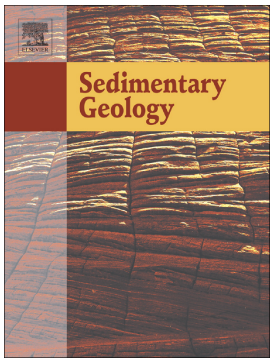

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Ashley D. Harris, Sarah E. Baumgardner, Tao Sun, Didier Granjeon

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A Poor Relationship Between Sea Level and Deep-Water Sand Delivery

Ashley D. Harris[1], Sarah E. Baumgardner[1], Tao Sun[1], Didier Granjeon[2]

[1]Chevron Energy Technology Company, Houston, Texas 77002, U.S.A.

[2]Department of Geology-Geophysics-Geochemistry, IFP Energies Nouvelles, 1 à 4 avenue de Bois, Préau, 92852 Rueil-Malmaison, France

Corresponding author: Ashley Harris (ashleyharris@chevron.com)

Abstract

The most commonly cited control on delivery of sand to deep water is the rate of relative sea-level fall. The rapid rate of accommodation loss on the shelf causes sedimentation to shift basinward. Field and experimental numerical modeling studies have shown that deep-water sand delivery can occur during any stage of relative sea level position and across a large range of values of rate of relative sea-level change. However, these studies did not investigate the impact of sediment transport efficiency on the relationship between rate of relative sea-level change and deep-water sand delivery rate. We explore this relationship using a deterministic nonlinear diffusion-based numerical stratigraphic forward model. We vary across three orders of magnitude the diffusion coefficient value for marine settings, which controls sediment transport efficiency. We find that the rate of relative sea-level change can explain no more than 1% of the variability in deep-water sand delivery rates, regardless of sediment transport efficiency. Model results show a better correlation with relative sea level, with up to 55% of the variability in deep water sand delivery rates explained. The results presented here are consistent with studies of natural settings which suggest stochastic processes such as avulsion and slope failure, and interactions among such processes, may explain the remaining variance. Relative sea level is a better predictor of deep-water sand delivery than rate of relative sea-level change because it is