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Quarterly Research Performance Progress Report

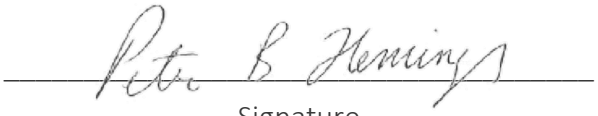
(Period Ending 12/31/24)

Deepwater Methane Hydrate Characterization & Scientific Assessment

Project Period 6: 11/15/23 - 09/30/25

Submitted by:

Peter B. Flemings



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U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

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DISCLAIMER

1 ACCOMPLISHMENTS

This report outlines the progress of the first quarter of the eleventh fiscal year of the project, from Oct. 1 – Dec. 31, 2024 (Budget Period 6, Year 1). Highlights from this period include:

- The Phase 5 Scientific/Technical Report was submitted to DOE (**Milestone M6A**). This document illustrates accomplishments throughout Phase 5 (Budget Period 5), Oct. 1, 2020 to Nov. 14, 2023.

- The UT-GOM2-2 Science Workshop was held Oct. 27 to Oct. 30 in Boerne, TX (**Appendix A**). Thirty attendees participated in the workshop, including scientists and project stakeholders from US DOE, USGS, UT Austin, Ohio State, University of Washington, New Mexico Tech, University of New Hampshire, Oregon State, and Tufts. The objectives of the workshop were to communicate initial UT-GOM2-2 findings amongst the project team; identify interdisciplinary questions and outstanding research opportunities; complete the AGU Special Collection application (**Milestone M6C**), and provide connections and opportunities for young members of the research team. Twenty-four posters were presented on UT-GOM2-2 post-cruise science. Numerous presentations and working sessions were held to discuss current research, identify additional research questions, and develop plans and collaborations for future publications. All objectives were achieved.

- We submitted an application for an AGU special collection dedicated to UT-GOM2-2 science results, which will serve as the UT-GOM2-2 comprehensive scientific results volume (**Milestone M6C**).

- GOM2 project team members convened and participated in the dedicated hydrates session at the AGU fall meeting in Washington DC, AGU24, on December 13: (*OS029-Natural Gas Hydrate Systems: Occurrence and Dynamic Behavior - Oral and Poster Session*). A total of 37 abstracts were presented, 17 of which included GOM2-2 data and were authored by UT-GOM2-2 scientists.

1.1 Major Project Goals

The primary objective of this project is to gain insight into the nature, formation, occurrence and physical properties of methane hydrate-bearing sediments for the purpose of methane hydrate resource appraisal. This was accomplished through the planning and execution of a state-of-the-art drilling, coring, logging, testing and analytical program that assess the geologic occurrence, regional context, and characteristics of marine methane hydrate deposits in the Gulf of Mexico Continental Shelf. Project Milestones are listed in Table 1-1 and Table 1-2.

Table 1-1. Previous Milestones

Budget Period	Milestone	Milestone Description	Estimated Completion	Actual Completion	Verification Method
1	M1A	Project Management Plan	Mar-15	Mar-15	Project Management Plan
	M1B	Project Kick-off Meeting	Jan-15	Dec-14	Presentation
	M1C	Site Location and Ranking Report	Sep-15	Sep-15	Phase 1 Report
	M1D	Preliminary Field Program Operational Plan Report	Sep-15	Sep-15	Phase 1 Report
	M1E	Updated CPP Proposal Submitted	May-15	Oct-15	Phase 1 Report
	M1F	Demonstration of a Viable Pressure Coring Tool: Lab Test	Sep-15	Sep-15	Phase 1 Report
2	M2A	Document Results of BP1/Phase 1 Activities	Dec-15	Jan-16	Phase 1 Report
	M2B	Complete Updated CPP Proposal Submitted	Nov-15	Nov-15	QRPPR
	M2C	Scheduling of Hydrate Drilling Leg by IODP	May-16	May-17	Report directly to DOE PM
	M2D	Demonstration of a Viable Pressure Coring Tool: Land Test	Dec-15	Dec-15	PCTB Land Test Report, in QRPPR
	M2E	Demonstration of a Viable Pressure Coring Tool: Marine Test	Jan-17	May-17	QRPPR
	M2F	Update UT-GOM2-2 Operational Plan	Feb-18	Apr-18	Phase 2 Report
3	M3A	Document results of BP2 Activities	Apr-18	Apr-18	Phase 2 Report
	M3B	Update UT-GOM2-2 Operational Plan	Sep-19	Jan-19	Phase 3 Report
4	M4A	Document results of BP3 Activities	Jan-20	Apr-20	Phase 3 Report
	M4B	Demonstration of a Viable Pressure Coring Tool: Lab Test	Feb-20	Jan-20	PCTB Lab Test Report, in QRPPR
	M4C	Demonstration of a Viable Pressure Coring Tool: Land Test	Mar-20	Mar-20	PCTB Land Test Report, in QRPPR

5	M5A	Document Results of BP4 Activities	Dec-20	Mar-21	Phase 4 Report
	M5B	Complete Contracting of UT-GOM2-2 with Drilling Vessel	May-21	Feb-22	QRPPR
	M5C	Complete Project Sample and Data Distribution Plan	Jul-22	Oct-21	Report directly to DOE PM
	M5D	Complete Pre-Expedition Permitting Requirements for UT-GOM2-2	Mar-23	Jul-23	QRPPR
	M5E	Complete UT-GOM2-2 Operational Plan Report	May-21	Sep-21	QRPPR
	M5F	Complete UT-GOM2-2 Field Operations	Jul-23	Sep-23	QRPPR

Table 1-2. Current Milestones

Budget Period	Milestone	Milestone Description	Estimated Completion	Actual Completion	Verification Method
6	M6A	Document Results of BP5 Activities	Mar-23	Nov-24	Phase 5 Report
	M6B	Complete Preliminary Expedition Summary	Mar-23	Sep-24	Report directly to DOE PM
	M6C	Initiate comprehensive Scientific Results Volume	Jun-24	Oct-24	Report directly to DOE PM
	M6D	Submit set of manuscripts for comprehensive Scientific Results Volume	Sep-25	-	Report directly to DOE PM

1.2 What Was Accomplishments Under These Goals

1.2.1 Previous Project Periods

Tasks accomplished in previous project periods (Phases 1, 2, 3, 4, and 5) are summarized in Table 1-3, Table 1-4, Table 1-5, Table 1-6, and Table 1-7.

Table 1-3. Tasks Accomplished in Phase 1

PHASE 1/BUDGET PERIOD 1	
Task 1.0	**Project Management and Planning**
Task 2.0	**Site Analysis and Selection**
Subtask 2.1	*Site Analysis*
Subtask 2.2	*Site Ranking / Recommendation*
Task 3.0	**Develop Operational Plan for UT-GOM2-2 Scientific Drilling Program**
Task 4.0	**Complete IODP Complimentary Project Proposal**
Task 5.0	**Pressure Coring and Core Analysis System Modifications and Testing**
Subtask 5.1	*PCTB Scientific Planning Workshop*
Subtask 5.2	*PCTB Lab Test*
Subtask 5.3	*PCTB Land Test Prep*

Table 1-4. Tasks Accomplished in Phase 2

PHASE 2/BUDGET PERIOD 2	
Task 1.0	**Project Management and Planning**
Task 6.0	**Technical and Operational Support of Complimentary Project Proposal**
Task 7.0	**Continued Pressure Coring and Core Analysis System Modifications and Testing**
Subtask 7.1	*Review and Complete NEPA Requirements for PCTB Land Test*
Subtask 7.2	*PCTB Land Test*
Subtask 7.3	*PCTB Land Test Report*
Subtask 7.4	*PCTB Modification*
Task 8.0	**UT-GOM2-1 Marine Field Test**
Subtask 8.1	*Review and Complete NEPA Requirements for UT-GOM2-1*
Subtask 8.2	*UT-GOM2-1 Operational Plan*
Subtask 8.3	*UT-GOM2-1 Documentation and Permitting*
Subtask 8.4	*UT-GOM2-1 Marine Field Test of Pressure Coring System*
Subtask 8.5	*UT-GOM2-1 Marine Field Test Report*
Task 9.0	**Develop Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 9.1	*Review and Complete NEPA Requirements for Core Storage and Manipulation*
Subtask 9.2	*Hydrate Core Transport*
Subtask 9.3	*Storage of Hydrate Pressure Cores*
Subtask 9.4	*Refrigerated Container for Storage of Hydrate Pressure Cores*

Subtask 9.5	*Hydrate Core Manipulator and Cutter Tool*
Subtask 9.6	*Hydrate Core Effective Stress Chamber*
Subtask 9.7	*Hydrate Core Depressurization Chamber*
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.1	*Routine Core Analysis (UT-GOM2-1)*
Subtask 10.2	*Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.3	*Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**

Table 1-5. Tasks Accomplished in Phase 3

PHASE 3/BUDGET PERIOD 3	
Task 1.0	**Project Management and Planning**
Task 6.0	**Technical and Operational Support of CPP Proposal**
Task 9.0	**Develop Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 9.8	*X-ray Computed Tomography*
Subtask 9.9	*Pre-Consolidation System*
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter Tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Storage of Hydrate Cores from UT-GOM2-1*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.1	*PCTB Lab Test*
Subtask 14.2	*PCTB Modifications/Upgrades*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.1	*Assemble and Contract Pressure Coring Team Leads for UT-GOM2-2 Scientific Drilling Program*
Subtask 15.2	*Contract Project Scientists and Establish Project Science Team for UT-GOM2-2 Scientific Drilling Program*

Table 1-6. Tasks Accomplished in Phase 4

PHASE 4/BUDGET PERIOD 4	
Task 1.0	**Project Management and Planning**
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Subtask 10.7	*Hydrate Modeling*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter Tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Storage of Hydrate Cores from UT-GOM2-1*
Subtask 13.7	*X-ray Computed Tomography*
Subtask 13.8	*Pre-Consolidation System*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.1	*PCTB Lab Test*
Subtask 14.2	*PCTB Modifications/Upgrades*
Subtask 14.3	*PCTB Land Test*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.3	*Permitting for UT-GOM2-2 Scientific Drilling Program*

