Sedimentary Responses to Forced Regressions by D. Hunt and R.L. Gawthorpe, editors, 2000, Geological Society Special Publication No. 172, London, 383 pp., US$ 132, GSL Members, US$58, ISBN 1-86239-063-0.

This book addresses the sedimentary response to falling base level conditions. It covers a large spectrum of subjects, e.g. recognition of forced regressive deposits, their 3-D facies, and architectural changes. It deals mainly with siliciclastic depositional systems. Out of 16 papers, only 3 address carbonate and mixed carbonate/siliciclastic systems. None of the papers, unfortunately, addresses industry applications.

Two concept papers provide two different models of forced regression. (The third alternative model of Ashton Embry is unfortunately not included in this publication). Plint and Nummedal argue for the inclusion of a fourth systems tract, Falling Stage Systems Tract "FSST", into the classic three-fold Exxon model, and for the placement of the sequence boundary "SB" at its top. They contend that the SB, though diachronous and comprising amalgamated higher order sequence boundaries modified by transgressive erosion, is the most readily identifiable surface. However, their definition and correlation of high order sequences within FSST, whether individual shoaling upward successions or units in between regressive surfaces of marine erosion, appear problematic. They subdivided shoreface sandstones (figure 5) into two high order FSST-LST sequences/allomembers "E" and "F". These, in turn, change laterally into two shoaling upward offshore facies successions, which were designated as HST/TST.

In contrast to the above model, Posamentier and Morris advocate the three-fold model and place the SB at the sharp erosional base of forced regressive deposits. They emphasized the importance of selecting a regional time synchronous surface as the SB, regardless of the practical difficulties of identifying it. They state "*this represents the surface that exists at the time of initiation of sea-level fall*". The sub-aerial segment of this surface, however, would likely be modified by later erosional, pedogenic and/or ravinement processes and would not necessarily mark the onset of sea-level fall. That segment would also merge imperceptibly with the palaeosol/erosional surface, which marks the later maximum sea-level fall. Moreover, should its sub-aqueous segment and its correlative conformity survive erosion during subsequent sea-level falls, its identity and correlation with the corresponding sub-aerial segment would be highly subjective.

The terminology and timing of deposition for forced regressive and lowstand deposits, in a relative sea-level cycle, are not consistent throughout the book. The onset and termination of forced regression coincide respectively with the highest and lowest sea-level stands (Plint and Nummedal). Alternatively, it starts just after the highest sea-level stand and ends before the lowest sea-level stand (Heranández et al.). In contrast, early LST that is comprised of higher order sequences, instead of FSST, starts shortly after the highest sea-level stand (Posamentier and Morris). In terms of terminology, four names; Forced Regressive "FRST", Forced Regressive Wedge "FRWST", FSST and Early LST were used by different authors to refer to the same systems tract. This lack of coherent definitions and terminologies presents both a communication challenge and a source of confusion.

Posamentier & Morris pointed out that correct sequence stratigraphic interpretation depends largely on "*the extent of data set, i.e. window to the world for geologists"*. The downward-stepping geometry is critical to the interpretation of FSST, as opposed to LST or HST. Such geometry and the lateral transition from one systems tract to the next were not demonstrated in the three papers dealing with carbonate systems. The interpretations were largely based on the vertical stratigraphic position, presumably FSST above HST and below LST, rather than clear lateral and vertical stratigraphic relationships. More work is needed to test the validity of the FSST concept in carbonate systems.

Choosing the correct datum in the construction of cross sections, that can decipher a downward stepping geometry of forced regressive deposits, was well emphasized by Plint & Nummedal. However, Fitzsimmons & Johnson presented a cross section to demonstrate forced regressive shoreface deposits that split down-dip into shoaling upward parasequences. Their choice of a highly subjective flooding surface as a datum produced, instead, an upward trajectory of progradational shoreface deposits that were presumably developed during sea-level fall.

Forced regression was repeatedly interpreted based on the presence of down-stepping sediment wedges on 2-D seismic sections. In some cases there were no corroborating data of 3-D geometry of such wedges, independently established sea level history or age dating. Autogenic processes, e.g. distributary channel avulsion and deposition of deltaic lobes in topographic lows at toes of older lobes would develop apparently down-stepping wedges on 2-D seismic sections.

Allogenic processes and products related to forced regression are well emphasized throughout the book. In contrast, autogenic processes directly responsible for facies distribution in depositional systems, and consequently critical to the correct interpretation of corresponding systems tracts, are insufficiently discussed, except in two papers by Mellere & Steel and Kolla et al. The former authors demonstrated the progression from tidally-influenced into wave-dominated lithosomes respectively, during the evolution from progradational-aggradational LST and retrogradational TST into progradational HST and FRWST. Kolla et al. mapped laterally shifting lobes, in the Pleistocene Lagniappe delta that were deposited in response to both autogenic processes and high-frequency sea-level fluctuations.

Eustatic sea-level changes were overemphasized in some papers as the main control over stratigraphy (e.g. Hamberg and Nielsen). In addition to eustacy; tectonics, structure and basin physiography were established as major controls over deposition of forced regressive sediments (Gawthorpe et al. and McMurray & Gawthorpe). Also, sediment supply was suggested to have partially controlled along-strike changes in FRST (McMurray & Gawthorpe). Nonetheless, the book lacks studies that explicitly deal with high sediment supply systems, which respond to sea-level fall quite differently from low sediment supply systems.

The book has one paper on 2-D forward stratigraphic modeling. Ainsworth et al. simulated clastic depositional geometries that developed under varying conditions of subsidence, eustacy and sediment supply. They proposed that detached sharp-based shorefaces develop initially in most cases as attached lowstand systems that subsequently detach by transgressive-regressive wave erosion. More modeling work is needed to further investigate the FSST concept in three dimensions.

Four studies utilize high-resolution offshore seismic data to investigate forced regression during the Quaternary. They demonstrate the occurrence of composite sequences of different hierarchies. High-frequency, high-amplitude asymmetric sea-level cycles driven mainly by glacioeustacy were interpreted to have largely controlled the development of these sequences. The glacioeustatic signals were characterized by rapid sea-level rises, very short highstands and relatively long-term and stepped sea-level falls. Heranández et al. and Chiocci argued that forced regressive deposits are thus volumetrically predominant. In contrast, Trincardi & Correggiari emphasized that the relationship between time and relative volume of each systems tract is not straightforward because of changes in preservation potential and sediment supply in time and space. They reported large volumes of deltaic sediments that were deposited during a short-term lowstand of sea-level.

Many papers show the occurrence of multiple erosional and diachronous surfaces of complex origins within both Quaternary and ancient sequences. Their development was attributed to the combined effects of; marine erosion during sea-level fall, sub-aerial exposure, fluvial incision and/or transgressive ravinement. Different types of erosional surfaces were used by various authors as sequence boundaries (SB). Interpretation of the origins of multiple erosional surfaces within an ancient sequence and deciding which one is the SB may prove to be a difficult task. Kolla et al., therefore, stated "*it is our preference to identify the multiple sequence boundaries as well as the most pronounced surface, map them regionally and then determine and understand the causes of their origins during a particular sea-level cycle, before a surface is distinguished as the main sequence boundary*".

This publication provides new insights into forced regression and bridges a once missing gap in sequence stratigraphy. I would recommend it for both university and industry libraries.

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