engineers Meeting*, Morgantown, WV, April 21, 2010.

Anderson, B.J., "Multiscale Modeling: Molecular, Thermodynamic, Reservoir, and Economic Modeling of Energy Systems," *West Virginia Academy of Science 85th Annual Meeting*, Morgantown, WV, April 10, 2010

Anderson, B.J., "The Role of Molecular Level Modeling in Gas Hydrate Studies," *AIChE Annual Meeting*, Nashville, TN, November, 2009

Beaudoin, Y., "Frozen Heat: UNEP Global Outlook on Methane Gas Hydrates," *Abstracts-World Energy Congress 2010*, September 12-16, 2010, Montreal, Canada.

Beaudoin, Y., "Frozen Heat: UNEP Global Outlook on Methane Gas Hydrates," *Abstracts-Joint International Conference Minerals of the Ocean-5 and Deep Sea Minerals and Mining-2*, June 28-July 01, 2010, St Petersburg, Russia.

Beaudoin, Y. and Kullerud, L, 2010. "Methane Gas Hydrates, a new phase of resource exploitation in the Arctic? What we can learn from the Global Assessment of Methane Gas Hydrates," *2010 International Polar Year Oslo Science Conference*, June 8-12, 2010, Oslo, Norway.

Behseresht, J., Peng, Y., Bryant, S. and Winters, W. "Sedimentological Control on Arctic Gas-Hydrate-Bearing Deposits", *AAPG 2010 Annual Convention and Exhibition*, New Orleans, Louisiana, April 13, 2010.

Bell, R. J., S. K. Toler, R. T. Short, 2010. "In Situ Chemical Analyses by Underwater Mass Spectrometry," *Goldschmidt Conference on Earth, Energy and the Environment*, Knoxville, TN.

Boswell, R., 2010. Methane Hydrate - Closer Than You Might Think. *Offshore Northern Seas (ONS) 2010*; Stavanger, Norway, Aug. 26.

- Boswell, R., 2010. Progress in Understanding the Energy and Environmental Implications of Gas Hydrates. *Goldschmidt Conference*, Knoxville, TN, June 16.
- Boswell, R., 2010. Natural Gas Hydrates. *Capitol Hill Oceans Week (CHOW) 2010*. Washington, DC., June 10.
- Boswell, R., 2010. Gas Hydrate in Marine and Permafrost Settings: Recent Insights from Drilling Programs. *Gordon Research Conference*, Waterville, ME, June 8.
- Boswell, R., et al., 2009. Gulf of Mexico Gas Hydrates Joint Industry Project: Leg II Initial Results. *American Geophysical Union*, San Francisco, CA. Dec. 12.
- Bowles, M.W., and S.B. Joye, 2009. "A geochemical and microbiological analysis of nitrate reduction at a hydrothermal vent and a cold seep," *19th Annual V. M. Goldschmidt Conference*, Davos, Switzerland, June.
- Briggs, B.R., Hieter, J., Pohlman, J., Torres, M., Riedel, M., Rose, K., Colwell, F. 2009. "Subseafloor Macroscopic Biofilms Involved in Anaerobic Oxidization of Methane," *American Geophysical Union Fall Meeting 2009*, Dec 14-18, San Francisco, CA.
- Chatterjee, S., Bhatnagar, G., Chapman, W. G., Dickens, G. R., Dugan, B., and Hirasaki, G. J., 2009. Sulfate, Methane, Alkalinity, Calcium and Carbon Isotope ($\delta^{13}\text{C}$) Profiles as an Indicator of Upward Methane Flux. *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS42A-05
- Chiaromonte L., Kowalsky M.B., Rutqvist J., and Moridis G.J. "Design of a potential long-term test of gas production from a hydrate deposit at the PBU-L106 site in North Slope, Alaska: Geomechanical system response and seismic monitoring." *American Geophysical Union Fall Meeting 2009*, San Francisco, CA, 14-18 December 2009.
- Coffin, R. B., Hamdan, L. J., Smith, J. P., Plummer, R., Greinert, J., De Batist, M. A., and Wood, W., 2009. Preliminary Results from the Methane In The Arctic Shelf (MITAS) Project on the Alaskan Beaufort Sea Shelf – Shallow Sediment Porewater Geochemical Profiles. *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS23B-01.
- Collett, T. S., and Boswell, R. M., 2009. Gas Hydrate Research Site Selection and Operational Research Plans. *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS24A-01.
- Connolly, E., Johnson, J., Torres, M., Teichert, B., Giosan, L., and Rose, K., (2009), New Insights from Sediment Ages and Carbon Isotopes at a Paleo-Seep/Chemosynthetic Biological Community in the Krishna-Godavari Basin, Offshore India, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., OS31A-1188
- Constable S, and Weitemeyer, K., 2009. "Applying marine EM methods to gas hydrate mapping," *MARELEC Meeting*, Stockholm, Sweden - July 7-9 2009
- Constable, S., 2010. "Natural resource exploration using marine controlled-source electromagnetic sounding," *13th International Symposium on Recent Advances in Exploration Geophysics (RAEG 2009)*, Kyoto, Japan. October 15-16, 2009.