Table 1-7. Tasks Accomplished in Phase 5

PHASE 5/BUDGET PERIOD 5	
Task 1.0	**Project Management and Planning**
Task 10.0	**UT-GOM2-1 Core Analysis**
Subtask 10.4	*Continued Pressure Core Analysis (UT-GOM2-1)*
Subtask 10.5	*Continued Hydrate Core-Log-Seismic Synthesis (UT-GOM2-1)*
Subtask 10.6	*Additional Core Analysis Capabilities*
Subtask 10.7	*Hydrate Modeling*
Task 11.0	**Update Science and Operational Plans for UT-GOM2-2 Scientific Drilling Program**
Task 12.0	**UT-GOM2-2 Scientific Drilling Program Vessel Access**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.4	*Develop Hydrate Core Transport Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.5	*Expansion of Pressure Core Storage Capability for UT-GOM2-2 Scientific Drilling Program*
Subtask 13.6	*Continued Maintenance and Storage of Hydrate Pressure Cores from UT-GOM2-1*
Subtask 13.7	*Maintain X-ray CT*
Subtask 13.8	*Maintain Preconsolidation System*
Subtask 13.9	*Transportation of Hydrate Core from UT-GOM2-2 Scientific Drilling Program*
Subtask 13.10	*Storage of Hydrate Cores from UT-GOM2-2 Scientific Drilling Program*
Subtask 13.11	*Hydrate Core Distribution*
Task 14.0	**Performance Assessment, Modifications, and Testing of PCTB**
Subtask 14.4	*PCTB Modifications/Upgrades*
Subtask 14.5	*PCTB Land Test III*
Task 15.0	**UT-GOM2-2 Scientific Drilling Program Preparations**
Subtask 15.3	*Permitting for UT-GOM2-2 Scientific Drilling Program*
Subtask 15.4	*Review and Complete NEPA Requirements*
Subtask 15.5	*Finalize Operational Plan for UT-GOM2-2 Scientific Drilling Program*
Task 16.0	**UT-GOM2-2 Scientific Drilling Program Field Operations**
Subtask 16.1	*Execute UT-GOM2-2 Field Program*
Optional Subtask 16.2	*Add Conventional Coring*
Optional Subtask 16.3	*Add Spot Pressure Coring*
Optional Subtask 16.4	*Add Second Hole at H-Location*
Optional Subtask 16.5	*Add Additional Cores and Measurements*
Task 17.0	**UT-GOM2-2 Core Analysis**
Subtask 17.1	*Routine UT-GOM2-2 Core Analysis*
Optional Subtask 17.2	*UT-GOM2-2 Expanded Core Analysis*

1.2.2 Current Project Period

Current project period tasks are shown in Table 1-8.

Table 1-8. Current Project Tasks

PHASE 6/BUDGET PERIOD 6	
Task 1.0	**Project Management and Planning**
Task 13.0	**Maintenance and Refinement of Pressure Core Transport, Storage, and Manipulation Capability**
Subtask 13.1	*Hydrate Core Manipulator and Cutter tool*
Subtask 13.2	*Hydrate Core Effective Stress Chamber*
Subtask 13.3	*Hydrate Core Depressurization Chamber*
Subtask 13.6	*Continued Storage of Hydrate Cores from UT-GOM2-1*
Subtask 13.7	*Maintain X-ray CT*
Subtask 13.8	*Maintain Preconsolidation System*
Subtask 13.10	*Storage of Hydrate Cores from UT-GOM2-2 Scientific Drilling Program*
Subtask 13.11	*Hydrate Core Distribution*
Task 16.0	**UT-GOM2-2 Scientific Drilling Program Field Operations**
Subtask 16.6	*Post-Expedition Permitting*
Task 17.0	**UT-GOM2-2 Core Analysis**
Task 18.0	**Project Data Analysis and Reporting**
Subtask 18.1	*Sample and Data Distribution and Archiving*
Subtask 18.2	*Collaborative Post-Field Project Analysis of Geologic Data and Samples*
Subtask 18.3	*Scientific Results Volume and Technical Project Presentations*

1.2.2.1 Task 1.0 – Project Management & Planning

1.2.2.1.1 *Coordinate the overall scientific progress, administration and finances of the project:*

- UT monitored and controlled the project budget, scope, and schedule.
- UT performed cumulative financial analysis of the project budget in preparation for a 1-year no-cost-extension proposal (See Section 3.2)

1.2.2.1.2 *Communicate with project team and sponsors:*

- UT organized UT-GOM2-2 science meetings to advance UT-GOM2-2 post-cruise science, and communicate/coordinate analytical and reporting efforts.
- UT organized sponsor and stakeholder meetings.
- UT managed SharePoint sites, email lists, the project website, and the UT-GOM2-2 expedition website.

1.2.2.1.3 *Coordinate and supervise service agreements:*

- UT monitored and validated subcontractor workplans and deliverables.

1.2.2.1.4 *Coordinate subcontractors:*

- UT continued to monitor and control subaward and subcontractor efforts.

1.2.2.2 Task 13.0 – Maintenance & Refinement of Pressure Core Transport, Storage, & Manipulation Capability

1.2.2.2.1 *Subtask 13.1 – Hydrate Core Manipulator and Cutter Tool*

Mini-PCATS was used to log, image, and cut a sample from UT-GOM2-1 Core H005-7FB-5 for testing. The sample was transferred to the Hydrate Effective Stress Chamber. The remainder of the core was transferred back to pressurized storage and will be used for cutting tests in Mini-PCATS and additional testing in the Hydrate Effective Stress Chamber. The H005-7FB-5 sample was placed in pressurized storage then the chamber underwent fluid exchange to replace the chamber water with methane-saturated water from our mixing vessel to mitigate hydrate dissolution and core degradation. After the cutting of H005-7FB-5, the Mini-PCATS system underwent a full maintenance teardown that is conducted once a year. All seals and consumables were replaced. All mechanical components underwent inspection and lubrication. The full system was then reassembled. The system was pressure tested successfully after service. The X-ray system underwent quarterly calibration. The full system then underwent a maintenance inspection and service visit from Geotek Ltd. This service visit included the installation of a new version of the PCATS software, calibration of the X-ray and P-wave systems to ensure measurements/resolution are accurate, inspection of electronics systems, and visual inspection of the core cutting components.

1.2.2.2.2 *Subtask 13.2 – Hydrate Core Effective Stress Chamber*

During this quarter, a sample from UT-GOM2-1 Core H005-7FB-5 was placed in the Effective Stress Chamber for testing. The testing of sample 7FB-5 was conducted as a “hydrate production technology test” to ensure all components are operational for a production condition, where the pore pressure is decreased while the total vertical stress is maintained constant. The temperature monitoring testing chamber was used to conduct this test and assess its operation. After testing, the Effective Stress Chamber was cleaned. The system underwent a full maintenance teardown and inspection afterwards. All seals and consumables were replaced. All mechanical components were inspected and lubricated. Two of the three testing chambers for the system underwent inspection and reassembly for testing preparation for the upcoming quarter. The system underwent a limited overview inspection and service with Geotek Ltd during their visit for the Mini-PCATS service. The service was limited for this system due to it being used for testing at the time.

1.2.2.2.3 *Subtask 13.3 – Hydrate Core Depressurization Chamber*

The system is in standby mode and ready for use.

1.2.2.2.4 *Subtask 13.6 – Continued Storage of Hydrate Cores from UT-GOM2-1*

The UT Pressure Core Center continues to accommodate the remaining pressure cores from UT-GOM2-1 as well as the 13 pressure cores collected during UT-GOM2-2.

1.2.2.2.5 *Subtask 13.7 – Maintain X-ray Computed Tomography*

The X-ray CT underwent a full calibration and maintenance service from Geotek Ltd. This calibration and service included both 2-D X-ray and 3-D CT operations. The calibration scans were then reconstructed on an updated version of the Geotek Reconstructor software. The X-Ray CT continues to operate as designed.

1.2.2.2.6 *Subtask 13.8 – Maintain Pre-Consolidation System*

The system will continue to be evaluated to ensure proper pressure maintenance to generate effective stresses in pressure cores.

1.2.2.2.7 *Subtask 13.10 – Storage of Hydrate Cores from UT-GOM2-2 Scientific Drilling Program*

The UT PCC continues to maintain hydrate-bearing pressure cores at 6°C and connected to the pressure maintenance system, which supplies one-way high-pressure water into the pressure storage chambers. The pressure cores continue to maintain stable storage pressures.

1.2.2.2.8 *Subtask 13.11 – Hydrate Core Distribution*

Future task.

1.2.2.3 Task 16.0 – UT-GOM2-2 Scientific Drilling Program Field Operations

1.2.2.3.1 *Subtask 16.6 – Post-Expedition Permitting*

Task complete.

1.2.2.4 Task 17.0 – UT-GOM2-2 Core Analysis

Work continued on maximizing the amount of science resulting from the UT-GOM2-2 expedition. Efforts are reported by discipline and cover two main areas of research: characteristics of the shallow sand, mud, and ooze intervals; and characteristics of the deep hydrate-bearing sands. Both inform our understanding of hydrate formation and carbon cycling locally, in the basin, and more generally in the Gulf of Mexico.

1.2.2.4.1 *Pressure Coring Tool Assessment*

- UT continued working on the assessment of the pressure coring tool performance during the expedition comparing pressure and temperature data from various sensors inside the Pressure Coring Tool with Ball Valve (PCTB) and outside on the wireline to rig and wireline data collected as part of the mud logging program.
- UT presented a poster titled: Pressure Coring in the Terrebonne Basin, Gulf of Mexico at AGU24.

1.2.2.4.2 *Lithostratigraphy*

- Work continued preparing a more expansive review of the Lithostratigraphy, including defined lithofacies and lithologic units for the Proceedings Volume.
- UNH presented a poster on the Petrography and SEM results titled: Stratigraphy, sediment composition, and provenance of Pleistocene strata of the Terrebonne Basin, northern Gulf of Mexico at AGU24
- Ohio State presented a poster titled: An Unusual Seafloor Sand in the Terrebonne Basin, Gulf of Mexico at AGU24.

1.2.2.4.3 *Biostratigraphy*

- UT continues to assess calcareous nannofossils as markers for the age of UT-GOM2-2 sediments and sediment deposition rates. Deposition rates can impact methanogenesis.
- UT presented a poster titled: High-resolution Calcareous Nannofossil Biostratigraphy in the Terrebonne Basin, northern Gulf of Mexico at AGU24
- USGS traveled to UT to collect more foraminifera samples.
- USGS worked on a planktic foraminifer radiocarbon age model for the upper 15 m (50,000 years).

1.2.2.4.4 *Physical Properties*

1.2.2.4.4.1 Thermal Conductivity, In-Situ Temperature, and Thermal Gradient

- UT identified some future experiments to measure the thermal conductivity of reconstituted sediments from UT-GOM2-2 needed to confirm the applicability of thermal conductivity measurements made on gaseous depressurized cores for assessing the thermal gradient.
- UT presented a poster titled: Heat Flow in the Terrebonne Basin, Gulf of Mexico: Establishing the Gas Hydrate Stability Zone at AGU24. Figure 1-2 shows measured in-situ temperatures at WR313 Hole H003 and the interpreted thermal gradient of 25 ^{o}C/km.

