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Long-term aggradation rates for Neogene carbonate platforms in the South China Sea and implications for sediment storage on icehouse vs greenhouse platforms

S.L. Dorobek

Exploration & New Business, Maersk Oil & Gas, (SLD@maerskoil.com / Fax: +45 3314 1554 / Phone: +45 3363 3980

Neogene carbonate platforms are common across the South China Sea and Indonesian backarc region; many of these platforms grew during major long-term climate changes (e.g., early Miocene greenhouse to late Miocene icehouse). After accounting for local variations in subsidence rates, average aggradation rates for these platforms also systematically change over time, synchronously with climatic changes. Most early to middle Miocene platforms aggraded at relatively low rates and did not attain significant cumulative thickness (generally $<$500 m thick). This was a time of global greenhouse climatic conditions, which culminated in the Mid-Miocene 'climatic optimum' at $\sim$14 Ma, and Milankovitch-band eustatic oscillations were probably low to moderate amplitude. After 14 Ma, however, long-term global cooling and transition to present-day icehouse climates produced much thicker inner-platform successions with faster accumulation rates in many platforms, even though most settings where platforms developed were subsiding more slowly than they were during early to middle Miocene time.

The change to faster aggradation rates during long-term climatic cooling likely indicate that average accumulation rates for shallow-water carbonate platforms are higher during icehouse times, when high-amplitude glacio-eustatic sea-level oscillations are common. In effect, inner-platform settings are at optimal water depths for sediment accumulation (and long-term storage) for long periods of time during icehouse times. Icehouse platform-margin and slope facies also exhibit limited progradation during falling and lowstands of sea level. During greenhouse times, platforms quickly aggrade and fill accommodation space created during low-amplitude glacioeustatic rises,

but once inner-platform space is filled, any additional sediment is swept off the platforms into adjacent slope and basinal areas. Where adjacent depocenters are relatively shallow during greenhouse platform growth, leeward platform margins are typically highly progradational. Thus, Neogene isolated platforms from the South China Sea may provide important analogs for understanding the response of carbonate-platform systems that form during major, long-term climate transitions. In addition, these platforms provide insight into rates of platform-derived sediment flux to basinal areas during different climatic conditions.