- Cook, A., and Goldberg, D., 2009. Two Kinds of Gas Hydrate Reservoirs: Pore-filling Sand vs. Fractured Clay. *Eos Trans. AGU*, 90(52) Fall Meet. Suppl. Abstract OS31A-1174.
- Crandall, D., Seol, Y., Bo. Hu, and Gyovai, K. "Conversion of CT scans of geological media to heterogeneous computational fluid dynamics models," *Third International Workshop on X-ray CT for Geomaterials*, March 1-3, 2010. New Orleans, Louisiana.
- Daigle, H., and Dugan, B., 2009. "Fracture Genesis and Fracture Filling In Hydrate Systems." *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS41A-02.
- Diercks, A.R., V.L. Asper, R. Highsmith, M. Woolsey, S. Lohrenz, K. McLetchie, A. Gossett, M. Lowe, D. Joung, L. McKay, S. Joye, and A. Teske, 2010. "The NIUST Deepwater Horizon Oil Spill Response Cruise," *OCEANS 10 MTS/IEE Conference*, Seattle.
- Gaddipati, M., Anderson, B.J., 2010. "Methane production from complex gas hydrate reservoirs: Effects of reservoir heterogeneity on gas production," *West Virginia Academy of Science 85th Annual Meeting*, Morgantown, WV , April 10, 2010.
- Garapati, N., Anderson, B.J., "Predictions of Phase Equilibrium Data of Mixed Hydrates Using the Cell Potential Method," *West Virginia Academy of Science 85th Annual Meeting*, Morgantown, WV, April 10, 2010.
- Garapati, N., Anderson, B.J., "Predictions of Mixed Hydrate Phase Equilibria and the Swapping of CH₄ Hydrate with CO₂ and CO₂+N₂ Mixtures," *AICHE Annual Meeting*, Nashville, TN, November, 2009.
- Garcia-Pineda, O.G., MacDonald, I.R., Shedd, W., and Zimmer, B., 2009. "HYFLUX: Satellite Exploration of Natural Hydrocarbon Seeps and Discovery of a Methane Hydrate Mound at GC600: *Eos Trans. AGU*, 90(52), p. OS31A-1185 Poster.
- Godfriaux, P. et al., Gulf of Mexico Gas Hydrate Joint Industry Project Leg II: Results from the Alaminos Canyon 21 Site., *Eos Trans. AGU*, 90(52)
- Gunnell, A. R. and J. A. Dunbar, 2010. "Correlations between direct current resistivity and seismic attribute tests across an active methane hydrate vent in Mississippi Canyon, Block 118, Gulf of Mexico," *Symposium on the Application of Geophysics to Engineering and Environmental Problems*, v. 23, p. 709, May 2010.
- Heintz M.B., Mau, S., Valentine, D.L., 2010. "Methane Consumption in the Water Column of the Santa Monica Basin: A Comparison From Two Sampling Expeditions," *Eos Trans. AGU*, 91(26), Ocean Sci. Meet. Suppl., Abstract CO45B-12.
- Heintz, M.B., Pohlman, J.W., Valentine, D.L., Wooller, M.J., 2010. "Ice Cover Modulates Methanotrophic Efficacy in Arctic Thermokarst Lakes," *7th Annual Southern California Geobiology Symposium*. CALTECH. Pasadena, CA.
- Holtzman, R., and Juanes, R., 2009. Hydrate Formation in Gas-Rich Marine Sediments: A Grain-Scale Model. *Eos Trans. AGU* 90(52), Fall Meet. Suppl. Abstract OS41A-08.