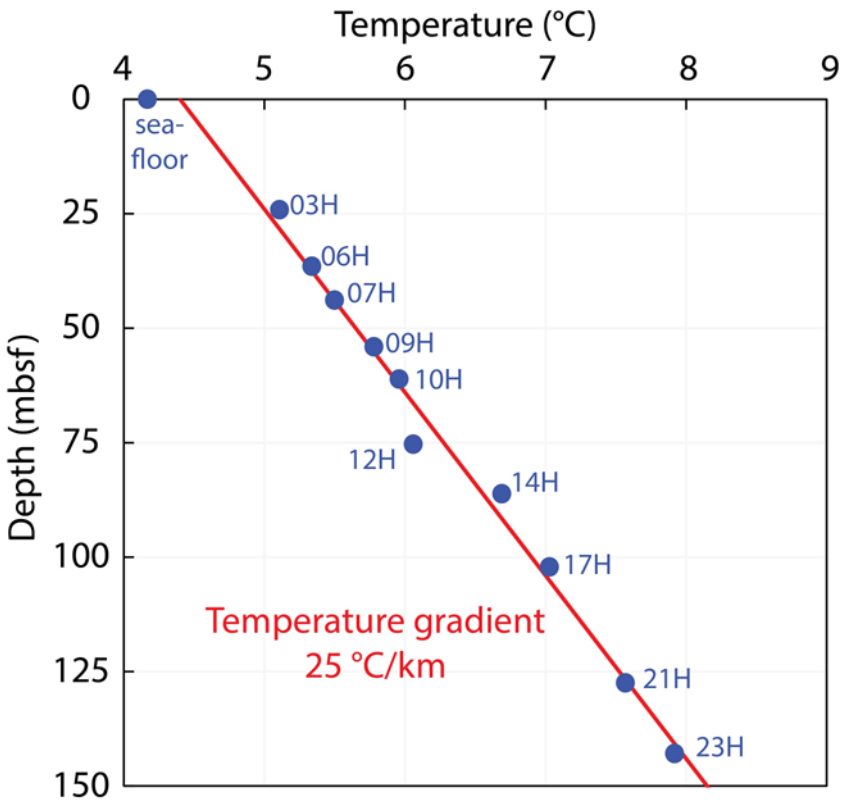

Figure 1-1. Interpreted in-situ temperatures from seafloor to 150 mbsf (true vertical depth below the seafloor) based on Advanced Piston Corer Temperature Tool (APCT-3) measurements. The red line is a linear fit using least square regression, with an error of R2 = 0.99. The seafloor temperature was excluded in this fitting procedure.

1.2.2.4.4.2 Core Logging and Imaging

- UT continued updating core logs created with the software package Strater. Logs were updated based on corrections to the core log including missing samples, corrected sample depths, etc. Final logs will be published in the expedition proceedings volume.
- UT met with Geotek to discuss the differences between the PCATS measurement of density, gamma density, or electron density, and the other measurements of bulk density. The draft Methods section of the proceedings volume on gamma density was updated.

1.2.2.4.4.3 Strength and Compression Behavior

- Ohio state presented a poster titled: Sediment Shear Strength Properties within the Hydrate Stability Zone: Results from the Gulf of Mexico Deepwater Hydrate Coring Expedition, Terrebonne Basin, Gulf of Mexico at AGU24.
- Tufts University continued conducting Constant Rate of Strain consolidation tests on UT-GOM2-2 intact samples from whole round cores. Tufts presented a poster on these initial results titled: Characterization of the compressive behavior of sediment in the Terrebonne Basin, Gulf of Mexico at AGU24.

- Tufts continued training on triaxial testing in preparation for testing resedimented samples from whole round blended material.

1.2.2.4.4.4 Index Properties

- Tufts presented a poster on these initial results titled: Downhole variation of porosity and grainsize in the Terrebonne Basin, Gulf of Mexico at AGU24 (Figure 1-2). Larger grain sizes and higher porosities were measured in Ooze intervals (intervals with high calcareous nannofossil content).
- Tufts continued working on the gas pycnometer density measurements on the split core plugs.

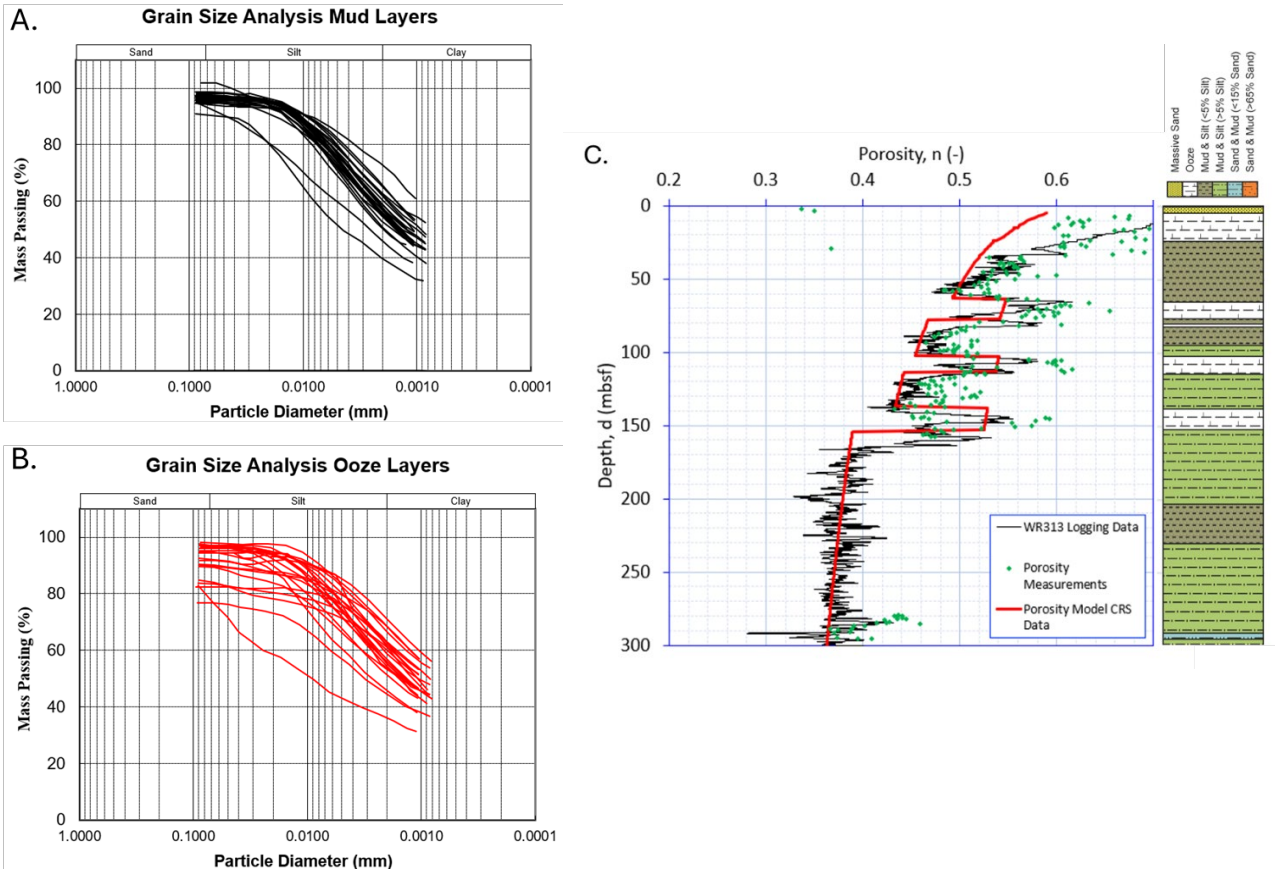

Figure 1-2. Measured grain size distribution and porosity of sediments from UT-GOM2-2 expedition Hole WR313 H003. A) Grain size distraction of sediments from the Mud lithofacies measured using the hydrometer method; B) Grain size distribution of sediments from the Ooze lithofacies measured using the hydrometer method; C) depth profile of measured porosity (green dots) plotted against the modeled (red line), WR313 H001 LWD porosity (black line), and identified lithofacies. The LWD porosity was derived from the Gulf of Mexico Hydrates Joint (JIP II) LWD density measurements for WR313 H001 by Ohio State. Depths for H001 were mapped to depths for Hole H003.

1.2.2.4.4.5 Rock Magnetism

- USGS traveled to the University of Minnesota Institute for Rock Magnetism to complete more advanced rock magnetic measurements on UT-GOM2-2 sediments.

1.2.2.4.5 *Dissolved Methane Concentration and Hydrate Saturation*

- USGS presented a talk titled: Accumulation of microbial methane in hemipelagic sediments of the Terrebonne Basin, northern Gulf of Mexico at AGU24.
- Ohio State presented a poster titled: Insights from X-ray computed Tomography on Core from the Terrebonne Basin, Gulf of Mexico at AGU24 showing relic hydrate filled fractures indicating possible hydrate formation in the UT-GOM2-2 WR313 H003 muds (Figure 1-3).

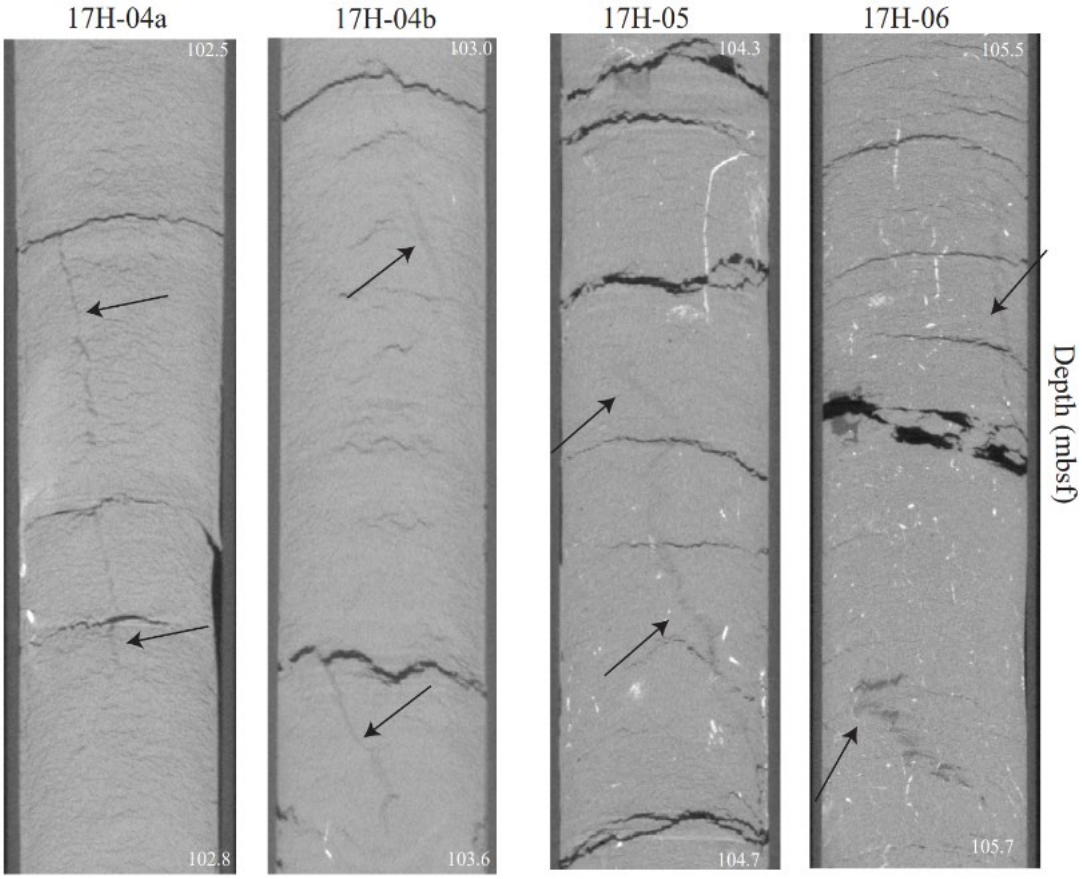

Figure 1-3. XCT slab images of Core UT-GOM2-2-H003-17H showing locations of relic hydrate filled fractures

