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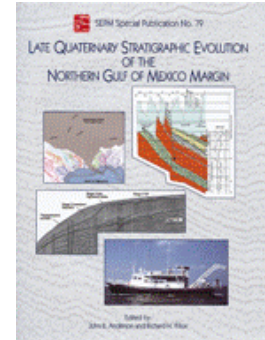
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Late Quaternary Stratigraphic Evolution of the Northern Gulf of Mexico Margin, edited by John B. Anderson & Richard H. Fillon, 2004. SEPM Special Publication 79. Society for Sedimentary Geology (SEPM), 6128 East 38th Street, Suite 308, Tulsa, OK 74135, USA. Hardcover, 311 pages. Price USD 135.00 (SEPM members USD 97.00; SEPM student members USD 68.00). ISBN 1-56576-088-3.



Seismic stratigraphy is now the main approach to the Late Quaternary stratigraphy of the Gulf of Mexico, as made clear in this book. All 12 chapters are nicely cover detailed studies of a broad range of geographic features of the Northern Gulf of Mexico. The book may be considered as a comprehensive answer to the questions: (1) why seismic stratigraphy, and (2) why just the Late Quaternary of the Gulf of Mexico?

It is one of the most comprehensive books written in the past few years on this subject. It is not hard to predict that it also will be among the most influential books in comparative sequence stratigraphy in this decade, together with the book by Catuneanu (2006) on sequence-stratigraphic principles. There are at least three reasons for this judgement. The first is that the book takes on the most important challenge of sequence stratigrapher today, namely the cross reference of the various sequence packages. This might well be the basis for reliable application in an offshore environment. Secondly, all essential concepts of the sequence phenomenon are presented, both on a pure seismic stratigraphic level and in outstanding comparisons with conventional stratigraphic methods. In the third place, the book is written from a regional perspective; approaches to major regional depositional geometries and topographic features of the Northern Gulf of Mexico Margin are presented in a novel, unifying way. It is therefore a source of knowledge and new insight for scientists and students on all aspects of stratigraphy of the study area.

The importance of the stratal architecture of Quaternary strata is clearly understood by the authors as the key paradigm of the sequence formation process.

This volume is particularly welcome because, in the authentic sense, sequence stratigraphy had its birth in studies of North America. Some forty years ago, it was Sloss (1963) who showed that the broad, inter-regional unconformities might potentially be divided into various recognizable stratigraphic packets (sequences). Peter Vail's further studies of sequence stratigraphy developed it into a powerful paradigm for the interpretation of sedimentary rocks (e.g., Vail et al., 1991), and his approach was widely accepted in the petroleum industry.

While other works deal in detail with the stratigraphy of the older deposits of North America (for example Witzke et al., 1996), John Anderson and colleagues show clearly what is the importance of the recognition of the late Quaternary sequence stratigraphic units, modified by the geographic features of the region.

One of the strengths of the volume is that the main part of most of the chapters is a multidisciplinary approach to the conventional seismic stratigraphic descriptions. This makes the book especially valuable for gathering a range of geologic expertise around such themes as stratigraphic evolution or the analysis of sedimentary environmental boundary conditions.

These chapters are a good starting point for a wider application of geological expert input in the classification of recent sediments.

The chapter on high-resolution stratigraphy of a sandy basin in Florida deals with the characterization of fluvial/deltaic sand deposits. In the absence of chronostratigraphic control, the authors dealt with the stratigraphic relationship of the structures to recognize the glacioeustatic cycles in the offshore Apalachicola, Florida. Detailed stratigraphic units were recognized based on approx. 500 km long high-resolution single-channel seismic data. An analysis of the morphology of the delta structures in the same glacioeustatic cycles gives an idea of the timing of the formation of the structures. The highstand to lowstand fluvial channels were localized west of the Apalachicola river. By applying the characteristic features of the stratigraphic structures of the area, three glacioeustatic cycles were identified.

Bart and Anderson studied the west Florida outer continental shelf using seismic stratigraphy. The studies yield a four-stage model for the evolution of the depositional basin during the last glacioeustatic cycle. The model shows how the deltaic system adjusted constructively to the falling sea level in the late Quaternary eustatic cycle. Following the development of the lowstand, the sea-level rise and shelf-edge prograding wedges were formed during the transgression of the sea. Finally, the late transgression evolved to an early highstand to develop the present depositional systems.

