High-Resolution Near-Surface Seismic Analogs for Deep Subsurface Canyon/Channel-Margin Slides

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Recent improvements in seismic data quality, and the acquisition of high-resolution seismic data enable detailed imaging of pairs of rotational slide systems associated with erosional canyons and channels observed in the near-surface section of the deep-water Gulf of Mexico. Previously interpreted as "chaotic zones", these features are now resolved as paired groups of *en echelon* detachment faults (Figure 1).

These faults form in response to the failure of the opposing slopes during canyon or channel incision. The erosion of the canyon or channel creates oversteepened slopes that fail by rotational faulting. The faults are small-scale gravity slides characterized by extension and rotation at the head. The compressional toe thrusts emerge into the axis of the developing canyon, where it is eroded and carried downslope.

Channel-margin slide systems are characterized by 1) base failure, 2) strata-parallel detachments, 3) multiple rotated blocks, and 4) asymmetry across the canyon/channel. The detachment surface of the faults passes below the base of the canyon/channel incision (base failure). For any given canyon/channel system, the detachment surface for all of the paired slide-faults typically occurs at the same stratigraphic level along the length of the canyon. Strata within the failed section deform as discrete rotational blocks, apparent even in low– resolution conventional seismic data, and strata within the blocks frequently have dips up to 25º. The horizontal extent of the detachment zone frequently appears to be asymmetric in respect to the canyon.

Study of deepwater channel-margin slides in the near surface facilitates recognition and mapping of similar features in the deep subsurface, where these phenomena occur within two to five seismic loops (Figure 2). In the deeper section, the canyon/channel cut rarely appears as a discrete event, rather, it appears as a series of truncated events. The associated

Paper presented at the AAPG Hedberg Research Conference, "Integration of Geologic Models for Understanding Risk in the Gulf of Mexico," September 20–24, 1998 (Galveston, Texas).

rotational slide faults typically appear as minor discontinuities between two or more parallel events. Complications from larger-scale structures often mask the paired nature of the slide faults.