1.2.2.4.6 *Microbiology*

- Oregon State used the molecular biology classification and modeling software, CosmosID, to identify the microbial taxa obtained from Site H and to begin the determination of predicted functionality of these taxa based on their distribution in the sediments. By extraction and sequencing of DNA obtained from communities in Walker Ridge 313 Site H sediments, Oregon St has determined the major microbial groups present in the samples. Contaminants arising from the drilling fluids, seawater, PCATS fluids, DNA extraction kits, lab air on the ship, and lab air at OSU were carefully investigated and taxa representing these microbes were subsequently removed from ensuing analyses. By classifying the communities according to the depths from which they were recovered, identified as above sulfate

methane transition zone (SMTZ), within the SMTZ, below the SMTZ, in the gas hydrate stability zone, and within gas hydrates, distinct patterns of community architecture are being determined. Many of these microbes appear to be subject to stochastic selection, likely due to the constraints of the environmental setting which include limited electron acceptors and dissolved organic matter. Analyses are on-going but suggest the presence of methane-producing archaea in the sediments below the SMTZ, as well as diverse microbes known to be capable of degrading complex organic matter to the simple compounds that can be used by methanogens.

- Oregon State presented a poster titled: Microbial Distribution in Methane Hydrate-Containing Deep Sea Sediments in the Terrebonne Basin, Gulf of Mexico at AGU24. Results included ultra-low level DNA extractions and community characterization including determination of community organization traits for specific samples.
- Plans were made to have splits of the microbiology samples measured for particle grain-size (Mills, UT) and total organic carbon (Johnson, UNH). In addition, sediment age (Purkey, UT) will be included as an abiotic factor to be considered in the assessment of determinants of microbial community structure

1.2.2.4.7 *Geochemistry*

- UW finished the analysis of all pore water, seawater, drilling mud, and PCATS fluid samples for sulfate, bromide, lithium, boron, strontium, barium, rubidium, cesium, and ammonium concentrations. In addition to the aqueous phase analyses, Dr. Solomon's group also finished the sediment leaching experiments to characterize the sediment trace metal concentrations (Fe, Mn, Ni, Co, Cr, Cu) and associated solid phases with depth in Hole H003.
- UW presented a poster titled: Geochemical Constraints on the Genesis of Methane Hydrates in the Terrebonne Basin, Gulf of Mexico at AGU24.
- New Mexico Tech presented a poster titled: Using Noble Gas Tracers to Constrain the Residence Time of Methane Gas Hydrates in the Gulf of Mexico at AGU24.
- UNH completed the measurements of ~450 Total Organic Carbon, Calcium Carbonate (CaCO3), Total Nitrogen, Total Sulfur, delta 13C isotope, and delta 34S isotope measurements The results were presented in a poster titled: Sediment Geochemistry and Early Diagenesis in the Terrebonne Basin, Gulf of Mexico at AGU24.
- UNH has also began developing a method for isolating and measuring the amount of charcoal (wt. %) in the marine sediments using soil standard samples. Ultimately the goal of this method refinement is to quantify the % C in the GOM2-2 sediments that is charcoal (the most non-reactive C phase in marine sediments, thus unavailable for methanogenesis).

1.2.2.5 Task 18.0 – Project Data Analysis and Reporting

1.2.2.5.1 *Subtask 18.1 – Sample and Data Distribution and Archiving*

- A material transfer agreement between UT and USGS was finalized to allow the transfer of sediment samples collected in this and future periods to USGS.
- No additional sample or data requests were received. All data is available to the science team via password protected websites. When the full expedition report is published the data will be archived and made public.

1.2.2.5.2 *Subtask 18.2 – Collaborative Post-Field Project Analysis of Geologic Data and Samples*

UT-GOM2-2 Science Workshop

- The University of Texas Gulf of Mexico Deepwater Hydrate Coring Expedition (UT-GOM2-2) post-cruise science meeting was held October 27-30, 2024, in Boerne, TX.
- Thirty attendees participated in the workshop, including scientists and project stakeholders from The University of Texas at Austin, The Ohio State University, University of Washington, New Mexico Tech, University of New Hampshire, Oregon State, Tufts University, U.S. DOE, and USGS.
- The objectives of the workshop were to communicate initial UT-GOM2-2 findings amongst the project team; identify interdisciplinary questions and outstanding research opportunities; complete the AGU Special Collection application (**Milestone M6C**), and provide connections and opportunities for young members of the research team. All objectives were achieved.
- Twenty-four posters were presented providing details of the work done. Many posters were previews of posters to be presented at AGU24. Nine presentations were made summarizing work done to date and the work yet to be done. Three breakout sessions were held to discuss and focus on three primary areas of research: thick hydrate-bearing sands, mud-ooze glacial cycles, and base of hydrate stability. A brainstorming session was held to generate ideas for publications. These paper ideas were compiled and used to draft an application for an AGU special collection (dedicated electronic journal) of papers related to the expedition.
- A summary report for the UT-GOM2-2 Science Workshop is provided as **APPENDIX A**.

UT-GOM2-2 Proceedings Volume

- UT and the project science team continued work on the UT-GOM2-2 Proceedings Volume. This volume will include three chapters: 1 – Summary, 2 – Methods, and 3 – WR313 Site H.
- The Proceedings Volume will be published on Zenodo.org, OSTI.gov, and our expedition website, UT-GOM2-2: Gulf of Mexico Deepwater Hydrate Coring Expedition - UT Institute for Geophysics. The estimated completion date is Spring 2025.

UT-GOM2-2 Data Archive / Data Directory

- UT continued to review core reports, coring data, curation data, logs and images to confirm the final integrated recovery data for each core.
- UT began building the structure to house 22 datasets on Zenodo under the Zenodo community for GOM, Gulf of Mexico Deepwater Hydrate Coring.

1.2.2.5.3 *Subtask 18.3 – Scientific Results Volume and Technical Project Presentations*

American Geophysical Union Fall Meeting

- The project team and project participants convened and participated in the dedicated hydrates session at the AGU fall meeting in Washington DC, AGU24, on December 13 (*Natural Gas Hydrate Systems Occurrence and Dynamic Behavior*). This session included a full morning of posters, followed by the oral session at 4:00-5:30 PM EST. Session attendees recognized the interdisciplinary nature of the project, and its value for a holistic understanding of hydrate systems.
- The session included abstracts from multiple institutions around the world. A total of 37 abstracts were presented, 17 of which included GOM2-2 data and were authored by UT-GOM2-2 scientists (Figure 1-3).

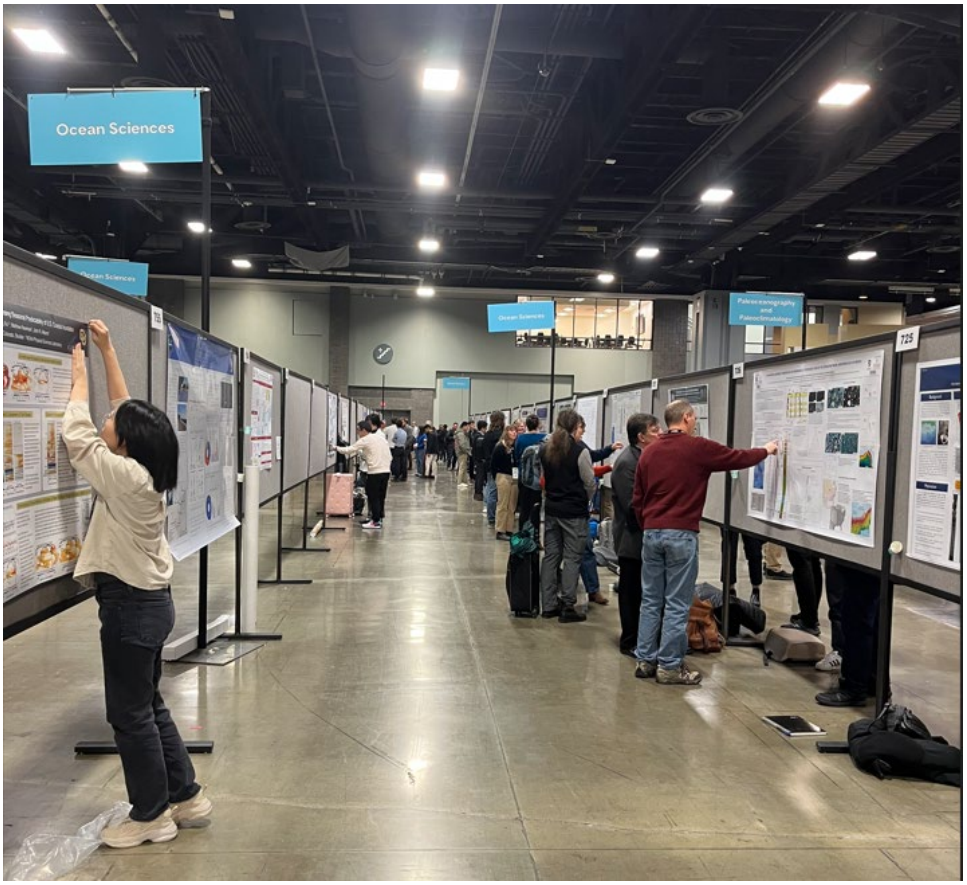

Figure 1-4. AGU 2024 Fall Meeting Hydrate Poster Session. A total of 29 posters were presented in the session, 17 of which included GOM2-2 data. Right: Project participants David Awwiller and John Germaine.

UT-GOM2-2 Scientific Results Volume

- During the UT-GOM2-2 Science Workshop, a dedicated session was held to develop a consensus of collaborative science papers that will be included in the UT-GOM2-2 Comprehensive Scientific Results Volume (**Milestone M6D**).
- The list of proposed manuscripts was compiled and integrated into an application for an AGU special collection – primarily in AGU's journal *Geochemistry, Geophysics, Geosystems*. This proposed collection will be similar to the two special AAPG journal volumes for UT-GOM2-1, but will be broader in scope and cover more topics related to hydrate system perturbation, including hydrate formation and carbon cycling.
- The special collection application was submitted to AGU on Nov. 4, 2024.