- Hu, L., Yvon-Lewis, S.A., Kessler, J.D., and MacDonald, I., 2009. "Air-Sea Flux of Methane from Selected Marine Hydrate/Seep Sites in the Northern Gulf of Mexico During HYFLUX," *Eos Trans. AGU*, 90(52), Abs. OS23B-04.
- Hunter, R., Digert, S., Collett, T.S., Boswell, R., 2010. "Mount Elbert Gas Hydrate Stratigraphic Test Well Results and Implications, Milne Point Unit, Alaska North Slope," *AAPG 2010 Annual Convention and Exhibition*, New Orleans, Louisiana, April 13, 2010.
- Johnson, J., Phillips, S., Miranda, E., Giosan, L., and Rose, K., 2009. "Long-term Variability of Carbon and Nitrogen in the Bay of Bengal and Arabian Sea: Results from NGHP Expedition 1," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., OS44A-01
- Joseph, C., Rose, K., Torres, M., Riedel, M., and Pohlman, J., 2009. "Lithostratigraphy and sedimentology of shallow piston cores from PGC2008-007 expedition - Bullseye and Amnesiac Vents," *Cascadia Margin, Geological Society of America Abstracts with Programs*, Vol. 41, No. 7, p. 142.
- Joye, S.B., A. Diercks, A. Teske, and D. Valentine, 2010. "Open ocean impacts of the BP Oil Well Blowout," *2010 American Geophysical Union, Fall Meeting*, San Francisco, CA. 13-17 Dec.
- Kannberg, P. K., and Trehu, A. M., 2009. "Heat flow and gas hydrates on the continental margin of India: Building on results from NGHP Expedition 01," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl. Abstract OS31A-1198.
- Kinnaman F., Heintz M., and Valentine D., 2010. "Identifying the source and strength of a Santa Barbara Channel mid-water methane plume," *7th Annual Southern California Geobiology Symposium*. CALTECH. Pasadena, CA (poster presentation).
- Knapp, James H., Camelia C. Knapp, Leonardo Macelloni, Antonello Simonetti, Carol Lutken, 2010. "Subsurface Structure and Stratigraphy of a Transient, Fault-Controlled Thermogenic Hydrate System at MC-118, Gulf of Mexico," *Proceedings of the AAPG 2010 Annual Convention*, Abstracts Volume, p.134.
- Kneafsey, T. J., Lu, H., Winters, W. J., and Hunter, R. B., 2009. "Effects of core retrieval, handling, and preservation on hydrate bearing-samples," *Eos Trans. AGU* 90(52), Fall Meet. Suppl., Abstract OS31A-1191.
- Kneafsey, T.J and S Nakagawa, 2010. "Cyclic formation and dissociation of methane hydrate within partially water saturated sand, OS53A-1364," *2010 AGU Fall Meeting*, San Francisco, CA., 13-17 Dec.
- Körber J.-H. Pineda O. MacDonald I. Sahling H. Bohrmann G., 2010. "Analysis and inventory of natural hydrocarbon seepage in the Black Sea using remote sensing techniques," *10th International Conference on Gas in Marine Sediments*, Listvyanka, Lake Baikal, Russia, 6-12 September, 2010.
- Lapham, L, Wilson, R., Short, T, Bell, R and Chanton, J., 2010. "Mechanisms Influencing Hydrate Dissolution Rates in Under-saturated Systems," *Goldschmidt Conference*, Knoxville, Tennessee, June 2010.

