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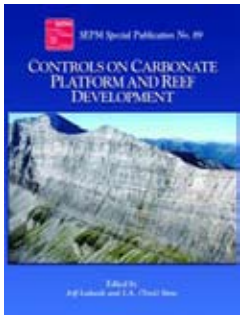

Controls on Carbonate Platform and Reef Development, edited by J. Lukasik and J.A. (Toni) Simo, 2008, SEPM Special Publication No. 89, Society for Sedimentary Geology, Tulsa, Oklahoma. 364 p. + CD-ROM, $125.00 ($90 for SEPM members).

Carbonate platforms are the manifestation of complex interactions among myriad global- to local-scale processes, including eustasy, climate, tectonism, oceanography, and ecology. Despite differences in spatial and temporal scale, any one of these processes is capable of dominating a particular carbonate system during all or parts of its development. With this in mind, research has gradually moved away from the notion of carbonate platforms as static systems that are best characterized in terms of gross morphology, and toward the idea of platforms as dynamic, living systems that evolve in response to shifts in controlling processes. The papers in this book are an outgrowth of an SEPM Special Session, "Controls on Carbonate Platform and Reef Development: A Tribute in Honor of Dr. Wolfgang Schlager," held at the 2005 AAPG-SEPM Conference in Calgary, Canada. Together they explore key questions related to process, scale, and expression of carbonate systems in the geologic record. Which mechanisms produce the dominant signature in carbonate platforms and under what circumstances? Are the sedimentological responses to particular mechanisms broadly applicable or are they time or space dependent? At what scale of observation are the signatures of particular mechanisms evident?

The book comprises 18 full papers and a CD-ROM containing accessory data. Papers are grouped into five sections that reflect a hierarchical scale of controls and response, from global-scale forcings over longer time windows to local controls over shorter time intervals. The first section, Introduction and Synthesis, consists of a paper by the volume editors, Lukasic and Simo. This paper reflects on the present understanding of carbonate platform systems and provides an eloquent argument, built on the contents of the volume, that future work should focus on evaluating these systems from a holistic perspective that integrates observations at a range of spatial and temporal scales.

The second section, Global Perspectives on Carbonate Platform Development, contains two papers that focus on very different themes. A paper by Markello and others explores the notion that geologic time—and attendant changes in ambient conditions—is the overriding control on carbonate platform development. Information from thousands of Phanerozoic platforms is integrated to create predictive, age-specific models for carbonate systems and their reservoir characteristics. Results, synthesized into a series of maps representing 29 time slices, are bundled into two products: the *Phanerozoic Carbonate Trends Chart* and the *Global Atlas of Carbonate Fields*. Although details will surely change as future research provides additional insight into Phanerozoic earth history, these products provide a useful context for investigating carbonate platform systems.

A thought-provoking paper by Wright and Cherns follows, which focuses on the implications of aragonite loss during the early stages of diagenesis. Diagenesis has long been viewed as a veil that might obscure, but not prevent, interpretation of primary features of ancient carbonate deposits. This discussion draws on a growing body of evidence indicating that aragonite dissolution, even in shallow-water settings, is a widespread process that has likely profoundly affected the taphonomic and textural fidelity of the carbonate record. The authors rightly advocate development of more dynamic concepts of carbonate accumulation that can account for aragonite loss.

The third section of the volume, Tectonic Controls, contains six papers that strive to identify and isolate signatures imparted by tectonism. Three papers, by Dorobek, Cross and Bosence, and Stoklosa and Simo, focus on platform development in extensional settings. The effects of halokinesis are investigated by Giles and others in a study of isolated platforms that developed atop rising salt diapirs. A paper by Watney and others examines the effects of basement structures and their reactivation on late Paleozoic epeiric systems of the United States Midcontinent, long assumed to have been dominated by sea level and climate. A paper by Batt and others takes on the age-old problem of distinguishing eustatic from regional tectonic controls on stacking patterns in a study of a Mississippian carbonate ramp developed in the Antler Foreland Basin, western United States. Despite differences in tectonic regimes, all six papers point toward the overarching role of tectonically controlled, differential subsidence on topography and terrigenous influx, which in turn governs the loci of carbonate accumulation and internal stratigraphic architecture. When examined at a smaller scale, however, it becomes evident that the tectonic signal is prone to modification by local processes. For example, the studies by Stoklosa and Simo and by Giles and others show how structural controls on bathymetry can affect water-mass distributions and, in turn, the spatial and temporal distribution of carbonate-producing biota. As noted by the volume editors, a lesson that emerges from this section is that our

