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

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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.

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

Third Quarter Report for Year 2
March 1, 2005 – May 31, 2005

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—Final preparations to study outcrops in Montana and Wyoming in June have been made (Table 1).

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

T-R Cycle Model Development—The development of a T-R sequence model based on the characterization data and analysis has been completed.

Depositional Sequence Model Assessment—The assessment of the existing depositional sequence model has been completed. The T-R cycle model and depositional sequence model have been compared (Figure 1).

Work Planned

Outcrop Study—Study of outcrops in Wyoming and Montana will be completed.

Data Integration—Data integration will continue.

Sequence Stratigraphy Model—The development of a sequence stratigraphy model based on the T-R model and depositional sequence model will begin.

Results and Discussion

Juan Carlos Llinas has left the University to work for an oil company. Brian Panetta is now working on the project.

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

Depositional Sequence	T-R Sequence	
	—SMR—	—SB—
Incised Valley Fill/ Lowstand System Tract (deepwater)	Forestepping Section	Regressive Systems Tract
—SB—		
Highstand Systems Tract	Infilling Section	
—MFS—	—SMT—	
Transgressive Systems Tract	Backstepping Section	Transgressive Systems Tract
—RS/TS—	—RS/TS—	
?Lowstand Systems Tract (nonmarine)	Aggrading Section	
—SB—	—SA—	—SB—

Figure 1. Comparison of transgressive-regressive sequence terminology to depositional sequence terminology.