- Lapham, L.L., C.S. Martens, and J.P. Chanton. "Controls on gas hydrate stability in methane-depleted sediments: Laboratory and field measurements," *Eos Trans.* 90(52), Fall Meet., Suppl. Abstract. OS31A-1187
- Leeman, J.R, Madden, M.E., Alford, J.E., Phelps, T.J., and Rawn, C.J., 2009. "Meso-scale clathrate experiments: effect of grain size on formation pathways," *Eos Trans.* 90(52), Fall Meet. Suppl. Abstract OS42A-03.
- Lorenson, T.D., Greiner, J., Huetten, E., Hamdan, L. J., Coffin, R., Rose, K., Wood, W.T., Mitas, S., 2010. "Methane Concentrations in Sediment and Bottom Water of the Alaskan Beaufort Sea," *Eos Trans.* AGU 91(26), Ocean Sci. Meet. Suppl. Abstract CO45B-05.
- Lloyd, K.G., 2009. "Spatial structure and activity of shallow microbial communities in a Gulf of Mexico methane seep. *Goldschmidt Conference*, Davos, Switzerland, June 21-26.
- Lutken, C.B., Macelloni, L., Lapham, L., Caruso, S., Lodi, M., Camilli, R., Asper, V., Diercks, A., Knapp, C., Knapp, J., 2010. "Monitoring Seafloor Morpho-Geological Evolution of the MC118 Hydrate/Carbonate Mound via Multiple AUV Missions," Proceedings of the AAPG 2010 Annual Convention, Abstracts Volume, p.155.151.
- Malinverno, A., Pohlman J.W. 2009. "Diagenetic modeling of sulfate reduction in sediment sequences overlying methane hydrate," *Eos Trans.* AGU, 90(52), Fall Meet. Suppl. Abstract OS44A-07.
- MacDonald, I.R., Garcia-Pineda, O.G., Chanton, J., Kastner, M., Solomon, E.A., Leifer, I., Naehr, T.H., Yvon-Lewis, S.A., and Kessler, J.D., 2009, HYFLUX: Satellite Inventory and Sea-Truth for Gulf of Mexico Gas Hydrate System: *Eos Trans.* AGU, 90 (52), p. OS23B-03.
- MacDonald I. Garcia-Pineda O. Chanton J. Kastner M. Solomon E. Leifer I. Naehr T., Yvon-Lewis S. Kessler D., 2010. "HYFLUX: Remote Sensing and Sea Truth of CH₄ Flux from the Gulf of Mexico Seep System," *10th International Conference on Gas in Marine Sediments*, Listvyanka, Lake Baikal, Russia, 6-12 September, 2010.
- McConnell, D., et al., Initial Results of Gulf of Mexico Gas Hydrate Joint Industry Program Leg II Logging-While-Drilling Operations in Green Canyon Block 955. *Eos Trans.* AGU, 90 (52),
- McGee, T., C. Lutken, L. Macelloni, J. R. Woolsey, L. Lapham, R. Kleinberg, B. Battista, C. Knapp, S. Caruso, V. Goebel, R. Chapman, P. Gerstoft, 2009. "A multidisciplinary sea-floor observatory in the northern Gulf of Mexico," *Oceans 2009*, Biloxi, MS.
- McGee, T. 2009. "Geologic structures associated with the carbonate/hydrate mound in Mississippi Canyon Block 118, Gulf of Mexico," *Eos Trans.* AGU, 90(52), Fall Meet. Suppl., Abstract OS41A-04.
- Moridis, G.J., M. Reagan, K. Boyle and K. Zhang, "Design of a Potential Long-term Test of Gas Production From a Hydrate Deposit at the PBU-L106 Site, North Slope, Alaska: Production Predictions and Sensitivity Analysis," *Eos Trans.* AGU, 90(52), Fall Meet. Suppl., Abstract OS31A-1208

