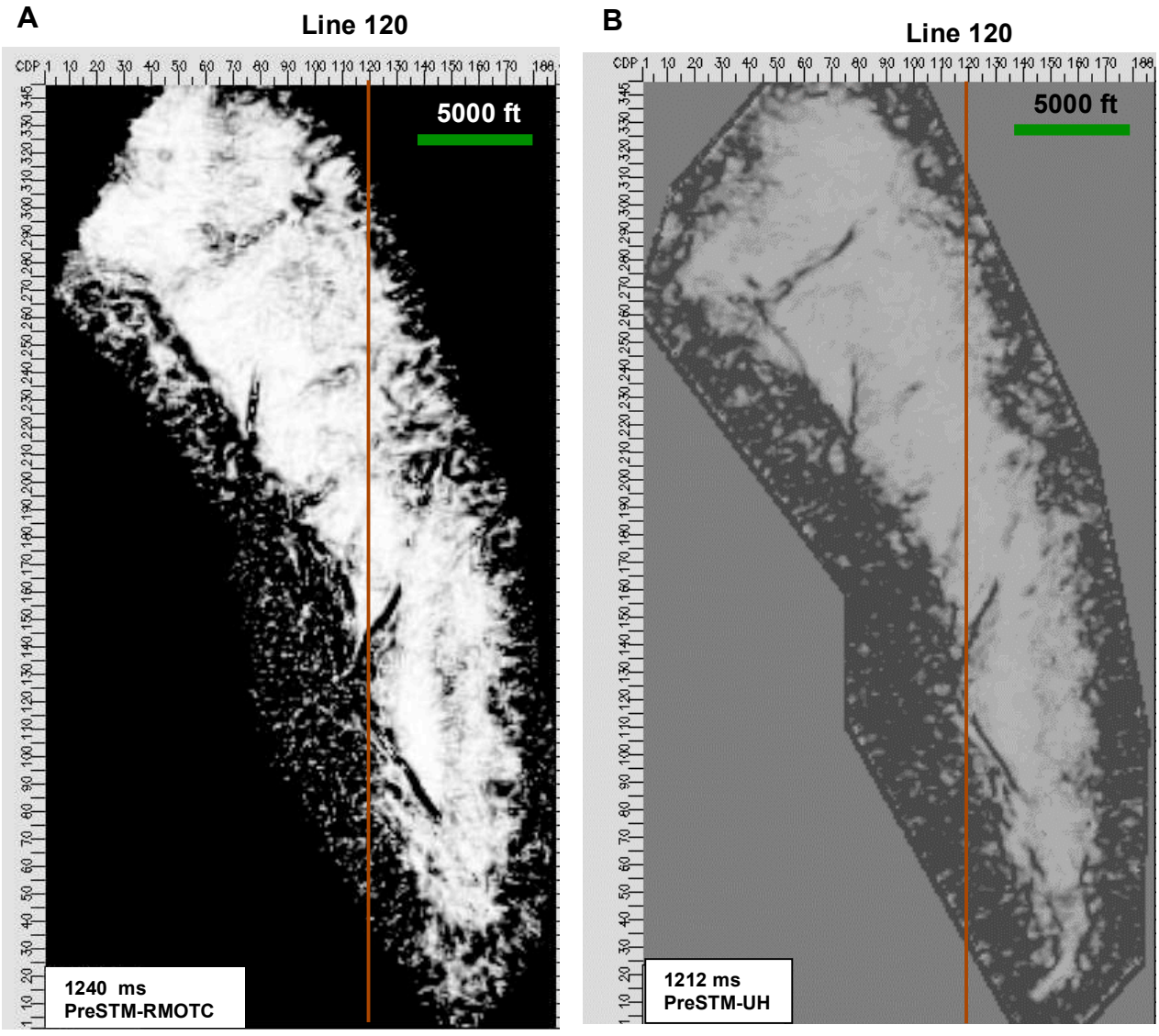

Figure 13. Coherence time slices near top granite basement extracted from UH processed and commercially processed (RMOTC data) prestack time migration volumes. **A.** Time slice from RMOTC seismic volume. **B.** Time slice from UH seismic volume. *Faults:* red. Because of different processing seismic datums, TWT values are not exactly correlative between UH and RMOTC volumes. See Figure 2 for seismic section along Line 120 and locations of slices.

