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Stratigraphic Signatures of Climate vs. Sea-Level Change in Quaternary Continental Margin Fluvial Systems

The relative importance of climate vs. sea-level change on continental and nearshore marine successions has become increasingly important in recent years. For Quaternary fluvial systems, empirical reconstructions of changes through time in long profiles, as geometric representations of former floodplain surfaces, play key roles in understanding the relative importance of climatic vs. sea-level controls.

Based on data from river systems of Western Europe and the Texas Coast, the fundamental importance of climatically-modulated changes in discharge and sediment load is illustrated by the downstream continuity of long profiles, underlying stratigraphic units, and component facies. This continuity extends from far upstream reaches where sea-level change is not an issue, to downstream reaches where sea-level change is increasingly important. On the other hand, there are corresponding downstream changes in stratigraphic architecture as a reflection of the increasing influence of sea-level change. Such influences can be identified by crossovers in long profiles and changes in stacking patterns for stratigraphic units that represent different time periods in a eustatic cycle.

The fundamental fluvial responses to sea-level change are channel extension or shortening, coupled with changes in the elevation of channel bases and floodplain surfaces, so as to track a shoreline that is advancing or retreating and changing elevation. Other adjustments of stratigraphic significance take place within this context, and are non-deterministic. Sea-level change is therefore a necessary condition for certain responses - for example, large-scale incision and aggradation - but may not be the immediate cause, and the actual trigger for changes may reflect other controls.