

AAPG Memoir 57 "Carbonate Sequence Stratigraphy"

edited by **Robert G. Loucks and J. Frederick Sarg**, published in 1993 by the American Association of Petroleum Geologists, ISBN 0-89181-336-5, 545 pages.

Review by Christopher G. Kendall

This book does not focus as heavily on seismic interpretations as AAPG memoir 58 on "Siliciclastic Sequence Stratigraphy" but does include some descriptions of the seismic response to carbonate deposition. The main emphasis of this text is on the principles which explain carbonate sedimentary relationships and their tie to relative sea level eustasy, tectonics and rates of sediment accumulation. The book provides a large variety of beautifully illustrated and well documented examples.

The first four chapters of the book examine how carbonate sequence stratigraphic relationships are tied to eustasy, tectonics and carbonate production. The first paper by Handford and Loucks provides a general description of carbonate depositional systems tracts for different carbonate settings. It is followed by a paper by Greenlee and Lehmann which discusses the nature of carbonate buildups and their relationship to sea level history, in particular suggesting that rapid sea level change and source rocks may be connected. They indicate that provided a carbonate buildup is isolated and drowned beneath the following transgression, their potential for hydrocarbon entrapment may be high.

This is followed by Zempolich's paper on Jurassic carbonates of the Venetian Alps of Italy which focuses on the development of the Ammonitico Rosso. This "drowning succession" of the western Venetian Alps and the demise of these carbonates is ascribed to excessive amounts of nutrient and organic matter with the accompanying establishment of oxygen deficient environments. Next is a paper entitled "the Tongue of the Ocean in the Bahamas" by Grammer, Ginsburg and Harris which investigates the response to high-amplitude/high-frequency fluctuations in sea level to concurrent carbonate deposition, diagenesis and failure of the carbonate slopes. It is followed by Brown and Loucks' paper on an investigation of the influence of carbonate sediment type and depositional processes on stratal patterns in the Permian basin-margin Lamar limestone of Texas. This paper emphasizes the variation in sea level and its affect on sediment supply downslope from the basin margin.

Then follow a series of papers which involve seismic interpretation, discussing such things as reciprocal lowstand clastic and highstand carbonate sedimentation and sedimentary cycles in mixed carbonate-siliciclastic systems from Devonian reef complex of the Canning Basin (Southgate et al., and Holmes and Christie-Blick), and the origin of Pennsylvanian seismic sequences and facies of the Eastern and Southern Horseshoe Atoll in Midland basin (White). A paper by Erlich, et al. continues the theme with a consideration of the response of carbonate platform margins to drowning and the evidence of environmental collapse. This paper considers examples from Baltimore Canyon and the offshore development of Miocene and carbonate platforms in the South China Sea close to the Pearl River Mouth Basin. The feeling of the authors is that this failure of the carbonate environment is the product of an over abundance of nutrients which adversely affected the rate of carbonate accumulation. This is thought to be related to the proximity of the prograding siliciclastics, combined with rapid tectonic subsidence and/or a rapid sea level rise.

Next is a paper by Saller et al. on the sequence stratigraphy of aggrading and backstepping carbonate shelves for the Oligocene section of the central Kalimantan in Indonesia. This is illustrated by clear cross-sections and one or two seismic lines. Then follows a paper on the sequence stratigraphy of Miocene carbonate buildups of the Jave Sea by Cucci and Clark. They illustrate their paper with a seismic line from the Kangean block of the east Java Sea. There

are a number of maps and cross-sections associated with the paper. Then follows a series of papers on outcrop studies from the Southern Great Basin in the middle to upper Cambrian rocks of the Bonanza King formation (Montanez and Osleger), the lower Mississippian Mission Canyon Formation from Montana and Idaho (Reid and Dorobek), the Middle Triassic of the Dolomites in Northern Italy (Goldhammer et al), the Miocene carbonates of Mallorca in Spain (Pomar), Miocene carbonate complexes of Southeastern Spain (Franseen et al), and the San Andres formation of Guadalupe Mountains in New Mexico Permian (Sonnenfeld and Cross). Then there is a paper on a comparison of the San Andres Permian formation with the Holocene Joulter's clay oolite complex by Harris, et al. followed by a paper on parasequence geometry as a control on permeability evolution for the San Andres Grayburg formations in the Guadalupe Mountains in New Mexico by Hovorka et al. Finally there is a paper by Mutti and Simo on the relationship between stratigraphic patterns and cycle-related diagenesis of upper Yates formation in Guadalupe Mountains.

This is an important book to carbonate sequence stratigraphers. I felt that the choice of papers was a little eclectic and was determined essentially by the authors following their own bent rather than editors setting rigid rules of style, papers topics or contents. No matter where its origins are, this has led to an important book which provides a clear insight into the effects of sea level, sedimentation and tectonics on the accumulation of carbonates. The immense range of carbonate terrains covered by this book are, in fact, what makes it so interesting. The standard of the line drawings in the text varied for some maps and diagrams, letters are smeared and there are breaks in lines. In some cases individual letters are filled so that it becomes hard to distinguish them. The scientific contribution of the book still remains high and a few examples of poor printing should not put the readers off from acquiring this text. Nevertheless, it is a shame that the reproductive quality of some of the illustrations is so variable. Some match AAPG's usually high standards of reproduction and some don't. All the diagrams, however, are understandable.