1.3 What Will Be Done In The Next Reporting Period To Accomplish These Goals

1.3.1 Task 1.0 – Project Management & Planning

- UT will continue to execute the project in accordance with the approved Project Management Plan (PMP) and Statement of Project Objectives (SOPO).
- UT will continue to manage and control project activities in accordance with their established processes and procedures to ensure subtasks and tasks are completed within schedule and budget constraints defined by the PMP.
- UT will submit a proposal for a no-cost extension of BP6.

1.3.2 Task 13.0 – Maintenance And Refinement Of Pressure Core Transport, Storage, & Manipulation Capability

- UT will continue to evaluate and confirm that mini-PCATS X-ray imaging is able to provide scans with enough accuracy to allow for adequate measurements and determine the accuracy of diameters measured with this approach.
- UT will conduct geomechanical tests on pressure cores from UT-GOM2-1 to validate our improved experimental approaches. Particularly, we will conduct more production tests where we will verify that our measured temperature, produced gas, and geomechanical and petrophysical properties are correctly determined. UT will plan and/or initiate testing of pressure cores from the GOM2-2 expedition. We will assess compressibility, in-situ stress and permeability behavior.
- The Mini-PCATS, PMRS, analytical equipment, and storage chambers will undergo continued observation and maintenance at regularly scheduled intervals and on an as-needed basis. Installation of new or replacement parts will continue to ensure operational readiness.
- UT will continue to test the Effective Stress Chamber computer system upgrade to ensure operational stability.
- UT will continue to evaluate and refine the temperature measurement capabilities of the Effective Stress Chamber test section.

1.3.3 Task 16.0 – UT-GOM2-2 Scientific Drilling Program Field Operations

- Task complete.

1.3.4 Task 17.0 – UT-GOM2-2 Core Analysis

1.3.4.1.1 *Pressure Coring Tool Assessment*

- UT will continue working on the assessment of the PCTB. Results will be summarized in the proceedings volume.

1.3.4.1.2 *Biostratigraphy*

- UT will continue to assess calcareous nannofossils as markers for the age of UT-GOM2-2 sediments and sediment deposition rates.
- USGS will finish their planktic foraminifer radiocarbon age model for the upper 15 m (50,000 years) and send out the first round of samples for benthic foraminifer oxygen-isotope analysis.

1.3.4.1.3 *Physical Properties*

1.3.4.1.3.1 Thermal Conductivity, In-Situ Temperature, and Thermal Gradient

- UT will begin experiments to measure the thermal conductivity of reconstituted sediments.

1.3.4.1.3.2 Strength and Compression Behavior

- Tufts University will continue work on Constant Rate of Strain consolidation tests.
- Tufts will continue triaxial work on resedimented samples from whole round blended material.

1.3.4.1.3.3 Index Properties

- Tufts will continue measuring grain density with a gas pycnometer.
- Tufts distribute results from James Hutton for X-ray powdered diffraction to identify minerals and clays.

1.3.4.1.3.4 Rock Magnetism

- USGS will being working on a paper summarizing the magnetics of WR313.

1.3.4.1.4 *Microbiology*

- Oregon State will make further determinations of potential microbial activities at different sediment depths, assessments of the key abiological parameters that constrain these cells.
- Oregon State will continue to work with other microbiologists who received samples from 2023 expedition at Walker Ridge 313 Site H.

1.3.4.1.5 *Geochemistry*

- UW will focus on the analysis of all pore water, seawater, drilling mud, and PCATS fluid samples for calcium, magnesium, sodium, and potassium concentrations as well as stable oxygen and hydrogen

isotope ratios. In addition, all of the pore water chemical data produced so far will be corrected for both drilling fluid and PCATS fluid contamination.

- UNH will prep a subset of the ~450 Total S and Total C and Total N samples for del 34S isotope measurements.
- UNH will continue developing a method for isolating and measuring the amount of charcoal (wt. %) in the marine sediments using soil standard samples.

1.3.5 Task 18.0 – Project Data Analysis and Reporting

- The project science team will continue working on edits to the Expedition Proceedings to be published in late Spring 2025.
- The project science team will continue checking data and creating datasets on Zenodo.

2 PRODUCTS

Project publications webpage:

https://ig.utexas.edu/energy/gom2-methane-hydrates-at-the-university-of-texas/gom2-publications/

2.1 Publications

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You, K., Flemings, P. B., Malinverno, A., Collett, T. S., and Darnell, K., 2019, Mechanisms of Methane Hydrate Formation in Geological Systems: Reviews of Geophysics, v. 0, no. ja. https://doi.org/10.1029/2018rg000638

You, K., Kneafsey, T. J., Flemings, P. B., Polito, P., and Bryant, S. L., 2015, Salinity-buffered methane hydrate formation and dissociation in gas-rich systems: Journal of Geophysical Research: Solid Earth, v. 120, no. 2, p. 643-661. https://doi.org/10.1002/2014JB011190

You, K., Summa, L., Flemings, P. B., Santra, M., and Fang, Y., 2021, Three-dimensional free gas flow focuses basin-wide microbial methane to concentrated methane hydrate reservoirs in geological system, Journal of Geophysical Research: Solid Earth, 126, e2021JB022793.

You K., and Flemings, P. B., 2021, Methane hydrate formation and evolution during sedimentation, Journal of Geophysical Research: Solid Earth, 126, e2020JB021235.

2.2 Conference Presentations/Abstracts

Awwiller, D., Johnson, J. E., Purkey Phillips, M., Phillips, S., et al., 2024, Stratigraphy, sediment composition, and provenance of Pleistocene strata of the Terrebonne Basin, northern Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Buser J. Z., Shannon, K., Morono, Y., Van Der Maal, C., et al, 2024, Microbial distribution in methane hydrate-containing deep sea sediments in the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Buser J.Z., Shannon K. and Colwell F., 2023, The Microbiome of Methane Hydrate-Bearing Sediments, a Global Meta-Analysis. OS21B-1425. Poster presented at the Fall Meeting of the American Geophysical Union. December 2023

Cardona, A., Bhandari, A. R., Flemings, P. B., 2024, Heat flow in the Terrebonne Basin, Gulf of Mexico: establishing the gas hydrate stability zone. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Cardona, A., Fang, Y., You, K., and Flemings, P.B., 2023, Relative Permeability of Hydrate-Bearing Sediments: The Critical Role of Hydrate Dissolution. OS21B-1418. Poster presented at the Fall Meeting of the American Geophysical Union. December 2023.

Cardona, A., Bhandari, A., and Flemings, P. B., 2022, Creep and stress relaxation behavior of hydrate-bearing sediments: implications for stresses during production and geological sedimentation. Presented at American Geophysical Union, Fall Meeting, Chicago, IL.

Colwell, F., Kiel Reese, B., Mullis, M., Buser-Young, J., Glass, J.B., Waite, W., Jang, J., Dai, S., and Phillips, S., 2020, Microbial Communities in Hydrate-Bearing Sediments Following Long-Term Pressure Preservation. Presented as a poster at 2020 Gordon Research Conference on Gas Hydrates

Collett, T., Boswell, R., Shukla, K., Flemings, P.B., and Tamaki, M., 2023, Characterization of deepwater marine depositional systems associated with highly concentrated gas hydrate accumulations in coarse-grained reservoirs. Abstract ID 61. Oral talk presented at International Gas Hydrates Conference (ICGH10). July 2023.

Chen X., Espinoza, D.N., Tisato, N., and Flemings, P.B., 2018, X-Ray Micro-CT Observation of Methane Hydrate Growth in Sandy Sediments. Presented at the AGU Fall Meeting 2018, Dec. 10–14, in Washington D.C.

Cook, A., Phillips, S., Flemings, P. B., Collet, T., Thomas, C., Frye, M., and McConnell, D., 2024, Comparing high saturation hydrate-bearing sand reservoirs in the northern Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Cook, A., Waite, W. F., Spangenberg, E., and Heeschen, K.U., 2018, Petrophysics in the lab and the field: how can we understand gas hydrate pore morphology and saturation? Invited talk presented at the American Geophysical Union Fall Meeting, Washington D.C.

Cook, A.E., and Waite, B., 2016, Archie's saturation exponent for natural gas hydrate in coarse-grained reservoir. Presented at Gordon Research Conference, Galveston, TX.

Cook, A.E., Hillman, J., Sawyer, D., Treiber, K., Yang, C., Frye, M., Shedd, W., Palmes, S., 2016, Prospecting for Natural Gas Hydrate in the Orca & Choctaw Basins in the Northern Gulf of Mexico. Poster presented at American Geophysical Union, Fall Meeting, San Francisco, CA.

Cook, A.E., Hillman, J., & Sawyer, D., 2015, Gas migration in the Terrebonne Basin gas hydrate system. Abstract OS23D-05 presented at American Geophysical Union, Fall Meeting, San Francisco, CA.

Cook, A. E., & Sawyer, D., 2015, Methane migration in the Terrebonne Basin gas hydrate system, Gulf of Mexico. Presented at American Geophysical Union, Fall Meeting, San Francisco, CA.

Coyte, R., Wulsin, G., Phillips, S., Darrah, T., et al., 2024, Using noble gas tracers to constrain the residence time of methane gas hydrates in the Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Darnell, K., Flemings, P.B., DiCarlo, D.A., 2016, Nitrogen-assisted Three-phase Equilibrium in Hydrate Systems Composed of Water, Methane, Carbon Dioxide, and Nitrogen. Presented at American Geophysical Union, Fall Meeting, San Francisco, CA.

DiCarlo, D., Murphy, Z., You, K. and Flemings, P.B., 2023, Pore Occupancy of Gas Hydrate. OS23A-06. Oral talk presented at the Fall Meeting of the American Geophysical Union. December 2023.

Dong, T., Lin, J. -F., Flemings, P. B., Gu, J. T., Polito, P. J., O'Connell, J., 2018, Pore-Scale Methane Hydrate Formation under Pressure and Temperature Conditions of Natural Reservoirs. Presented to the AGU Fall Meeting 2018, Washington D.C., 10-14 December.

Ewton, E., Klasek, S., Peck, E., Wiest, J. Colwell F., 2019, The effects of X-ray computed tomography scanning on microbial communities in sediment cores. Poster presented at AGU Fall Meeting.

Erica Ewton et al., 2018, The effects of X-ray CT scanning on microbial communities in sediment cores. Poster presented at American Geophysical Union, Fall Meeting, Washington, D.C. OS23D-1657

Espinoza D.N., Chen X., Luo J.S., Tisato N., Flemings P.B., 2010, X-Ray Micro-CT Observation of Methane Hydrate Growth and Dissociation in Sandy Sediments. Presented to the Engineering Mechanics Institute Conference 2019, Pasadena, CA, 19 June.