- Moridis, G.J., M.T. Reagan, J. Rutqvist, K. Zhang, and M. Kowalsky, 2010. "Modeling studies of gas production from hydrate deposits and of the corresponding geomechanical system response," *7th International Workshop on Methane Hydrate Research & Development*, 10-12 May 2010, Te papa, Wellington, New Zealand.
- Moridis, G.J., "Promises and Challenges of Production from Gas Hydrates". *Distinguished Lecturer Seminar*, Haas School of Business, University of California at Berkeley, Berkeley, CA, 16 April 2010.
- Myshakin, E. M., Gamwo, I. K., Warzinski, R. R., 2009. "Experimental Design Applied to Simulation of Gas Productivity Performance at Reservoir and Laboratory Scales Utilizing Factorial ANOVA Methodology," *TOUGH Symposium*, Berkeley, CA.
- Nakagawa, S., and T.J. Kneafsey, "Split Hopkinson Resonant Bar Test And Its Application For Seismic Property Characterization of Geological Media," Paper 10-491, *Proceedings of the 44th U.S. Rock Mechanics Symposium and 5th U.S.-Canada Rock Mechanics Symposium*, June 27 - 30, 2010 , Salt Lake City, Utah.
- Peng, Y., Behseresht, J., Bryant, S. and Winters, W. "Sedimentological Control on Arctic Gas-Hydrate-Bearing Deposits," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract GC51A-0707.
- Pohlman, J.W., Kim, Ji-Hoon, Heuer, V.B., Osburn, C.L. 2009. "Availability of Dissolved Organic Carbon (DOC) In the Northern Cascadia Margin Gas Hydrate System: Results from IODP Expedition 311," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS31A-1190.
- Rawn, C.J., Chakoumakos, B.C., Garlea, V.O., Leeman, J.R., Alford, J.E., and Phelps, T.J., 2009. "High Pressure Neutron Powder Diffraction Study of CO₂ Hydrate," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS42A-07.
- Rawn, C.J., Leeman, J.R., Ulrich, S.M., Alford, J.E., Madden, M.E., and Phelps, T.J., 2010. "Homogeneous and heterogeneous sediment experiments using fiber optic sensing technology for detecting gas hydrate formation," *Goldschmidt Conference: Knoxville, TN*, June 13-18.
- Reagan, M., 2010, "Climate Change and the Response of Oceanic Hydrate Accumulations," European Geosciences Union General Assembly, Vienna, Austria, 7 May 2010.
- Reagan, M.T., Moridis, G.J., 2009 "Large-Scale Simulation of Oceanic Gas Hydrate Dissociation in Response to Climate Change," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS43C-07.
- Rees, E.V.L., T.J. Kneafsey and T. Kwon, 2010. Synthesising Uniform Gas Hydrate in Natural Porous Media under Partially Saturated and Fully Water Saturated Conditions," *Eos Trans. AGU*, 91(53), Fall Meet. Suppl., Abstract OS43C-07.
- Rose, K., Johnson, J. E., Smith, J. P., Coffin, R. B., Wood, W. T., Hart, P. E., Greinert, J., Lorenson, T. D., 2009. "The Role of Geology and Shallow Lithostratigraphy in the Distribution of Methane Flux through Shallow Sediments Across the Beaufort Shelf of Alaska," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS31A-1179.

- Rose, K., Johnson, J.E., Reed, A.H., Smith, J.P., 2010. Sedimentology, Lithostratigraphy and Physical Properties of Recently Acquired Shallow Piston and Vibra Cores from the U.S. Beaufort Shelf and Slope, Arctic Ocean. *Eos Trans. AGU* 91 (26), Ocean Sci. Meet. Suppl. Abstract PO45C-14..
- Rutqvist, J., G.J. Moridis, M.T. Reagan, 2010. "Geomechanical Response of Sloping Oceanic Hydrate Deposits to Thermal Loading and Production Activities," OTC 21048, *Proceedings of the 2010 Offshore Technology Conference*, Houston, Texas, May 3-6, 2010.
- Sahling, H., Bohrmann, G. Pape, T., Bruening, M., Roemer, M., Wagner-Friedrichs, M., Spiess, V., Artemov, Y., 2010. "Submarine gas emissions offshore Georgia, Black Sea," *10th International Conference on Gas in Marine Sediments*, Listvyanka, Lake Baikal, Russia, 6-12 September, 2010.
- Scandella, B. P., and R. Juanes, 2009. "Dissociation With Free Gas Flow for a Global Inventory," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS31A-1204.
- Schwalenberg, K., Haeckel, M., Pecher, I. A., Toulmin, S. J., Hamdan, L. J., Netzeband, G., Wood, W., Poort, J., Jegen, M. D., Coffin, R. B., 2009. "Assessing submarine gas hydrate at active seeps on the Hikurangi Margin, New Zealand, using controlled source electromagnetic data with constraints from seismic, geochemistry, and heatflow data," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS43C-03.
- Seol, Y. Timothy J. Kneasey, and Emily V.L. Rees, 2009. "X-ray CT observations of methane hydrate distribution in natural sediment and laboratory formed compacted sand samples," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS31A-1193
- Shapiro, R.A., Naehr, T.H., MacDonald, I., Kastner, M., Robertson, G., and Solomon, E.A., 2009. "Pore Water Data From Three Gas Hydrate Sites in the Gulf of Mexico: First Results from the HyFlux Project," *Eos Trans. AGU*, 90(52), p. OS31A-1186.
- Shedd, W., et al., Gulf of Mexico Gas Hydrate Joint Industry Project Leg II: Results from the Walker Ridge 313 Site *Eos Trans. AGU*, 90 (52),
- Short R. T., R. J. Bell, S. K. Toler, F. H. W. van Amerom, 2010. "Recent Developments and In Situ Measurements of Underwater Mass Spectrometers," *58th ASMS Conference on Mass Spectrometry and Allied Topics*, Salt Lake City ,UT.
- Short, R. T., R. J. Bell and S. K Toler, 2010. "In situ characterization of distributions of dissolved gases, volatile organics, and light hydrocarbons using underwater membrane introduction mass spectrometry," *American Chemical Society meeting*, Boston, MA, August 24.
- Solomon, E.A., Kastner, M., and Leifer, I., 2009, Ethane and Propane Emissions to the Ocean and Atmosphere from 550-1200 m Seeps in the Gulf of Mexico: *Eos Trans. AGU*, 90(52), p. OS31A-1182 Poster.
- Sun, K., D. Omeragic, C. Minh, J. Rasmus, J. Yang, A. Davydychev, T. Habashy, R. Griffiths, G. Reaper, Q. Li, 2010. "Evaluation of Resistivity Anisotropy and Formation Dip from Directional Electromagnetic Tools While Drilling," *SPWLA 51st Annual Logging Symposium*, June 19-23, 2010.