AAPG Memoir 57 "Carbonate Sequence Stratigraphy"

edited by **Robert G. Loucks and J. Frederick Sarg**, published in 1993 by the American Association of Petroleum Geologists, ISBN 0-89181-336-5, 545 pages.

Review by Christopher G. Kendall

This book does not focus as heavily on seismic interpretations as AAPG memoir 58 on "Siliciclastic Sequence Stratigraphy" but does include some descriptions of the seismic response to carbonate deposition. The main emphasis of this text is on the principles which explain carbonate sedimentary relationships and their tie to relative sea level eustasy, tectonics and rates of sediment accumulation. The book provides a large variety of beautifully illustrated and well documented examples.

The first four chapters of the book examine how carbonate sequence stratigraphic relationships are tied to eustasy, tectonics and carbonate production. The first paper by Handford and Loucks provides a general description of carbonate depositional systems tracts for different carbonate settings. It is followed by a paper by Greenlee and Lehmann which discusses the nature of carbonate buildups and their relationship to sea level history, in particular suggesting that rapid sea level change and source rocks may be connected. They indicate that provided a carbonate buildup is isolated and drowned beneath the following transgression, their potential for hydrocarbon entrapment may be high.

This is followed by Zempolich's paper on Jurassic carbonates of the Venetian Alps of Italy which focuses on the development of the Ammonitico Rosso. This "drowning succession" of the western Venetian Alps and the demise of these carbonates is ascribed to excessive amounts of nutrient and organic matter with the accompanying establishment of oxygen deficient environments. Next is a paper entitled "the Tongue of the Ocean in the Bahamas" by Grammer, Ginsburg and Harris which investigates the response to high-amplitude/high-frequency fluctuations in sea level to concurrent carbonate deposition, diagenesis and failure of the carbonate slopes. It is followed by Brown and Loucks' paper on an investigation of the influence of carbonate sediment type and depositional processes on stratal patterns in the Permian basin-margin Lamar limestone of Texas. This paper emphasizes the variation in sea level and its affect on sediment supply downslope from the basin margin.

Then follow a series of papers which involve seismic interpretation, discussing such things as reciprocal lowstand clastic and highstand carbonate sedimentation and sedimentary cycles in mixed carbonate-siliciclastic systems from Devonian reef complex of the Canning Basin (Southgate et al., and Holmes and Christie-Blick), and the origin of Pennsylvanian seismic sequences and facies of the Eastern and Southern Horseshoe Atoll in Midland basin (White). A paper by Erlich, et al. continues the theme with a consideration of the response of carbonate platform margins to drowning and the evidence of environmental collapse. This paper considers examples from Baltimore Canyon and the offshore development of Miocene and carbonate platforms in the South China Sea close to the Pearl River Mouth Basin. The feeling of the authors is that this failure of the carbonate environment is the product of an over abundance of nutrients which adversely affected the rate of carbonate accumulation. This is thought to be related to the proximity of the prograding siliciclastics, combined with rapid tectonic subsidence and/or a rapid sea level rise.

Next is a paper by Saller et al. on the sequence stratigraphy of aggrading and backstepping carbonate shelves for the Oligocene section of the central Kalimantan in Indonesia. This is illustrated by clear cross-sections and one or two seismic lines. Then follows a paper on the sequence stratigraphy of Miocene carbonate buildups of the Jave Sea by Cucci and Clark. They illustrate their paper with a seismic line from the Kangean block of the east Java Sea. There

are a number of maps and cross-sections associated with the paper. Then follows a series of papers on outcrop studies from the Southern Great Basin in the middle to upper Cambrian rocks of the Bonanza King formation (Montanez and Osleger), the lower Mississippian Mission Canyon Formation from Montana and Idaho (Reid and Dorobek), the Middle Triassic of the Dolomites in Northern Italy (Goldhammer et al), the Miocene carbonates of Mallorca in Spain (Pomar), Miocene carbonate complexes of Southeastern Spain (Franseen et al), and the San Andres formation of Guadalupe Mountains in New Mexico Permian (Sonnenfeld and Cross). Then there is a paper on a comparison of the San Andres Permian formation with the Holocene Joulter's clay oolite complex by Harris, et al. followed by a paper on parasequence geometry as a control on permeability evolution for the San Andres Grayburg formations in the Guadalupe Mountains in New Mexico by Hovorka et al. Finally there is a paper by Mutti and Simo on the relationship between stratigraphic patterns and cycle-related diagenesis of upper Yates formation in Guadalupe Mountains.

This is an important book to carbonate sequence stratigraphers. I felt that the choice of papers was a little eclectic and was determined essentially by the authors following their own bent rather than editors setting rigid rules of style, papers topics or contents. No matter where its origins are, this has led to an important book which provides a clear insight into the effects of sea level, sedimentation and tectonics on the accumulation of carbonates. The immense range of carbonate terrains covered by this book are, in fact, what makes it so interesting. The standard of the line drawings in the text varied for some maps and diagrams, letters are smeared and there are breaks in lines. In some cases individual letters are filled so that it becomes hard to distinguish them. The scientific contribution of the book still remains high and a few examples of poor printing should not put the readers off from acquiring this text. Nevertheless, it is a shame that the reproductive quality of some of the illustrations is so variable. Some match AAPG's usually high standards of reproduction and some don't. All the diagrams, however, are understandable.

