Control of Upstream Variables on Late Quaternary Incised-Valley Evolution along the Northern Gulf of Mexico Margin

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ABSTRACT

It is established that sea level along the northern Gulf of Mexico margin fell to ~120 m below present day level during the Last Glacial Maximum (~22-17 ka), exposing the continental shelf and promoting fluvial incision. The incised-valley systems formed during this lowstand in sea level have been well constrained by seismic and lithologic studies, aided by ^{14}C dating techniques. However, a comparative study has not been attempted to determine relative controls of upstream (climate and drainage-basin characteristics) and downstream (fluvial and shelf gradients, rate and magnitude of base-level fall) controls on incised-valley evolution. To address this, incised-valley dimension was calculated for eight Oxygen Isotope Stage 2 incised-valley systems from core and seismic data at locations close to the highstand shoreline of the previous sequence along the margin. Studied systems cover a region presently characterized by steep precipitation gradients, are distinguished by drainage basins that vary in size by three orders of magnitude, and extend across a continental shelf that varies along strike in width (80-160 km) and gradient (1.0-2.0 m/km). Linear relationships between drainage-basin area and incised-valley cross-sectional area and width suggest a strong correlation between discharge and incised-valley dimension for systems along the northern Gulf of Mexico margin. These data suggest that the level of variability along the margin is not unique and comparison of incised-valley dimension therefore yields insight into respective drainage-basin sizes and/or climate gradients. Although the base-level fall promoted fluvial incision, incised-valley dimension was controlled by upstream variables.