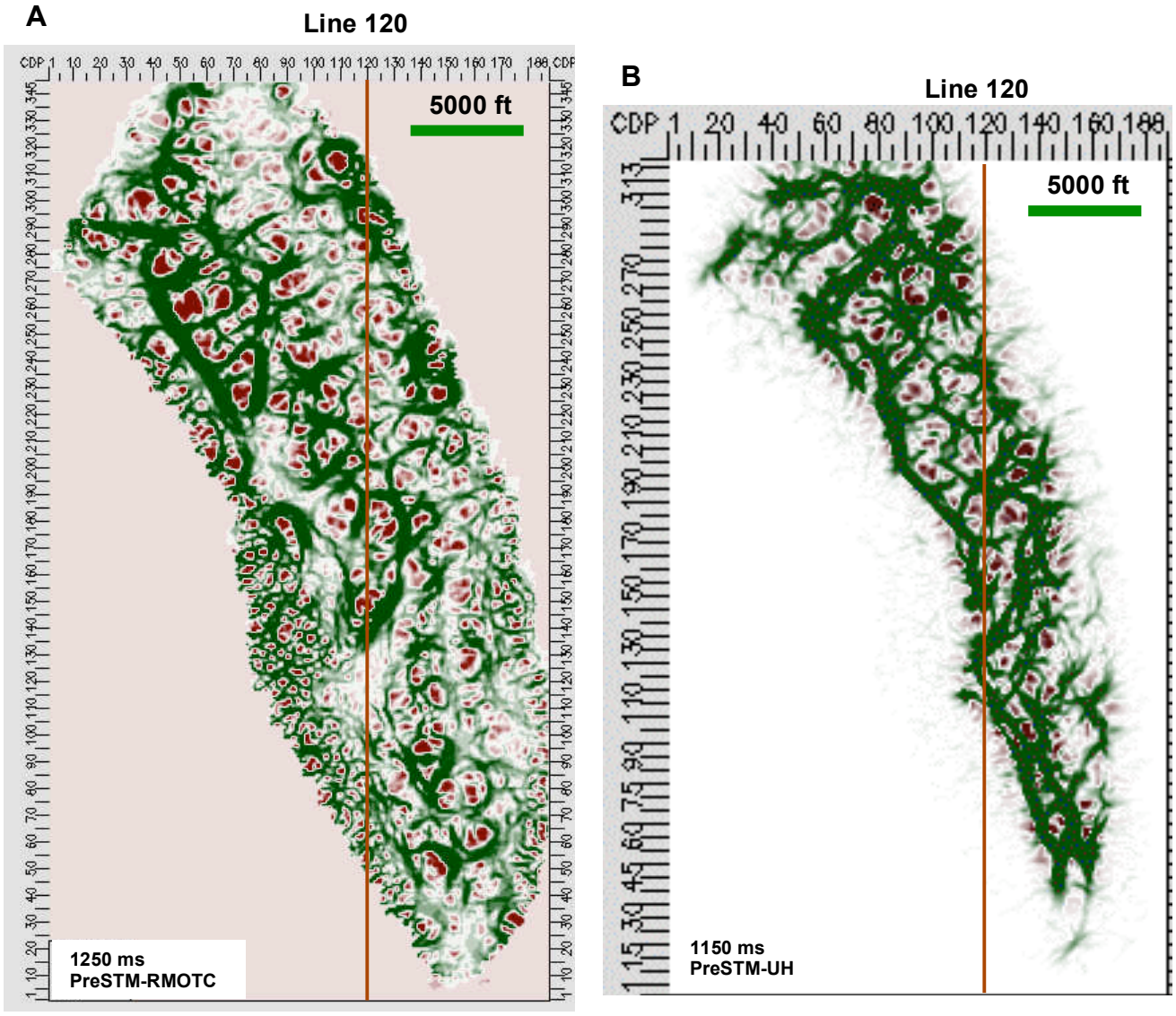

Figure 14. Most positive curvature time slices near top granite basement extracted from UH processed and commercially processed (RMOTC data) prestack time migration volumes. **A.** Time slice from RMOTC seismic volume. **B.** Time slice from UH seismic volume. *Faults:* red. Because of different processing seismic datums, TWT values are not exactly correlative between UH and RMOTC volumes. See Figure 2 for seismic section along Line 120 and locations of slices.

Dickman field: The late disbursement of DOE funding delayed work on Dickman field. When funds and personnel are available, we plan to carry out an impedance inversion of the prestack data and develop a 3-D model of the porosity and saturation distributions of the porous Mississippian reservoir.

Illinois Basin-Patoka and Sciota Fields: Work on Sciota and Patoka fields has been deferred pending completion of the migration of the prestack data at Patoka field. We plan to carry out impedance inversions of the data from both fields to determine if we can develop 3-D models of the porosity distribution of the Mt. Simon sandstone from the analysis of seismic attributes extracted from the inverted data volumes.