- Thygesen, K., Beaudoin, Y. and Kullerud, L., 2010. "Methane Gas Hydrates, a new phase of resource exploitation in the Arctic? What we can learn from the Global Assessment of Methane Gas Hydrates," *Arctic Days 2010*, May 31 - June 4, 2010, Tromso, Norway.
- Valentine, D.L., Heintz, M.B., Mau, S., Kinnaman, F., Bagby, S., Camilli, R., Yoerger, D., Pizarro, O., Jakuba, M., 2010. "Methane Biogeochemistry of the Santa Barbara Basin," *Eos Trans. AGU*, 91(26), Ocean Sci. Meet. Suppl., Abstract CO44A-04
- Velaga, S., Anderson, B.J., 2010. "Calculation of N₂ hydrate reference parameters and cell potential parameters to analyze the N₂-CO₂ and N₂-CH₄ three-phase equilibrium and structural transitions", *West Virginia Academy of Science 85th Annual Meeting*, Morgantown, WV, April 10, 2010.
- Wade, T.L., Sweet S.T., Sericano, J.L., Guinasso, N.L. Jr., Lohrenz, S.E., Shiller, A.M., S.B. Joye, Dierks, A.R., Asper, V.L. and Highsmith, R.C., 2010. "Documentation of Sub-Surface Oil Plume by Analyses of Toxic PAH in Water Samples from the Deep Water Horizon Oil Spill," *SETAC 31th Annual Meeting*, November 7-11, 2010, Portland, OR.
- Waite, W. F., Bratton, P. M., Mason, D. H., 2009. "Laboratory formation of non-cementing, methane hydrate-bearing sand samples," *EOS Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS21A-1138.
- Weitemeyer, K. A., Constable, S, 2009. "Preliminary results from the Gulf of Mexico gas hydrate CSEM experiment," *EOS Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract GP33A-0735.
- Weitemeyer, K. and S. Constable, 2010, "Mapping gas hydrates and shallow sedimentary structure in the Gulf of Mexico using marine controlled source electromagnetics," *20th International Workshop on EM Induction in The Earth*, Giza, Egypt - Sept 18-24, 2010.
- Weitemeyer, K. and Constable, S., 2010. "Results from the GoM gas hydrate studies," *SIO Seafloor Electromagnetics Consortium Annual Meeting*, La Jolla, CA March 17-18, 2010.
- Winters, W. J., Walker, M., Collett, T.S., Bryant, S. L., Novosel, I, Wilcox-Cline, R., Bing, J., and Gomes, M. L., 2009. Comparison of Physical Properties of Marine and Arctic Gas-Hydrate-Bearing-Deposits. *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS31A-1178.
- Wood, W.T., P. E. Hart; J. Greinert; M. A. De Batist; K. Rose; R. B. Coffin, 2009. "Constraints on Methane Distribution," *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abstract OS23B-02
- Zhang, K., G.J. Moridis, N. Wu, and X. Li, 2010. "Evaluation of Alternative Horizontal Well Designs for Gas Production From Hydrate Deposits in the Shenhu Area, South China Sea," SPE 131151, *Proceedings of the 2010 CPS/SPE International Oil & Gas Conference and Exhibition in China*, Beijing, China, 8–10 June 2010.