Stratigraphic Cycles in Cretaceous Turbidite Sand Sheets—-Implications for Progradation/Retrogradation Cycles

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Abstract

Attempts have been made in the past to link stratigraphic cycles in turbidite sequences to progradation (i.e. thickening and coarsening upward) and retrogradation (thinning and fining upward). However, if the sedimentary system is laterally unconfined or shows much compensational stacking, the relationship between stratigraphic cycles and such vertical sequences may be more complex or stochastic. Meanwhile, progradation and retrogradation imply a basinward or landward shift in deposition respectively, but few 2D outcrop sections along depositional dip have been studied sufficiently to establish the longitudinal variations in stratigraphic cycles. In this study, two Cretaceous turbidite sand sheet systems, referred to as Pehoe Member B and Paine Member A (abbreviated here to Pehoe B and Paine A) are compared, to investigate the longitudinal stratigraphic variation and possible implications. With a logging scale of 1:10, statistical methods such as runs tests, moving average, and correspondence tests are used to detect stratigraphic cycles. Combined with facies and thickness analysis, Pehoe B and Paine A sand sheet systems are both interpreted to be laterally confined with dominantly vertical stacking overall. Along depositional dip, stratigraphic cycles of thickening and coarsening upward then thinning and fining upward, where present, are asymmetrical in proximal areas but appear to be more symmetrical in distal areas. The longitudinal variation of stratigraphic cycles is generally consistent with that of maximum thickness of amalgamated beds and total counts or counts/meter of all bypass features. Turbidite vertical sequences of both Pehoe B and Paine A reflect a general progradation then retrogradation process, with superimposed small scale fluctuations, which may infer allogenic variations in sediment supply (3rd to 4th order sequences).

Keywords: sand sheet systems, stratigraphic cycles, turbidite, progradation, retrogradation, Cretaceous

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