

Oil & Natural Gas Technology

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Quarterly Research Performance Progress Report (Period ending 12/31/2012)

Measurement and Interpretation of Seismic Velocities and Attenuations
in Hydrate-Bearing Sediments

Project Period (10/1/2012 to 9/30/2015)

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Abstract:

Measurement and Interpretation of Seismic Velocities and Attenuations
in Hydrate-Bearing Sediments

Grant/Cooperative Agreement DE-FE 0009963.

This project is now underway and making steady progress.

- The Project Management Plan (PMP) was written and approved
- Appropriate staff recruited
- Components for the upgrade of the low frequency system were specified and ordered.
- A website for information and data transmittal was established
- Calibration of the micro CT scanner has begun.

The PMP was drafted largely from the proposal material and accepted. The primary additions were more precise purchasing plans and costs and risk assessments of various aspects of the project.

Organizational sessions have already been conducted and the initial research plans are in place.

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Executive Summary:

Our project to measure the seismic attenuation and velocity as a function of texture and formation process is now underway. At this moment, our project has only been active for a couple of months, so most of our effort has been in planning and purchasing.

The first milestone was the completion and approval of the Project Management Plan (PMP). This plan more firmly established the roles played by researchers involved and provided a more precise cost plan for the upgrade of equipment.

Two graduate students have been recruited and are now directly involved in the hydrate measurements. Both students (Marisa Rydzy and Mandy Schindler) have made measurements on hydrates and hydrate-saturated rocks, so the training period will be short and efficient.

The low frequency system used to make velocity and attenuation measurements is in place, and the required upgrades are underway. Modifications include extending the internal environmental conditions to reach the methane hydrate stability field and improvement of the data acquisition system. In other words, pumps and chillers were ordered.

A separate page was developed on the Rock Physics website specifically for this hydrate project. Although all of the data collected can not be displayed (Gigabytes), highlights and significant results will be posted. The page is available at:
<http://crusher.mines.edu/CRA-DOE-Hydrates>

The Micro CT scanner is up and running. Calibration tests are being run in preparation for hydrate imaging.

Accomplishments

During these first couple of months, most of our time and effort has been used organizing the project, planning, and purchasing the required equipment. Our first milestone, the “Project Management Plan (PMP) was completed and approved by the Department of Energy staff. The organizational aspects are shown in Figure 1.

The risk management component was almost tested recently when the PI entered the hospital for major surgery. Fortunately (or unfortunately according to your opinion) the surgery is complete, tubes removed, and stitches out. The project continues to run smoothly.

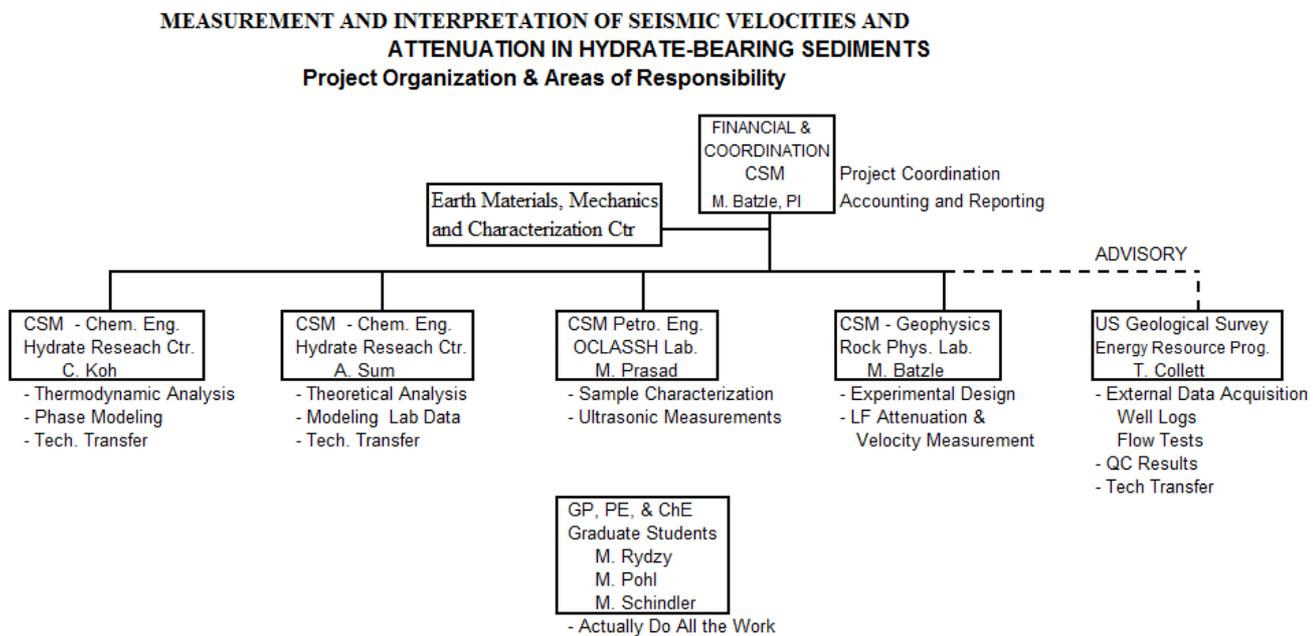


Figure 1. CSM staff involved with this hydrate project and the chain of responsibility.

Products

Our current products are mostly CT scans of sands and bead packs in preparation for hydrate growth characterization. An example of the table of runs made is included as Figure 2.

