A PREDICTIVE MODEL FOR CONTINENTAL SEDIMENTS

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Sequence stratigraphy has been used as a predictive exploration tool for a number of decades and is well understood when dealing with marine depositional environments. Relative sea level in such environments is equivalent to base level, and vertical fluctuations of this surface provide a response in the vertical and lateral facies deposited.

In continental environments however, relative sea level plays an increasingly lesser role in the facies preserved. Base level changes become dominated by tectonic effects and sediment supply. The variations and relationships of continental facies are less evident than in marine facies, and distinguishing trends and cyclicity in deposition is not as obvious. Continental sediment has been described as 'internally complex rock pilesi where consistent correlation is difficult because of abrupt and often random facies changes' (Lagerreta et al., 1993). Recently however, fluvial channel stacking patterns have been recognized to follow a pattern dictated by the resultant base level variations, and hence providing a new tool with which to predict lateral and vertical facies variations in a continental setting.

The basis for this sequence stratigraphic interpretation of continental environments is the fluvial channel stacking patterns. Within the lowstand system tract (LST) and the late highstand systems tract (HST), channel sands are amalgamated laterally and vertically, while similar sands in the transgressive systems tract (TST) and in the early HST are isolated. Sequence formation is controlled by third-order base level cycles, while fourth and fifth-order fluctuations control deposition within the systems tracts.

Accommodation during LST deposition is minimal, before base level eventually starts rising at a slow rate. The TS is the surface at which point the rate of rise of base level starts to increase rapidly. This acceleration continues until a point is reached where the rate of rise starts to decrease, the surface of maximum rate of base level rise of the surface of maximum transgression (SMT). During HST deposition, the rate of accommodation creation decreases until it is again stationary and eventually becomes negative. When this point is reached, erosion starts to take place, forming the sequence boundary (SB) of the following sequence.

The proposed model is mainly based on a review of work carried out by Legarreta et al. (1993), Shanley and Mc Cabe (1994), Aitken and Flint (1995), Olsen et al. (1995), and Allen et al. (1996).

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