Report Title

“T-R Cycle Characterization and Imaging: Advanced Diagnostic Methodology for Petroleum Reservoir and Trap Detection and Delineation”

Type of Report

First Quarterly Progress Report for Year 2

Reporting Period Start Date

September 1, 2004

Reporting Period End Date

November 30, 2004

Principal Author

Ernest A. Mancini (205/348-4319)
Department of Geological Sciences
Box 870338
202 Bevill Building
University of Alabama
Tuscaloosa, AL 35487-0338

Date Report was Issued

December 1, 2004

DOE Award Number

DE-FC26-03NT15395

Name and Address of Participants

Ernest A. Mancini
Dept. of Geological Sciences
Box 870338
Tuscaloosa, AL 35487-0338

William C. Parcell
Department of Geology
Wichita State University
Wichita, KS 67260

Bruce S. Hart
Earth & Planetary Sciences
McGill University
Montreal, CANADA

Disclaimer

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Abstract

The principal research effort for Year 2 of the project is on stratigraphic model assessment and development. The research focus for the first six (6) months of Year 2 is on T-R cycle model development. The emphasis for the remainder of the year is on assessing the depositional model and developing a sequence stratigraphy model. Outcrop study and data integration will continue throughout Year 2.

TABLE OF CONTENTS

	Page
Title Page	i
Disclaimer	ii
Abstract	iii
Table of Contents	iv
Introduction	1
Executive Summary	1
Project Objectives	1
Experimental	1
Work Accomplished	1
Work Planned	2
Results and Discussion	2
Conclusions	2
References	2

“T-R Cycle Characterization and Imaging: Advanced Diagnostic Methodology for Petroleum Reservoir and Trap Detection and Delineation”

First Quarter Report for Year 2
September 1, 2004–November 30, 2004

Introduction

The University of Alabama, Wichita State University and McGill University have undertaken a cooperative 3-year research project involving the characterization and modeling of transgressive-regressive (T-R) cycles to facilitate exploration for underdeveloped and undiscovered petroleum resources associated with stratigraphic traps and with specific facies in continental and coastal geologic systems that have reservoir potential.

Executive Summary

The principal research effort for Year 2 of the project is on stratigraphic model assessment and development. The research focus for the first six (6) months of Year 2 is on T-R cycle model development. The emphasis for the remainder of the year is on assessing the depositional model and developing a sequence stratigraphy model. Outcrop study and data integration will continue throughout Year 2.

Project Objectives

The objectives of the project are to develop through T-R cycle characterization and modeling a sequence stratigraphic predictive model that can be used for improved petroleum trap and reservoir imaging, detection and delineation by using the characteristics and geometries of T-R cycle units and their associated bounding surfaces to provide a reliable and advanced approach for targeting stratigraphic traps and specific reservoir facies associated with continental and coastal plain geologic systems and to demonstrate the importance of using the concept of T-R cycles in the formulation of advanced exploration strategies in the search for underdeveloped and undiscovered petroleum resources associated with subtle stratigraphic traps and with specific continental and coastal plain reservoir facies.

Experimental

Work Accomplished

Outcrop Study—Surface exposures in the Gulf Coastal Plain were revisited to examine specific physical surfaces, such as subaerial unconformities, transgressive surfaces, and surfaces of maximum regression (Table 1).

Data Integration—Integration of the data into an electronic database continues.

T-R Cycle Model Development—The development of a T-R cycle model based on the characterization data and analysis has been initiated. This model is based on changes in stratigraphic base level. In the model, sea level is held constant and sediment supply and tectonics (subsidence) are the variables used to assess the creation of accommodation space, times of sediment deposition and accumulation, and times of erosion by varying the sediment surface in relation to stratigraphic base level. Stratigraphic base level, sea level, and the sediment surface intersect at the shoreline in this model.

Work Planned

Outcrop Study—The study of outcrops in the Gulf Coastal Plain and in Wyoming and Montana will continue.

Data Integration—Data integration will continue.

T-R Cycle Model Development—The development of a T-R cycle model will continue.

Depositional Sequence Model Assessment—The assessment of the existing depositional sequence model will be initiated.

Results and Discussion

The University plans to hire an individual with seismic and sequence stratigraphic experience to work on the project to replace George Puckett in January 2005.

Conclusions

The project work is on schedule.