In studying the Late Quaternary geology of the NE Gulf of Mexico shelf, McBride and colleagues analysed cores recovered from 52 vibracores of various depth, ranging from 3 to 45 m. The most striking result of the study is the variation of the width of the shelf, which appears to range from 25 to 100 km. The study also differentiates five shoal complexes as well as sand sheets in the transgressive system tract bounded by an underlying transgressive surface and the overlying maximum flooding surface.

In dealing with sequence stratigraphy of the low-energy and low-supply environmental conditions that existed at the Pleistocene/Holocene boundary, the authors studied the seismic stratigraphy along 2,125 km offshore Alabama. In an attempt to develop a simple incised-valley model for the area, the authors tried to apply geomorphic principles as well as the internal architecture analysis of the structures, to provide a more realistic picture of the depositional boundary conditions. As the incised-valley fill contains large quantities of sandy deposits (which form potential aquifers/reservoirs of oil and gas), the significance of the investigation can't be overestimated.

By recognition of various seismic facies, the authors managed to provide an accurate ground for compilation of lithologic core data, Markov analysis and all available map data. Consequently, a model for the geomorphic response of the Mobile Incised Valley to base-level change developed. Further, the paleogeography of the study area was reconstructed, with special emphasis on the development of a shelf-edge system between late highstand and lowstand in a transgressive system.

The earlier suggested backstepping system for the study area could be confirmed with special reference to the punctuated nature of Holocene relative allocyclic (eustatic?) sea-level changes. A comparison of the proposed model for the development of the Mobile Incised Valley with the ancient analogues shows a number of similarities. Thus, this detailed study would provide a three-dimensional reference case for studies with less developed structures and field data.

Fillon et al. report on the paleobathymetry and late Quaternary depositional conditions in a case study of the shelf-to-slope transition in the Ancestral Mobile Riverdelta complex. The study focuses on the oxygen-isotope chronostratigraphy of benthic foraminiferal assemblages to reveal the relative sea-level changes responsible for the formation of the regional deltaic structures. The proposed stratal history analysis of the Lagniappe margin suggests that the best zone for reservoir development can shift landward and basinward with depth, a phenomenon not well documented in the cored sections of the Gulf of Mexico.

One of the other chapters of the book deals with the differentiation of factors that governed the deposition and evolution of the Brazos and Colorado deltas; this chapter is authored by Abdulah et al. The structures developed during the Late Quaternary have migrated across the

Texas continental shelf in response to the eustatic sea-level fluctuations, sediment supply and climate changes. The

biostratigraphic ages of the sediments are compared with the available tephra layers, radiocarbon dates and oxygen-isotope data; the thus obtained absolute date for the regional seismic horizons provide the tools for a comprehensive analysis of the late Quaternary history of the area. The study suggests that eustatic events were the major factor in the formation of the structures, whereas sediment changes in supply and climate were of less importance.

The last chapter of the book is devoted to the evolution of the storm-wave-dominated central Texas shelf. Eckles and coauthors studied the ideltaic region of the central Texas shelf, which has a characteristic ramp-like profile. The glacioeustatic sea-level changes had much impacts on the formation of the structures in the area. This was found through a high-resolution sequence-stratigraphic study that showed that the fourth-order (100,000 year) cycles are the primary mechanism. In contrast, autocyclic events are more important in the formation of the structures in the shelf areas north and south of the region. The proposed stratigraphic model for the central Texas shelf consists of highstand shoreface sands and muds as well as of transgressive muds on the inner shelf. As the only sand-prone facies, this suggests a unique strong influence of waves and marine currents on the depositional environment of the study area.

As this is an informative and up-to-date book on particularly the seismic stratigraphy of shallow margins of the Gulf of Mexico, many readers would be pleased to learn more about the stratigraphy of the various geographic localities. As a non-North American reader, however, it is a disappointment to recognize the lack of reference to the major European/Asian sequence-stratigraphic studies. Saying so, the volume contains numerous excellent multidisciplinary studies that might be considered as a good example of the lateral thinking method used for solving stratigraphic problems using seismics.

In summary, it is a pleasure to read the various chapters of this book. I believe that all stratigraphers will find some papers close to their personal interests. The book is especially valuable for researchers, as it can be used as a reference study that compares the various orders of sequence boundary surfaces with other conventional stratigraphic methods. Such a comparison, needless to emphasize, highlights the strength of seismic stratigraphy for recognizing the complicated tectonic/eustatic/sediment-supply events of the recent history of offshore and delta basins across the globe.

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