Fang, Y., et al., 2020, Petrophysical Properties of Hydrate-Bearing Siltstone from UT-GOM2-1 Pressure Cores. Presented at the AAPG virtual Conference, Oct 1, Theme 9: Analysis of Natural Gas Hydrate Systems I & II

Fang, Y., et al., 2018, Permeability, compression behavior, and lateral stress ration of hydrate-bearing siltstone from UT-GOM2-1 pressure core (GC-955 – northern Gulf of Mexico): Initial Results. Poster presented at American Geophysical Union, Fall Meeting, Washington, D.C. OS23D-1650

Fang, Y., Flemings, P.B., Daigle, H., O'Connell, J., Polito, P., 2018, Measure permeability of natural hydrate-bearing sediments using K0 permeameter. Presented at Gordon Research Conference on Gas Hydrate, Galveston, TX. Feb 24- Mar 02, 2018.

Flemings, P. B., Thomas, C., Phillips, S., Collett, T. S., et al., 2024, Exploring the methane hydrate system through coring in the deepwater Gulf of Mexico: the UT-GOM2-2 Expedition. OS54B-01. Talk presented at the American Geophysical Union Fall Meeting, December 2024.

Flemings, P. B., Fang, Y., You, K., and Cardona, A., 2022, The Water Relative Permeability Behavior of Hydrate-bearing Sediment. Presented at American Geophysical Union, Fall Meeting, Chicago, IL.

Flemings, P.B., et al., 2020, Pressure Coring a Gulf of Mexico Deep-Water Turbidite Gas Hydrate Reservoir: The UT-GOM2-1 Hydrate Pressure Coring Expedition. Presented at the AAPG virtual Conference, Oct 1, Theme 9: Analysis of Natural Gas Hydrate Systems I & II

Flemings, P., Phillips, S., and the UT-GOM2-1 Expedition Scientists, 2018, Recent results of pressure coring hydrate-bearing sands in the deepwater Gulf of Mexico: Implications for formation and production. Talk presented at the 2018 Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX, February 24-March 2, 2018.

Fortin, W., 2018, Waveform Inversion and Well Log Examination at GC955 and WR313 in the Gulf of Mexico for Estimation of Methane Hydrate Concentrations. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Fortin, W., Goldberg, D.S., Küçük, H. M., 2017, Prestack Waveform Inversion and Well Log Examination at GC955 and WR313 in the Gulf of Mexico for Estimation of Methane Hydrate Concentrations. EOS Trans. American Geophysical Union, Fall Meeting, New Orleans, LA.

Fortin, W., 2016, Properties from Seismic Data. Presented at IODP planning workshop, Southern Methodist University, Dallas, TX.

Fortin, W., Goldberg, D.S., Holbrook, W.S., and Küçük, H.M., 2016, Velocity analysis of gas hydrate systems using prestack waveform inversion. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Fortin, W., Goldberg, D.S., Küçük, H.M., 2016, Methane Hydrate Concentrations at GC955 and WR313 Drilling Sites in the Gulf of Mexico Determined from Seismic Prestack Waveform Inversion. EOS Trans. American Geophysical Union, Fall Meeting, San Francisco, CA.

Goldberg, D., Küçük, H.M., Haines, S., Guerin, G., 2016, Reprocessing of high resolution multichannel seismic data in the Gulf of Mexico: implications for BSR character in the Walker Ridge and Green Canyon areas. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Hammon, H., Phillips, S., Flemings, P., and the UT-GOM2-1 Expedition Scientists, 2018, Drilling-induced disturbance within methane hydrate pressure cores in the northern Gulf of Mexico. Poster presented at the 2018 Gordon Research Conference and Seminar on Natural Gas Hydrate Systems, Galveston, TX, February 24-March 2, 2018.

Heber, R., Kinash, N., Cook, A., Sawyer, D., Sheets, J., and Johnson, J.E., 2017, Mineralogy of Gas Hydrate Bearing Sediment in Green Canyon Block 955 Northern Gulf of Mexico. Abstract OS53B-1206 presented at American Geophysical Union, Fall Meeting, New Orleans, LA.

Hillman, J., Cook, A. & Sawyer, D., 2016, Mapping and characterizing bottom-simulating reflectors in 2D and 3D seismic data to investigate connections to lithology and frequency dependence. Presented at Gordon Research Conference, Galveston, TX.

Johnson, J., Phillips, S., Purkey Phillips, M., Awwiller, D., et al., 2024, Sediment geochemistry and early diagenesis in the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Johnson, J., et al., 2020, Grain Size, TOC, and TS in Gas Hydrate Bearing Turbidite Facies at Green Canyon Site 955, Gulf of Mexico. Presented at the AAPG virtual Conference, Oct 1, Theme 9: Analysis of Natural Gas Hydrate Systems I & II

Johnson, J.E., Phillips, S.C., and Divins, D.L., 2018, Tracking AOM through TOC and Elemental S: Implications for Methane Charge in Gulf of Mexico Marine Sediments. Abstract OS13A-08 presented at 2018 Fall Meeting, AGU, San Francisco, Calif., 14-18 Dec. Oral Presentation

Johnson, J., 2018, High Porosity and Permeability Gas Hydrate Reservoirs: A Sedimentary Perspective. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Kinash, N. Cook, A., Sawyer, D. and Heber, R., 2017, Recovery and Lithologic Analysis of Sediment from Hole UT-GOM2-1-H002, Green Canyon 955, Northern Gulf of Mexico. Abstract OS53B-1207 presented at American Geophysical Union, Fall Meeting, New Orleans, LA.

Küçük, H.M., Goldberg, D.S, Haines, S., Dondurur, D., Guerin, G., and Çifçi, G., 2016, Acoustic investigation of shallow gas and gas hydrates: comparison between the Black Sea and Gulf of Mexico. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Kumar, A., Cook, A. E., and the UT-GOM2-2 Scientists, 2024, An unusual seafloor sand in the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Kumar, A., Cook, A., Portnov, A., Palmes, S., Frye, M. and Lawal, M., 2023, Bottom Simulating Reflections and Pockmark Distribution in the Northern Gulf of Mexico. OS21B-1412. Poster presented at the Fall Meeting of the American Geophysical Union. December 2023.

Liu, J. et al., 2018, Pore-scale CH4-C2H6 hydrate formation and dissociation under relevant pressure-temperature conditions of natural reservoirs. Poster presented at American Geophysical Union, Fall Meeting, Washington, D.C. OS23D-2824

Malinverno, A., Cook, A. E., Daigle, H., Oryan, B., 2017, Methane Hydrate Formation from Enhanced Organic Carbon Burial During Glacial Lowstands: Examples from the Gulf of Mexico. EOS Trans. American Geophysical Union, Fall Meeting, New Orleans, LA.

Malinverno, A., 2016, Modeling gas hydrate formation from microbial methane in the Terrebonne basin, Walker Ridge, Gulf of Mexico. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Martin, S., Cook, A. E., Holland, M. E., Thomas, C., et al., 2024, Insights from X-ray computed tomography on core from the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Meazell, K., and Flemings, P.B., 2021, Seal capacity and fluid expulsion in hydrate systems. Presented at IMAGE 2021, SEG/AAPG Annual Conference. Denver, Colorado. Theme 9: Hydrocarbons of the future.

Meazell, K., Flemings, P. B., Santra, M., and the UT-GOM2-01 Scientists, 2018, Sedimentology of the clastic hydrate reservoir at GC 955, Gulf of Mexico. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Meazell, K., & Flemings, P.B., 2016, Heat Flux and Fluid Flow in the Terrebonne Basin, Northern Gulf of Mexico. Presented at American Geophysical Union, Fall Meeting, San Francisco, CA.

Meazell, K., & Flemings, P.B., 2016, New insights into hydrate-bearing clastic sediments in the Terrebonne basin, northern Gulf of Mexico. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Meazell, K., & Flemings, P.B., 2016, The depositional evolution of the Terrebonne basin, northern Gulf of Mexico. Presented at 5th Annual Jackson School Research Symposium, University of Texas at Austin, Austin, TX.

Meazell, K., 2015, Methane hydrate-bearing sediments in the Terrebonne basin, northern Gulf of Mexico. Abstract OS23B-2012 presented at American Geophysical Union, Fall Meeting, San Francisco, CA.

Moore, M., Darrah, T., Cook, A., Sawyer, D., Phillips, S., Whyte, C., Lary, B., and UT-GOM2-01 Scientists, 2017, The genetic source and timing of hydrocarbon formation in gas hydrate reservoirs in Green Canyon, Block GC955. Abstract OS44A-03 presented at American Geophysical Union, Fall Meeting, New Orleans, LA.

Morrison, J., Flemings, P., and the UT-GOM2-1 Expedition Scientists, 2018, Hydrate Coring in Deepwater Gulf of Mexico, USA. Poster presented at the 2018 Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Murphy, Z., Flemings, P.B., DiCarlo, D., and You, K, 2022, Simultaneous CH4 Production and CO2 Storage in Hydrate Reservoirs. Presented at American Geophysical Union, Fall Meeting, Chicago, IL.

Murphy, Z., et al., 2018, Three phase relative permeability of hydrate bearing sediments. Poster presented at American Geophysical Union, Fall Meeting, Washington, D.C. OS23D-1647

Naim, F., Cook, A., Konwar, D., 2021, Estimating P-wave velocity and Bulk Density in Hydrate Systems using Machine Learning: in IMAGE 2021, SEG/AAPG Annual Conference. Denver, Colorado

Naim, F., Cook, A.E., Moortgat, J., 2023, Estimating P-wave Velocity and Bulk Density in Near-seafloor Sediments Using Machine Learning: Energies. 16(23) doi:10.3390/en16237709. https://www.mdpi.com/1996-1073/16/23/7709

Oryan, B., Malinverno, A., Goldberg, D., Fortin, W., 2017, Do Pleistocene glacial-interglacial cycles control methane hydrate formation? An example from Green Canyon, Gulf of Mexico. EOS Trans. American Geophysical Union, Fall Meeting, New Orleans, LA.

Oti, E., Cook, A., Phillips, S., and Holland, M., 2019, Using X-ray Computed Tomography (XCT) to Estimate Hydrate Saturation in Sediment Cores from UT-GOM2-1 H005, Green Canyon 955 (Invited talk, U11C-17). Presented to the AGU Fall Meeting, San Francisco, CA.

Oti, E., Cook. A., Phillips, S., Holland, M., Flemings, P., 2018, Using X-ray computed tomography to estimate hydrate saturation in sediment cores from Green Canyon 955 Gulf of Mexico. Talk presented at the American Geophysical Union Fall Meeting, Washington D.C.