ability to extract signals related to tectonic controls varies as a function of the scale at which strata are examined.

The fourth section of the volume, Environmental Controls (Oceanography, Climate, Trophic Resources, Temperature), contains six quite disparate studies that examine platforms where morphology, stratigraphic architecture, cycle development, and modes of carbonate production are governed largely by local environmental mechanisms. An intriguing paper by Pomar and Kendall promotes the use of backstripping to evaluate the genetic character of carbonate sequences as products of temporal changes in physical and ecological accommodation. In an examination of lateral variability in cycle-stacking patterns in the classic Latemàr carbonate platform, Peterhänsel and Egenoff illustrate how variations in paleotopography can lead to significant lateral variations in cycle preservation and expression. James and Bone examine the interplay of changes in sea level, climate, and the weathering flux (silica and nutrients) in producing distinctive cycles in mixed heterozoan carbonate and siliceous estuarine systems of southern Australia. In a study of rudist-bearning platforms of the peri-Tethyan region, Carannante and others show how global-scale controls on deposition may be overprinted by regional variation in environmental conditions to produce latitudinal gradients in facies distributions and biota. MacNeil and Jones examine links between eustasy and regional oceanography on Devonian reef systems and conclude that sea level–controlled variations in water-mass distribution can cause differences in carbonate producers and facies expression among different systems tracts. This section closes with a study by Whalen and Day, which investigates the use of magnetic susceptibility in regional-scale correlation in platform-to-basin systems. Despite disparity in terms of geologic age, environmental setting, and scale, the studies in this section illustrate that although carbonate systems respond to global-scale forcings, the signatures related to those forcings can, in some cases, be amplified, modified, and, indeed, overwhelmed by local-to-regional environmental conditions and the attendant effects on trophic resources and biotas. As such, these studies illustrate the importance of a holistic approach in studies of carbonate platforms, one that considers processes and integrates observations over a range of spatial and temporal scales.

The final section, Improved Characterization of Carbonate Platforms and Reefs, represents a departure from the previous sections of the book. Rather than focusing on controlling mechanisms and their signatures in the carbonate record, the three papers in this section illustrate recent advances in technology that have the potential to improve our ability to quantify and model carbonate systems. Papers by Rankey and Harris and by Harris and Vlaswinkel explore the use of high-resolution satellite imagery in quantifying facies attributes in terms of size, shape, and distribution. Of particular use to those who teach is a set of high-quality images and exercises provided on the CD-ROM by Rankey and Harris. In the final paper in this section, Bassant and Harris use the forward stratigraphic modeling software, Dionisos, to examine the distribution of grainstones on a platform exposed to variations in rate and direction of sea-level change. Together, these papers illustrate ways in which academia and industry are exploring the use of technology to enhance understanding of carbonate systems.

This volume is a welcome addition to the literature on controls on carbonate platform and reef development. As with many compilations of this nature, the papers in the volume are quite variable in scale and scope. Given this, the Introduction and Synthesis section is a must-read for all who purchase the book, as it provides the reader with a context in the form of several key themes, within which each contribution may be considered. Considered together, these papers serve to illustrate the benefits of the trend toward a more holistic approach to studies of carbonate systems and, in particular, the growing awareness of the importance of scale in interpreting the development of carbonate platforms and reefs. My understanding of how various processes might leave their imprint on the stratigraphic record grew as a result of reading this volume. I assume that this will be true for others as well.

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