References

- Mancini, Ernest A., 2000, Sequence stratigraphy and chronostratigraphy of Upper Eocene and Lower Oligocene strata, eastern Gulf Coastal Plain, Gulf Coast Association of Geological Societies Trans. 50:379-388.
- Mancini, Ernest A., and Parcell, W.C., 2001, Outcrop analogs for reservoir characterization and modeling of Smackover microbial reefs in the northeastern Gulf of Mexico area, Gulf Coast Association of Geological Societies Trans. 51: 207-228.
- Mancini, Ernest A., and Puckett, T.M., 2000, Sequence stratigraphy and petroleum potential of Lower Cretaceous strata, Mississippi Interior Salt Basin, Gulf Coast Association of Geological Societies Trans. 50:351-360.
- Mancini, Ernest A., and Puckett, T.M., 2002, Transgressive-regressive cycles: application to petroleum exploration for hydrocarbons associated with Cretaceous shelf carbonates and coastal and fluvial-deltaic siliciclastics, northeastern Gulf of Mexico, Sequence Stratigraphic Models for Exploration and Production: Evolving Methodology, Emerging Models

- and Application Case Histories: Proceedings of the 22nd Annual Research Conference, Gulf Coast Section, SEPM Foundation, (in press).
- Mancini, Ernest A., and Puckett, T.M., 2002, Transgressive-regressive cycles in Lower Cretaceous strata, Mississippi Interior Salt Basin area of the northeastern Gulf of Mexico, *Cretaceous Research* (in press).
- Mancini, Ernest A., Puckett, T. Markham, and Tew, Berry H., 1996, Integrated biostratigraphic and sequence stratigraphic framework for Upper Cretaceous strata of the eastern Gulf Coastal Plain, USA, *Cretaceous Research* 17:645-669.
- Mancini, Ernest A., Puckett, T. Markham, Tew, Berry H., and Smith, Charles C., 1995, Upper Cretaceous sequence stratigraphy of the Mississippi-Alabama area, *Gulf Coast Assoc. Geol. Socs. Trans.* 45:377-384.
- Mancini, Ernest A., and Tew, Berry H., 1988, Paleocene sequence stratigraphy of southwestern Alabama, *Gulf Coast Assoc. Geol. Socs. Trans.* 38:453-460.
- Mancini, Ernest A., and Tew, Berry H., 1990, Relationships of Paleogene stage boundaries to group and unconformity-bounded depositional sequence contacts in Alabama and Mississippi, *in* Sequence Stratigraphy as an Exploration Tool: Concepts and Practices in the Gulf Coast, Proceedings of the 11th Ann. GCS-SEPM Research Conf., p. 221-228.
- Mancini, Ernest A., and Tew, Berry H., 1991, Relationships of Paleogene stage and planktonic foraminiferal zone boundaries to lithostratigraphic and allostratigraphic contacts in the eastern Gulf Coastal Plain, *Jour. Foraminiferal Research* 21:48-66.
- Mancini, Ernest A., and Tew, Berry H., 1993, Eustasy versus subsidence: Lower Paleocene depositional sequences from southern Alabama, eastern Gulf Coastal Plain, *Geological Society of America Bull.* 105:3-17.
- Mancini, Ernest A., and Tew, Berry H., 1994, Integrated biostratigraphic and sequence stratigraphic approach for intrabasin and interbasin correlations: Upper Cretaceous and Paleogene strata of the eastern Gulf Coastal Plain, USA, *in* Application of Sequence Stratigraphy to Oil Field Development, AAPG Hedberg Research Conference, p. M1-M5.
- Mancini, Ernest A., and Tew, Berry H., 1995, Geochronology, biostratigraphy and sequence stratigraphy of a marginal marine to marine shelf stratigraphic succession: upper Paleocene and lower Eocene, Wilcox Group, eastern Gulf Coastal Plain, USA, *SEPM Special Publication* 54, p. 281-293.
- Mancini, Ernest A., and Tew, Berry H., 1997, Recognition of maximum flooding events in mixed siliciclastic-carbonate systems: key to global chronostratigraphic correlation, *Geology* 25:351-354.
- Mancini, Ernest A., Tew, Berry H., and Mink, Robert M., 1990, Jurassic sequence stratigraphy in the Mississippi interior salt basin, *Gulf Coast Assoc. Geol. Socs. Trans.* 40:521-529.

- Mancini, Ernest A., Tew, Berry H., and Mink, Robert M., 1993, Petroleum source rock potential of Mesozoic condensed section deposits of southwest Alabama, *in* Source Rocks in a Sequence Stratigraphic Framework, Am. Assoc. Petroleum Geologists Studies in Geology No. 37, p. 147-162.
- Mancini, Ernest A., Tew, Berry H. and Puckett, T. Markham, 1996, Comparison of Upper Cretaceous and Paleogene depositional sequences, Gulf Coast Assoc. Geol. Socs. Trans. 46:281-286.
- Puckett, T. Markham, and Mancini, Ernest A., 2000, Microfossil characteristics of systems tracts in the Upper Cretaceous deposits of Mississippi and Alabama, Gulf Coast Association of Geological Societies Trans. 50:389-398.
- Tew, Berry H., and Mancini, Ernest A., 1992, An integrated lithostratigraphic, biostratigraphic, and sequence stratigraphic approach to paleogeographic reconstruction: examples from the Upper Eocene and lower Oligocene of Alabama and Mississippi, Gulf Coast Assoc. Geol. Socs. Trans. 42:735-756.

Table 1
Milestone Chart—Year 2