Oti, E., Cook, A., 2018, Non-Destructive X-ray Computed Tomography (XCT) of Previous Gas Hydrate Bearing Fractures in Marine Sediment. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Oti, E., Cook, A., Buchwalter, E., and Crandall, D., 2017, Non-Destructive X-ray Computed Tomography (XCT) of Gas Hydrate Bearing Fractures in Marine Sediment. Abstract OS44A-05 presented at American Geophysical Union, Fall Meeting, New Orleans, LA.

Phillips S., Coyte, R., Casso, M., You, K., et al., 2024, Accumulation of microbial methane in hemipelagic sediments of the Terrebonne Basin, northern Gulf of Mexico. OS54B-02. Invited talk presented at the American Geophysical Union Fall Meeting, December 2024.

Phillips S., and Johnson, J., 2023, Tectono-sedimentary controls on early diagenetic methane cycling in the Cascadia accretionary wedge. OS21B-1424. Poster presented at the Fall Meeting of the American Geophysical Union. December 2023.

Phillips, S.C., et al., 2020, High Concentration Methane Hydrate in a Silt Reservoir from the Deep-Water Gulf of Mexico. Presented at the AAPG virtual Conference, Oct 1, Theme 9: Analysis of Natural Gas Hydrate Systems I & II

Phillips, S.C., Formolo, M.J., Wang, D.T., Becker, S.P., and Eiler, J.M., 2020. Methane isotopologues in a high-concentration gas hydrate reservoir in the northern Gulf of Mexico. Goldschmidt Abstracts 2020. https://goldschmidtabstracts.info/2020/2080.pdf

Phillips, S.C., 2019, Pressure coring in marine sediments: Insights into gas hydrate systems and future directions. Presented to the GSA Annual Meeting 2019, Phoenix, Arizona, 22-25 September. https://gsa.confex.com/gsa/2019AM/meetingapp.cgi/Paper/338173

Phillips et al., 2018, High saturation of methane hydrate in a coarse-grained reservoir in the northern Gulf of Mexico from quantitative depressurization of pressure cores. Poster presented at American Geophysical Union, Fall Meeting, Washington, D.C. OS23D-1654

Phillips, S.C., Flemings, P.B., Holland, M.E., Schultheiss, P.J., Waite, W.F., Petrou, E.G., Jang, J., Polito, P.J., O'Connell, J., Dong, T., Meazell, K., and Expedition UT-GOM2-1 Scientists, 2017, Quantitative degassing of gas hydrate-bearing pressure cores from Green Canyon 955. Gulf of Mexico. Talk and poster presented at the 2018 Gordon Research Conference and Seminar on Natural Gas Hydrate Systems, Galveston, TX, February 24-March 2, 2018.

Phillips, S.C., Borgfedlt, T., You, K., Meyer, D., and Flemings, P., 2016, Dissociation of laboratory-synthesized methane hydrate by depressurization. Poster presented at Gordon Research Conference and Gordon Research Seminar on Natural Gas Hydrates, Galveston, TX.

Phillips, S.C., You, K., Borgfeldt, T., Meyer, D.W., Dong, T., Flemings, P.B., 2016, Dissociation of Laboratory-Synthesized Methane Hydrate in Coarse-Grained Sediments by Slow Depressurization. Presented at American Geophysical Union, Fall Meeting, San Francisco, CA.

Purkey-Phillips, M., Johnson, J. E., Phillips, S., Tozier, K., 2024, High-resolution calcareous nannofossil biostratigraphy in the Terrebonne Basin, northern Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Portnov, A., Flemings, P.B., and Meazell, K. Anomalously Deep Gas Hydrate Stability Zone In Rapidly Formed Sedimentary Basins. Poster presented at the Offshore Technology Conference (OTC). May 2023.

Portnov, A., Flemings, P. B., You, K., Meazell, K., Hudec, M. R., and Dunlap, D. B., 2023, Low temperature and high pressure dramatically thicken the gas hydrate stability zone in rapidly formed sedimentary basins: Marine and Petroleum Geology, v. 158, p. 106550.

Portnov, A., Cook, A. E., Frye, M. C., Palmes, S. L., Skopec, S., 2021, Prospecting for Gas Hydrate Using Public Geophysical Data in the Northern Gulf of Mexico. Presented at in IMAGE 2021, SEG/AAPG Annual Conference. Denver, Colorado. Theme 9: Hydrocarbons of the future.

Portnov A., et al., 2018, Underexplored gas hydrate reservoirs associated with salt diapirism and turbidite deposition in the Northern Gulf of Mexico. Poster presented at American Geophysical Union, Fall Meeting, Washington, D.C. OS51F-1326

Portnov, A., Cook, A., Heidari, M., Sawyer, D., Santra, M., Nikolinakou, M., 2018, Salt-driven Evolution of Gas Hydrate Reservoirs in the Deep-sea Gulf of Mexico. Presented at Gordon Research Conference on Natural Gas Hydrate Systems, Galveston, TX.

Santra, M., et al., 2020, Gas Hydrate in a Fault-Compartmentalized Anticline and the Role of Seal, Green Canyon, Abyssal Northern Gulf of Mexico. Presented at the AAPG virtual Conference, Oct 1, Theme 9: Analysis of Natural Gas Hydrate Systems I & II

Santra, M., et al., 2018, Channel-levee hosted hydrate accumulation controlled by a faulted anticline: Green Canyon, Gulf of Mexico. Poster presented at American Geophysical Union, Fall Meeting, Washington, D.C. OS51F-1324

Santra, M., Flemings, P., Scott, E., Meazell, K., 2018, Evolution of Gas Hydrate Bearing Deepwater Channel-Levee System in Green Canyon Area in Northern Gulf of Mexico. Presented at Gordon Research Conference and Gordon Research Seminar on Natural Gas Hydrates, Galveston, TX.

Sawyer, D., Germaine, J., Cardona, A., Bhandari, A. R., et al., 2024, Sediment shear strength properties within the hydrate stability zone: results from the Gulf of Mexico Deepwater Hydrate Coring Expedition,

Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Small., C., Germaine, J., Cook, A. E., Cardona, A., et al., 2024, Characterization of the compressive behavior of sediment in the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Small., C., Germaine, J., Johnson, J. E., Cook, A. E., et al., 2024, Downhole variation of porosity and grainsize in the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Solomon, E., Walton, T., Tsang, M., Aylward, I., et al., 2024, Geochemical constraints on the genesis of methane hydrates in the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Thomas, C., Flemings, P. B., Cook. A. E., Phillips, S., et al., 2024, Pressure coring in the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Tozier, K., Johnson, J. E., Phillips, S., Purkey Phillips, M., et al., 2024, Investigating Late Pleistocene to Recent Bimodal Sedimentation in the Terrebonne Basin, Gulf of Mexico. OS51E. Poster presented at the American Geophysical Union Fall Meeting, December 2024.

Tozier, K., 2024, Investigating Late Pleistocene to Recent Bimodal Sedimentation in the Terrebonne Basin, Gulf of Mexico. Master's Thesis, University of New Hampshire, p. 75.

Treiber, K, Sawyer, D., & Cook, A., 2016, Geophysical interpretation of gas hydrates in Green Canyon Block 955, northern Gulf of Mexico, USA. Poster presented at Gordon Research Conference, Galveston, TX.

Van der Maal, C., Flemings, P., Mills, T., Johnson, J., Greiner, K., 2024, Characterizing the Orange Sand in the Deepwater Gulf of Mexico. Poster presented at UT GeoFluids Annual Meeting, February, 2024

Varona, G., Flemings, P.B., Santra, M., Meazell, K., 2021, Paleogeographic evolution of the Green Sand, WR313. Presented at in IMAGE 2021, SEG/AAPG Annual Conference. Denver, Colorado. Theme 9 Gas Hydrates and Helium Sourcing.

Wei, L., Malinverno, A., Colwell, R., and Goldberg, D, 2022, Reactive Transport Modeling of Microbial Dynamics in Marine Methane Hydrate Systems. Presented at American Geophysical Union, Fall Meeting, Chicago, IL.

Wei, L. and Cook, A., 2019, Methane Migration Mechanisms and Hydrate Formation at GC955, Northern Gulf of Mexico. Abstract OS41B-1668 presented to the AGU Fall Meeting, San Francisco, CA.

Wei, L., Cook, A. and You, K., 2020, Methane Migration Mechanisms for the GC955 Gas Hydrate Reservoir, Northern Gulf of Mexico. Abstract OS029-0008. AGU 2020 Fall Meeting

Worman, S. and, Flemings, P.B., 2016, Genesis of Methane Hydrate in Coarse-Grained Systems: Northern Gulf of Mexico Slope (GOM^2). Poster presented at The University of Texas at Austin, GeoFluids Consortia Meeting, Austin, TX.

Yang, C., Cook, A., & Sawyer, D., 2016, Geophysical interpretation of the gas hydrate reservoir system at the Perdido Site, northern Gulf of Mexico. Presented at Gordon Research Conference, Galveston, TX, United States.

You, K., Thomas, C., Savage, A., Murphy, Z., O'Connell, J., Flemings, P.B., 2023, Dissolved methane diffusion drives hydrate-bearing pressure core degradation during long-term storage in water. Poster presented at International Gas Hydrates Conference (ICGH10). July 2023.

You, K., Portnov, A., Flemings, P.B., 2023, Methane dynamics associated with the thawing subsea permafrost since the Last Glacial maximum. Abstract ID 250. Oral talk presented at International Gas Hydrates Conference (ICGH10). July 2023.

You, K., Flemings, P.B. and DiCarlo, D., 2023, Thermal and Hydraulic Controls on Gas Production from Methane Hydrate Reservoirs. OS21B-1421. Poster presented at the Fall Meeting of the American Geophysical Union. December 2023.

You, K., Phillips, S., Flemings, P.B., Colwell, F.S., and Mikucki, J., 2022, Coarse-Grained Sediments are Potential Microbial Methane Factories in Marine Sediments. Presented at American Geophysical Union, Fall Meeting, Chicago, IL.

You, K., M. Santra, L. Summa, and P.B. Flemings, 2020, Impact of focused free gas flow and microbial methanogenesis kinetics on the formation and evolution of geological gas hydrate system, Abstract presented at 2020 AGU Fall Meeting, 1-17 Dec, Virtual

You, K., et al. 2020, Impact of Coupled Free Gas Flow and Microbial Methanogenesis on the Formation and Evolution of Concentrated Hydrate Deposits. Presented at the AAPG virtual Conference, Oct 1, Theme 9: Analysis of Natural Gas Hydrate Systems I & II

You, K., Flemings, P. B., and Santra, M., 2018, Formation of lithology-dependent hydrate distribution by capillary-controlled gas flow sourced from faults. Poster presented at American Geophysical Union, Fall Meeting, Washington, D.C. OS31F-1864

You, K., and Flemings, P. B., 2018, Methane Hydrate Formation in Thick Marine Sands by Free Gas Flow. Presented at Gordon Research Conference on Gas Hydrate, Galveston, TX. Feb 24- Mar 02, 2018.