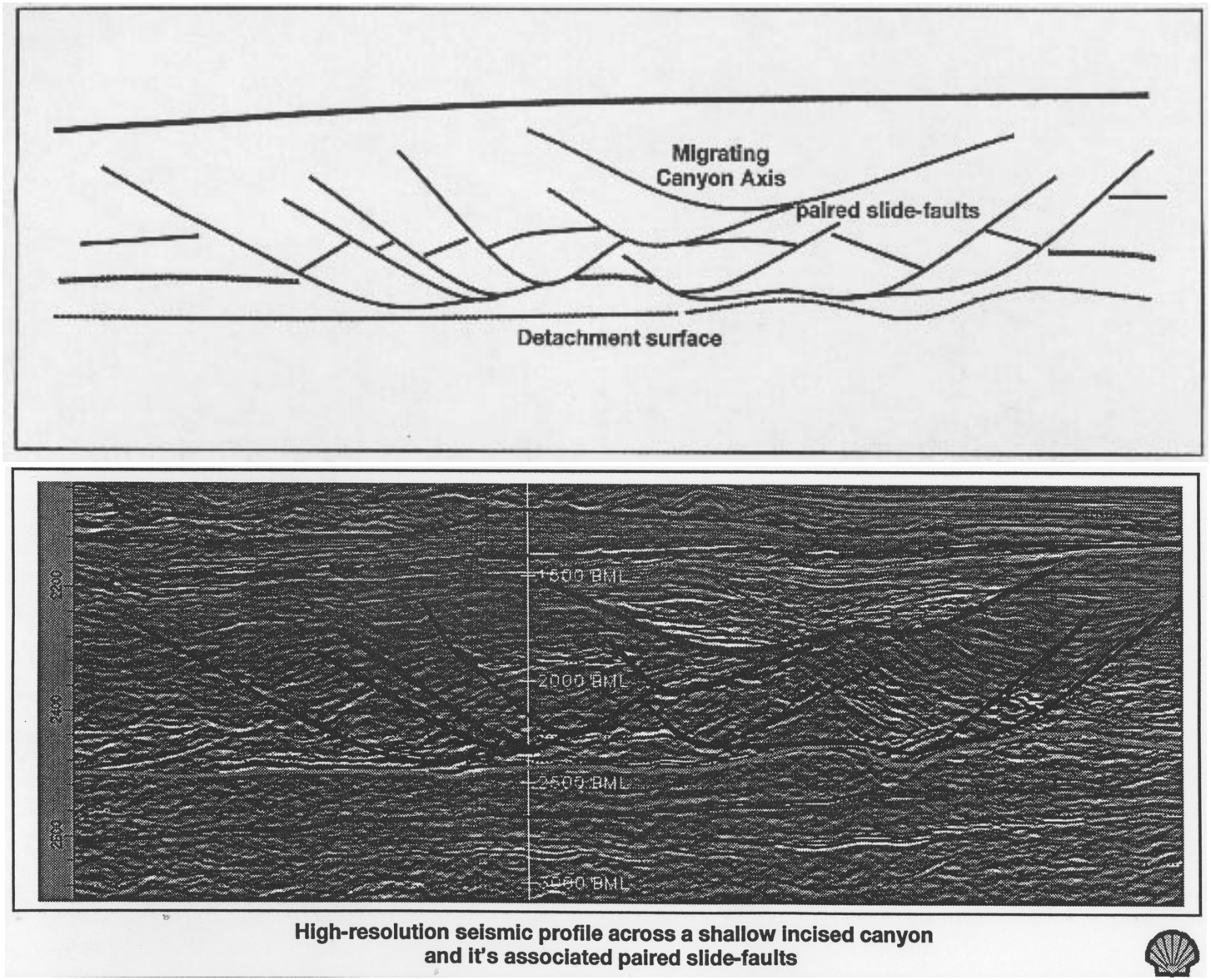

Figure 1 High-resolution seismic profile across a shallow incised canyon And it's associated paired slide-faults

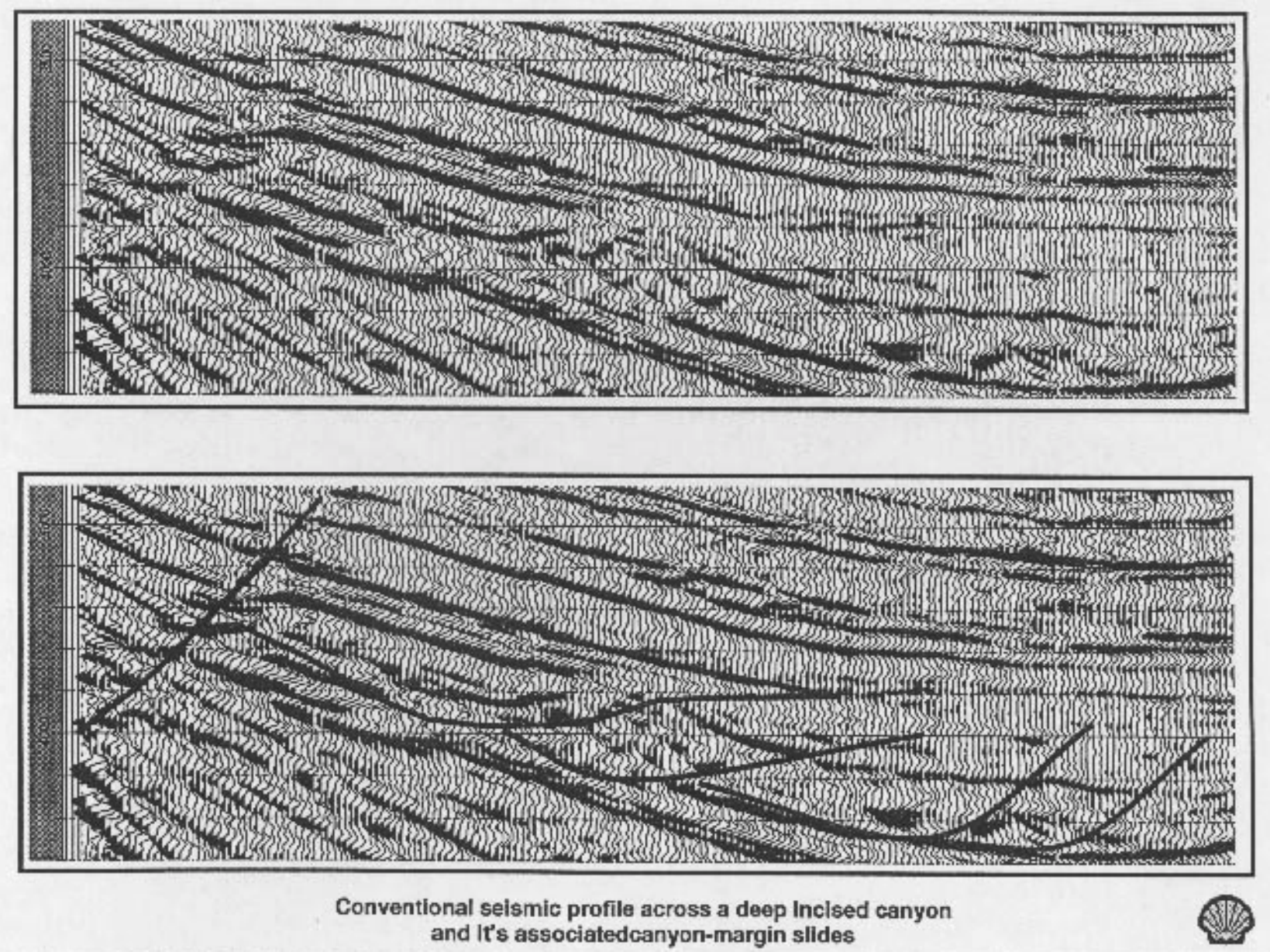

Figure 2 Conventional seismic profile across a deep incised canyon And it's associated canyon-margin slides