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The Relative Importance of Climatic and Eustatic Variation on Boundary Formation in an Incised Valley: A Study of the Latest Pleistocene Brazos River Valley (TX)

The Late Pleistocene incised valley of the Brazos River (TX) was formed by the stepped eustatic fall preceding the Last Glacial Maximum. Three nested terraces record the fall through OIS 3. Each terrace is the product of a high frequency climo-eustatic cycle. Eustatic fall controlled valley excavation. Climate controlled sediment influx and character of the fill. Terraces are bound above and below by well-developed palaeosols. Data, including radiocarbon and thermoluminescence dating, derived from a coring program reconstruct the incision and valley fill history within the latest Pleistocene Brazos River system.

High order climo-eustatic, cut-and-fill cycles are responsible for excavating and partially filling the latest Pleistocene Brazos valley. Cut-and-fill footprints migrated laterally in the lower valley and basinward throughout OIS 3. Younger cycles substantially cannibalized the sediments and surfaces of older cycles. The Late Pleistocene Brazos valley incision surface is a diachronous, composite surface formed by at least three cut-and-fill events. The composite valley surface pre-dates the -120 m OIS 2 lowstand by as much as 40,000 years.

There is no widespread boundary in the Brazos valley that can be tied to a single offshore sequence boundary (e.g., OIS 2 lowstand). Instead, there is a patchwork of surfaces that have offshore correlatives.