You, K., Flemings, P.B., 2016, Methane Hydrate Formation in Thick Sand Reservoirs: Long-range Gas Transport or Short-range Methane Diffusion? Presented at American Geophysical Union, Fall Meeting, San Francisco, CA.

You, K.Y., DiCarlo, D. & Flemings, P.B., 2015, Quantifying methane hydrate formation in gas-rich environments using the method of characteristics. Abstract OS23B-2005 presented at 2015, Fall Meeting, AGU, San Francisco, CA, 14-18 Dec.

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2.3 Proceeding of the UT-GOM2-1 Hydrate Pressure Coring Expedition

Volume contents are published on the UT-GOM2-1 Expedition website and on OSTI.gov.

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2.3.2 Prospectus

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2.4 Proceeding of the UT-GOM2-2 Hydrate Coring Expedition

Volume contents will be published on the UT-GOM2-2 Expedition Proceedings website and on OSTI.gov.

2.4.1 Prospectus

Peter Flemings, Carla Thomas, Tim Collett, Fredrick Colwell, Ann Cook, John Germaine, Melanie Holland, Jesse Houghton, Joel Johnson, Alberto Malinverno, Kevin Meazell, Tom Pettigrew, Steve Phillips, Alexey Portnov, Aaron Price, Manasij Santra, Peter Schultheiss, Evan Solomon, Kehua You, UT-GOM2-2 Prospectus: Science and Sample Distribution Plan, Austin, TX (University of Texas Institute for Geophysics, TX). http://dx.doi.org/10.2172/1827729, 141 p.

2.4.2 Preliminary Report

Peter B. Flemings, Carla Thomas, Stephen C. Phillips, Timothy S. Collett, Ann E. Cook, Evan Solomon, Frederick S. Colwell, Joel E. Johnson, David Awwiller, Irita Aylward, Athma R. Bhandari, Donald Brooks, Alejandro Cardona, Michael Casso, Rachel Coyte, Tom Darrah, Marcy Davis, Brandon Dugan, Dan Duncan, John T. Germaine, Melanie Holland, Jesse Houghton, N. Tanner Mills, Michael Mimitz, Daniel Minarich, Yuki Morono, Zachary Murphy, Joshua O'Connell, Ethan Petrou, Tom Pettigrew, John W. Pohlman, Alexey Portnov, Marcie Purkey Phillips, Thomas Redd, Derek E. Sawyer, Peter Schultheiss, Kelly Shannon, Camille Sullivan, Cathal Small, Kayla Tozier, Man-Yin Tsang, Camila Van Der Maal, William F. Waite, Taylor Walton, 2024, UT-GOM2-2 Preliminary Report Terrebonne Basin Northern Gulf of Mexico, The University of Texas Institute for Geophysics, https://doi.org/10.5281/zenodo.13648253

2.5 Websites

- Project Website:

https://ig.utexas.edu/energy/genesis-of-methane-hydrate-in-coarse-grained-systems/

- UT-GOM2-2 Expedition Website

https://ig.utexas.edu/energy/gom2-methane-hydrates-at-the-university-of-texas/gom2-2-expedition/

- UT-GOM2-1 Expedition Website:

https://ig.utexas.edu/energy/genesis-of-methane-hydrate-in-coarse-grained-systems/expedition-ut-gom2-1/

- Project SharePoint:

https://sps.austin.utexas.edu/sites/GEOMech/doehd/teams/

- Methane Hydrate: Fire, Ice, and Huge Quantities of Potential Energy:

https://www.youtube.com/watch?v=f1G302BBX9w

- Fueling the Future: The Search for Methane Hydrate:

https://www.youtube.com/watch?v=z1dFc-fdah4

- Pressure Coring Tool Development Video:

https://www.youtube.com/watch?v=DXseEbKp5Ak&t=154s

2.6 Technologies Or Techniques

Nothing to report.

2.7 Inventions, Patent Applications, and/or Licenses

Nothing to report.

3 CHANGES/PROBLEMS

3.1 Changes In Approach And Reasons For Change

None.

3.2 Actual Or Anticipated Problems Or Delays And Actions Or Plans To Resolve Them

Budget Period 6 (BP6) is scheduled to end on September 30, 2025. Project leadership has determined that *UT-GOM2-2 Core Analysis* (Task 17.0) and *Project Data Analysis and Reporting* (Task 18.0) cannot be completed within this timeframe due to delays resulting from the 2023 UT-GOM2-2 Hydrate Coring Program. To ensure the successful completion of these critical tasks, we will request a no-cost extension of BP6.

The UT-GOM2-2 Hydrate Coring Program (Task 16.0) was scheduled to occur in early spring 2023. However, the preparation and certification of the Helix *Q4000* multi-service vessel experienced multiple compounding delays. As a result, UT-GOM2-2 field operations did not commence until August 2023 and conclude until September 2023. The resulting schedule shifts have caused cascading impacts affecting the timeline for post-expedition scientific analysis of core samples and data, collaborations, and publications.

Together, Task 17.0 and Task 18.0 represent the final culmination of the of the DE-FE0023919 project, capping 10 years of technology development and scientific research. A no-cost extension of BP6 will help to ensure that Task 17.0 and Task 18.0 are completed to their full measure.

3.3 Changes That Have A Significant Impact On Expenditures

None.

3.4 Change Of Primary Performance Site Location From That Originally Proposed

None.

4 SPECIAL REPORTING REQUIREMENTS

4.1 Current Project Period

Task 1.0 – Revised Project Management Plan

Subtask 18.1 – Project Sample and Data Distribution Plan

Subtask 18.3 – UT-GOM2-2 Scientific Drilling Program Scientific Results Volume

4.2 Future Project Periods

None.

5 BUDGETARY INFORMATION

The Budget Period 6 cost summary is provided in Table 5-1.

Table 5-1. Phase 6 / Budget Period 6 Cost Profile

Baseline Reporting Quarter	Budget Period 6							
	Y1Q1		Y1Q2		Y1Q3		Y1Q4	
	11/16/23-12/31/23		01/01/24-03/31/24		04/01/24-06/30/24		07/01/24-09/30/24	
	Y1Q1	Cumulative Total	Y1Q2	Cumulative Total	Y1Q3	Cumulative Total	Y1Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 555,325	$ 71,091,055	$ 471,086	$ 71,562,141	$ 456,085	$ 72,018,226	$ 456,085	$ 72,474,312
Non-Federal Share	$ 282,554	$ 32,363,632	$ 271,503	$ 32,635,135	$ 269,534	$ 32,904,669	$ 269,535	$ 33,174,204
Total Planned	$ 837,880	$ 103,454,687	$ 742,590	$ 104,197,276	$ 725,619	$ 104,922,895	$ 725,620	$ 105,648,516
Actual Incurred Cost								
Federal Share	$ 2,871,720	$ 70,588,076	$ 391,191	$ 70,979,267	$ 407,450	$ 71,386,716	$ 370,446	$ 71,757,162
Non-Federal Share	$ 745,317	$ 34,398,513	$ 152,951	$ 34,551,464	$ 160,980	$ 34,712,444	$ 130,874	$ 34,843,318
Total Incurred Cost	$ 3,617,037	$ 104,986,589	$ 544,142	$ 105,530,731	$ 568,429	$ 106,099,160	$ 501,320	$ 106,600,480
Variance								
Federal Share	$ 2,316,395	$ (502,979)	$ (79,895)	$ (582,875)	$ (48,636)	$ (631,510)	$ (85,639)	$ (717,150)
Non-Federal Share	$ 462,762	$ 2,034,882	$ (118,552)	$ 1,916,330	$ (108,554)	$ 1,807,775	$ (138,662)	$ 1,669,114
Total Variance	$ 2,779,157	$ 1,531,902	$ (198,448)	$ 1,333,455	$ (157,190)	$ 1,176,265	$ (224,301)	$ 951,964
Baseline Reporting Quarter	**Budget Period 6**							
	Y2Q1		Y2Q2		Y2Q3		Y2Q4	
	10/01/24-12/31/24		01/01/25-03/31/25		04/01/25-06/30/25		07/01/25-09/30/25	
	Y2Q1	Cumulative Total	Y2Q2	Cumulative Total	Y2Q3	Cumulative Total	Y2Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 401,106	$ 72,875,417	$ 401,106	$ 73,276,523	$ 385,250	$ 73,661,774	$ 385,250	$ 74,047,024
Non-Federal Share	$ 218,494	$ 33,392,698	$ 218,494	$ 33,611,191	$ 216,156	$ 33,827,347	$ 216,156	$ 34,043,503
Total Planned	$ 619,599	$ 106,268,115	$ 619,599	$ 106,887,715	$ 601,406	$ 107,489,121	$ 601,406	$ 108,090,527
Actual Incurred Cost								
Federal Share	$ 512,470	$ 72,269,632		$ 72,269,632		$ 72,269,632		$ 72,269,632
Non-Federal Share	$ 153,103	$ 34,996,421		$ 34,996,421		$ 34,996,421		$ 34,996,421
Total Incurred Cost	$ 665,573	$ 107,266,053	$ -	$ 107,266,053	$ -	$ 107,266,053	$ -	$ 107,266,053
Variance								
Federal Share	$ 111,364	$ (605,786)						
Non-Federal Share	$ (65,390)	$ 1,603,723						
Total Variance	$ 45,973	$ 997,937						

6 ACRONYMS

Table 7-1. List of Acronyms

ACRONYM	DEFINITION
AAPG	American Association of Petroleum Geologists
AGU	American Geophysical Union
AOM	Anaerobic Oxidation of Methane
BOEM	Bureau of Ocean Energy Management
BSR	Bottom-Simulating Reflector
BSEE	Bureau of Safety and Environmental Enforcement
CPP	Complimentary Project Proposal
CT	Computed Tomography
DNA	Deoxyribonucleic Acid
DOE	U.S. Department of Energy
GC	Green Canyon
ICP-MS	Inductively Coupled Plasma Mass Spectrometry
IODP	International Ocean Discovery Program
LWD	Logging While Drilling
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NMT	New Mexico Tech
OSR	Organoclastic Sulfate Reduction
OSTI	Office of Scientific and Technical Information
OSU	The Ohio State University
PCATS	Pressure Core Analysis and Transfer System
PCC	Pressure Core Center
PCTB	Pressure Core Tool with Ball Valve
PI	Principle Investigator
PM	Project Manager
PMP	Project Management Plan
PMRS	Pressure Maintenance and Relief System
QRPPR	Quarterly Research Performance and Progress Report
RPPR	Research Performance and Progress Report
SEM	Scanning Electron Microscope
SOPO	Statement of Project Objectives
UNH	University of New Hampshire
USGS	United States Geological Survey
UT	University of Texas at Austin
UW	University of Washington
WR	Walker Ridge
XCT	X-ray Computed Tomography

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