Task 4.0- Calibrate Seismic Attributes with Geological and Engineering Data

Dickman Field: The KGS continued work on log correlations and the digitization and quality control of logs in the original and expanded areas of the field. We have deferred work on the integration of seismic and well data pending inversion of the prestack migrated data volume.

Task 5.0-Validate Seismic Attribute Analyses Results

We have completed the reprocessing of the prestack seismic data for Dickman field (See **Subtask 2.2** above). Our sub-recipient, the Kansas Geological Survey, will carry out the major subtasks, which are to complete the construction of an integrated geomodel at Dickman field and to carry out a reservoir simulation of the field production history.

Subtask 5.1 Construct Integrated Geomodel of Dickman Field, Kansas

Our goal is to validate the results of seismic attribute analyses with a reservoir simulation of the pressure and production history of the field. A necessary requirement to achieve this goal is the construction of an integrated geomodel. The following summarizes our state-of-the-knowledge geomodel for Dickman field.

1. A small structural closure has localized an oil accumulation in the porous Mississippian dolomites, which has an OWC at about -1980 feet subsea and an oil column of about 35 feet.
2. The porous Mississippian saline aquifer underlying the oil accumulation ranges from 200 to 300 feet thick and is a CO2 sequestration target in the Mid-Continent area.
3. The contact between the porous Mississippian and the overlying seal (Pennsylvanian shale and conglomerates of the Cherokee Group) is a karst surface and a slight angular unconformity, which dips to the west.
4. Fractures in the porous Mississippian are aligned N45E and N45W, and the two fracture trends formed at different times. Geologic and production data suggest that the northeast-trending fractures are clay and silt-filled and closed while the northwest-trending fractures are open and form conduits for water to move from the underlying aquifer into the oil zone.

5. Basal Pennsylvanian conglomerates were deposited in the topographically low areas on the Mississippian unconformity. The distribution of the thickest conglomerates may correlate with the distribution of closed fractures.

Important missing pieces of the geomodel are the 3-D distributions of porosity and fractures in the porous Mississippian carbonates. To obtain the porosity distribution, we plan to correlate porosities derived from well logs with the seismic impedance data generated from the reprocessed seismic data. We plan to further assess our field fracture model with attribute maps extracted from the impedance volume of the entire survey area.

CONCLUSIONS

Teapot Dome Field:

1. Seismic profiles from the UH reprocessed prestack seismic volumes compared to profiles from the previously available commercially processed seismic volume better illuminate the apparent south-dipping basement fault and other basement features and exhibit enhanced reflectors between high amplitude events in the sedimentary section. The UH reprocessed data may contain less high frequency data.

2. The resolution of extractions of time slices from the UH processed prestack seismic volumes is as good as or better than extractions from the previously available commercially processed volume with respect to the sharpness of delineation and the lateral continuity of structural features and attribute anomalies.

3. The depth of basement top in the 74-CMX-16 well correlates exactly with the UH depth migrated top basement seismic horizon. A better evaluation of the quality of the depth migration is dependent upon a comprehensive analysis of the relationships between geologic features on the depth migrated volume and well data constraints.

COST STATUS

Baseline Costs Compared to Actual Incurred Costs

July 1-Sept 30	Plan	Costs	
Federal	$34,132	$0	$34,132
Non-Federal	$13,248	$0	$13,248
Total	$47,380	$0	$47,380

Table 1. Forecasted Cash Needs vs. Actual Incurred Costs

Analysis of Variance

For this report period, UH did not receive a second increment of funding from the DOE, which would have covered the report period, and had no funds remaining from the first increment disbursement of the DOE award to carry out project work. UH provided

limited funding for salaries from interim sources, which will be reimbursed when DOE funds become available. The KU Research Center has not submitted a cost share amount for the period, because their cost share is contingent on receiving a share of DOE funds from UH. Several employee changes at Continental Resources of Illinois, Inc, our industry partner, continue to delay their participation in the project. We plan to meet with Continental Resources management during the next period.

MILESTONE PLAN AND STATUS

Specific Sub-Milestones for 2007

1. Complete prestack time migration of Patoka field seismic data by **December 31, 2007** (*Subtask 2.2)*.

2. Use Dickman field well log and core data to develop reservoir property dataset (Sw and porosities) for calibration and validation of seismic attributes by **December 31, 2007,** (*Task 4.0*).

3. Carryout impedance inversion of prestack time migrated seismic volume of Dickman field by **December 31, 2007** (*Task 4.0*).

