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The Influence of Climatically Mediated Stream Discharge and Sediment Flux on the Sedimentary Record of Landscape Evolution: Implications for the Sequence Stratigraphy of Continental Strata

Sequence stratigraphy provides a chronostratigraphic framework in both paralic and continental siliciclastic deposits. Sequence stratigraphic concepts were developed in areas in which accommodation and regional erosion were controlled solely by changes in magnitude and rates of ultimate baselevel change, while sediment supply was assumed constant. However, the mechanisms which control the stratal architecture of sequences and the formation of their bounding unconformities, in areas outside the dominant influence of ultimate baselevel changes, have not been fully addressed. The concept of landscape aggradation and degradation, linked to the processes of fluvial systems incising and/or aggrading to an equilibrium profile, addresses some conceptual limitations of traditional sequence stratigraphy. This concept links the climatically mediated variables of stream discharge and sediment flux to depositional architecture. Thus, sequence boundaries can then be defined as regional surfaces of regional degradation produced by the lowering of the equilibrium profile of drainage systems. Such lowering may occur in response to a fall in baselevel, tectonic uplift, increase in stream discharge, or a decrease in the bedload of streams. The amount, grade, and flux of silicilcastic material carried and deposited by alluvial systems, and the magnitude and timing of regional erosional events, are intrinsically linked to these variables. Conceptual and numerical models of fluvial systems, with stream discharge and sediment flux input scaled to data from modern basins in different climatic settings, are a first step in determining the sensitivities of the processes and investigating the generation of recognizable facies associations, vertical trends (systems tracts), and surfaces (‘flooding’ surfaces, sequence boundaries).