DOE Hydrate Project														
Marisa: (720)291-5185														
Mandy:														
Mathias:														
Micro X-Ray CT Samples Overview														
Sample	Batch	Host Sed	BaCl2	Student	Scan Date	Files	Comment	Objective Angle ±	ET [s]	No IM	V [keV]	P [W]	S [mm]	D [mm]
Prelim1	Jan8-15	GB 0.1	7 wt%	Marisa	1/17/2013	Prelim1_tomo1-6	Cooled with liquid Nitrogen	0.5 110	0.5	220	80	8	-55	58.9
Prelim2	Jan8-15	GB 0.1	7 wt%	Marisa	1/17/2013	Prelim2_tomo1-6	Cooled with dry ice	0.5 110	0.5	220	80	8	-55	58.9
Prelim3	Jan8-15	GB 0.1	7 wt%	Marisa	1/17/2013	Prelim3_tomo1-6	Cooled with liquid Nitrogen	0.5 110	0.5	220	80	8	-55	58.9
Prelim4	Jan8-15	GB 0.1	7 wt%	Marisa	1/17/2013	Prelim4_tomo1-6	Cooled with liquid Nitrogen	0.5 110	0.5	220	80	8	-55	58.9
Prelim5	Jan8-15	GB 0.1	7 wt%	Marisa	1/18/2013	Prelim5_tomo1-6	Cooled with dry ice	0.5 110	0.5	220	80	8	-55	58.9
Prelim6	Jan8-15	Qtz Sand	7 wt%	Marisa	1/18/2013			0.5 110	0.5	440	80	8	-55	58.9
Prelim7	Jan8-15	Qtz Sand	7 wt%	Marisa										
Prelim8	Jan8-15	Qtz Sand	7 wt%	Marisa										
Prelim9	Jan8-15	Qtz Sand	7 wt%	Marisa										
Prelim10	Jan8-15	Qtz Sand	7 wt%	Marisa										

Figure 2. Initial calibration images collected on the Micro-CT scanner as part of this project.

A web page was created to hold data and information associated with this project. The page is available at <http://crusher.mines.edu/CRA-DOE-Hydrates>.

Participants and Collaborating Organizations

Name: George Radziszewski

Project Role: Research Faculty

Nearest person month worked: 1

Contribution to Project: Dr. Radziszewski spent his time establishing standards and procedures for running the MicroCT scanner .

Funding Support: “Organics, Clays, Sands and Shales (OCLASSH) consortium

Collaborated with individual in foreign country: No

Country(ies) of foreign collaborator: N/A

Travelled to foreign country: No

If traveled to foreign country(ies):

Name: Marisa Rydzy

Project Role: Graduate Student

Nearest person month worked: 1

Contribution to Project: Ms. Rydzy assisted in design of high pressure low temperature equipment.

Additional Funding Support: N/A

Collaborated with individual in foreign country: No

Country(ies) of foreign collaborator: N/A

Travelled to foreign country: No

If traveled to foreign country(ies),

duration of stay: N/A

Name: Mandy Schindler

Project Role: Graduate Student

Nearest person month worked: 1

Contribution to Project: Ms. Schindler assisted in sample preparation
Additional Funding Support: N/A
Collaborated with individual in foreign country: No
Country(ies) of foreign collaborator: N/A
Travelled to foreign country: Yes
If traveled to foreign country(ies), (Germany)
duration of stay: 3 weeks

Name: Michael Batzle
Project Role: Principle Investigator
Nearest person month worked: 1
Contribution to Project: Overall (dis)organization.
Funding Support: Academic faculty
Collaborated with individual in foreign country: No
Country(ies) of foreign collaborator: N/A
Travelled to foreign country: N/A
If traveled to foreign country(ies):

External Collaborations:
Dr. Tim Collett
US Geologic Survey
Denver, Colorado: (if foreign location list country)
Support: Data and guidance on interpretation and application
Tim continues to publish numerous papers on hydrate properties
(see Collett and Lee, 2011)

Changes / Problems

The only significant change is the surgery the Principle Investigator undertook in December. According to the doctors, the PI should be up to 110% in March.

One of the graduate students currently working on the project plans to graduate soon. A replacement will need to be found, probably by Fall, 2013.

Special Reporting Requirements

None

Budgetary Information

Attached separately

References

Collett, T., Lee, M., 2011, Log Characterization of Natural Gas Hydrates; Paper I, SPWLA transactions, Houston Texas

Appendix 1

Milestone Status

Measurement and Interpretation of Seismic Velocities and Attenuations in Hydrate-Bearing Sediments
DOE Award No.: DE-FE 0009963

	Milestone Title / Description	Planned Completion Date	Actual Completion Date	Verification Method	Comments
1	Project Management Plan (PMP)	1-Dec-12	28-Nov-12	DOE acceptance	Complete and approved
2	Modifications to low frequency system	1-Jun-13			On schedule
3	Modeling established using EOS	31-May-13			On schedule
4	Property models of hydrates complete	31-May-13			On schedule
5	Logs acquired and database estab.	31-Dec-13			Planned
6	THF hydrate grown in pressure vessel	1-Jun-14			Planned
7	Methane hydrates from free gas phase	31-Dec-14			Planned
8	Methane hydrates from gas in solution	30-Jun-15			Planned
9	CO ₂ replacing methane in hydrates	30-Sep-15			Planned
10	MXCT scans completed	30-Sep-15			Continuing
11	Effective media models complete	30-Sep-15			Planned
12	Comparison to in situ data complete	15-Oct-15			Planned
13	Information Dissemination	31-Dec-15			Continuing