Actual Progress Compared to Milestones

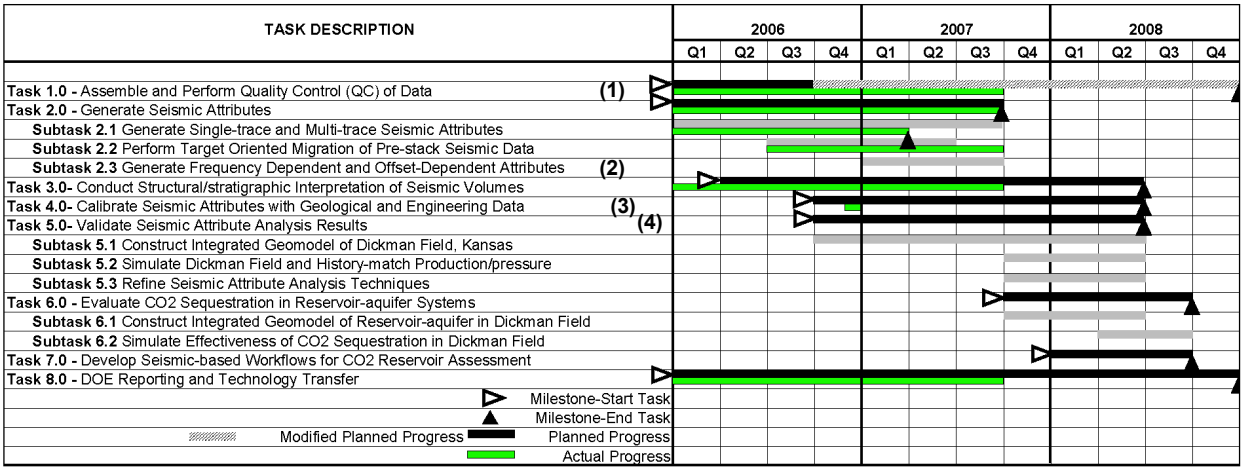

Table 2. Gantt chart

(1) QC of data will continue throughout project.
(2) Deferred pending evaluation of alternatives.
(3) Further work deferred until next period.
(4) Deferred until next period.

SUMMARY OF SIGNIFICANT ACCOMPLISHMENTS

1. We have successfully carried out 0-10 degree, 10-20 degree and 20-30 degree offset angle prestack time migrations and a whole-stack (0-45 degree) prestack time migration of the Dickman 3-D seismic data over the entire survey area. We can now carry out an impedance inversion in an area that contains modern well log data through the entire objective section.

2. We have completed prestack and post-stack Kirchhoff time migrations and depth migrations of the 3-D seismic data at Teapot Dome. Very few studies of prestack depth migrated land 3-D seismic surveys have been published in the United States, and we are not aware any studies of advanced seismic attribute volumes extracted from prestack depth migrations of 3-D land data that have been published. Successful inversion of the reprocessed seismic volumes and integration with well data will provide a unique dataset to develop a structurally and stratigraphically integrated geomodel of the Teapot Dome Tensleep reservoir for reservoir simulation tests in the future.

ACTUAL OR ANTICIPATED PROBLEMS AND SIGNIFICANT EVENTS

1. At the end of this period, the University of Houston had no funds available to continue work on the project. We had spent or committed all of the $172,000 first increment of DOE funding and $50,000 of interim funding provided by the Department of Geosciences of the University of Houston to allow the project work to continue. This delay in DOE funding placed the Department in serious financial jeopardy and could adversely affect existing academic programs. During the next period, we will review the need to adjust project milestones to reflect this budget shortfall and the resulting cutback in research efforts.

2. Several key employees of our industry partner, **Continental Resources of Illinois**, have resigned since the beginning of this project. These resignations have adversely affected the capability of **Continental** to consult on the project. **Continental's** management has repeatedly assured us that they intend to meet their in-kind contribution commitment over the three-year period of the project, but their follow-through has not been satisfactory. We plan to meet with Continental Resources management during the next period to resolve this problem.

3. Oklahoma University has offered Dr. Kurt Marfurt a Chaired Professorship, and Dr. Marfurt has resigned as co-P.I. of the project to accept this position. Dr. Marfurt will be available during a transition period to consult on project technical matters. He will remain on the faculty at the University of Houston as an adjunct professor so that he can actively supervise graduate students involved with project.

TECHNOLOGY TRANSFER ACTIVITIES

Publication:

Ramaker, B. J., 2007, Type log showing stratigraphic horizons for Ness County, Kansas, Kansas Geological Survey, open File Report 2007-16.

Presentation:

Perez, G., Marfurt, K. J. and Nissen, S., 2007, *Abstract*, Azimuthal binning for improved fracture delineation, SEG, San Antonio, Annual Meeting, 26, 931.

Other:

We will make the results of the research available on the KU CO2 sequestration studies website and the CAGE website at UH.

CONTRIBUTORS

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