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Kinematic Sequences and Systems Tracts: A Perspective from Growth Strata

Existing investigations of the influence of tectonics on the development and composition of depositional sequences have largely focused on basin-scale (long-wavelength) patterns of subsidence and the effects of this accommodation on sequence and systems tract development in the absence of causal changes in eustasy. Outcrop and subsurface investigation of growth strata from multiple contractional, extensional and halokinetic structural settings suggest that syndepositional deformation also develops systematic, local unconformity-bounded, stratigraphic intervals proximal to active structures in many basins. These kinematic sequences are composed of kinematic systems tracts defined and identified by their stratal termination patterns (cf. Riba, 1976; Anadón et al., 1986; Ford et al., 1997), which are observable in reflection seismic data and many outcrops. The apparent episodic nature of fault displacement, halokinesis and fold growth, combined with the repetitive patterns of these kinematic sequences (as indicated in chronostratigraphic, Wheeler-type diagrams) supports existing interpretations that associate different stratal termination patterns with different rates of relative uplift (i.e., deformation). The correlation of these termination-pattern-based systems tracts with field- and subsurface-based systematic facies distributions (see Barbeau, Hamid and Geslin, this volume) and/or geochronologic data could improve the efficiency of hydrocarbon recovery and resolution of kinematic histories constructed from growth strata. Correlation of these proximal sequences and systems tracts with conformable down-dip stratigraphic features could also shed light on poorly defined sequences in tectonically controlled basins, wherein structural deformation can have the dominant influence over sediment supply and accommodation.