

Incised Valleys from Stratal Slicing and Attribute Analysis, a Northern Gulf Coast Analog

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In the Starfak and Tiger Shoal 3-D survey area, offshore Louisiana, hundreds of incised valley fills (IVF's) of Miocene-Pliocene age have been detected by seismic geomorphology and attribute mapping on stratal slices. Represented mostly as strongly negative seismic amplitude patterns, IVF's are composed of sandstones wherever correlated to wireline logs. IVF's are apparent in variable shapes and sizes. Some IVF patterns abruptly terminate in either the updip or the downdip direction, possibly indicating that the sandstones were locally eroded, probably during marine transgression. Some IVF's at the paleo-shelf edge show distinct downslope widening, before connecting to the prograding wedges on the downthrown side of the regional growth fault. The size of IVF's measured in fourth-order sequences is controlled by third-order cyclicity of sea level. The IVF's developed in third-order lowstands are the largest in size (30 to 50 m in depth and 4 to 36 km in width). In contrast, IVF's in the third-order highstands are typically smaller (10 to 40 m in depth and 1.4 to 10 km in width). Orientation of the incised valleys also changes through geologic time, with most of the IVF's aligned to the east-northeast and several IVF's oriented north-northwest, probably indicating a mixed sediment supply from two point sources, both within the Central Mississippi Delta System. IVF sandstones consist of the best-quality hydrocarbon reservoirs in the area, which can be quickly mapped according to their geomorphologic characteristics on stratal slices, either by digitization of the IVF boundaries, or by neural network-assisted, geomorphology-based facies classification.
