In November to December 1983, the University of Texas and the U.S. Geological Survey conducted a seismic experiment that attempted to measure crustal and upper mantle depths and velocities along a transect of the Gulf of Mexico south of Galveston, Texas. The transect is composed of 5 along-strike lines spaced to span the continental shelf and slope and reaching the deep basin. Two 2,000-in.^{3}, 2,000-psi air guns were fired simultaneously at 30-sec intervals at 5 knots for a shot spacing of 77 m. The signals were recorded by digital ocean-bottom seismographs with vertical geophones. Four seismographs were placed along each 90-km line. The seismic sections obtained are densely sampled and fully reversed, about half showing seismic arrivals at the full range of the line.

We find that the deep Gulf of Mexico is, as expected, underlain by oceanic crust. On the outer slope, we see deeply penetrating arrivals from below thick salt, and we find that this crust is thicker than the oceanic crust. North of the thick salt, we see the crust thinning to nearly the thickness of oceanic crust. Although this crust may be seismically indistinguishable from oceanic crust, we believe it to be highly extended continental crust. We interpret the two northern lines to show northward thickening, extended continental crust.

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Micropaleontology, Textural and Isotopic Characteristics of Turbidites on Continental Slope and Rise off Newfoundland

Graded turbidite deposits observed in x-radiographs of gravity and piston cores collected from the lower slope and rise (2,300-3,210 m) occur below a well-documented 9,300 y.B.P. ash zone. The largest turbidite observed on the upper rise is 35-cm thick. C^{14} dates of foraminifera tests from intervals above and below this deposit average about 13,000 y.B.P. suggesting deposition during late glacial time. The base of this deposit is marked by a textural change to comparatively coarse sediments. It is also marked by an anomalous concentration of foraminiferal species (up to 50%) belonging to the miliolid family, that constitutes 2-4% of modern assemblages. A pronounced increase in the percentage of *Valvulinaria artica* in the turbidite suggests a middle-slope source. The thinner gravity flows (10-15 cm thick) that occur in the deeper sections of the upper-rise cores have extrapolated C^{14} ages of less than 22,000 y.B.P. Their foraminiferal assemblages suggest outer-shelf to upper-slope sediment sources.

A comparatively thick (150 cm), graded turbidite sequence of unknown source occurs on the lower slope, just above ash zone 2 (approximate age is 64,000 y.B.P.). The related turbidity-current event apparently took place during the latter part of isotope stage 4. Texturally, this sequence is similar to the 35-cm thick upper-rise turbidite, but it lacks the anomalous concentrations of foraminiferal species in its basal interval. Oxygen isotope values (sinistral *N. pachyderma*) are relatively homogeneous throughout the sequence at a value of +3.75 ppt compared to +2.75 ppt for the upper Holocene section of the core.

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Tectonic Evolution and Hydrocarbon Prospects of Tunisia-Sicily Shelf

The stratigraphic evolution, structural styles, and principal hydrocarbon prospects of the Tunisia-Sicily shelf are all linked to the crustal "template" created during the middle Mesozoic rifting of the Tethyan margin of North Africa. Transtensional stretching and fragmentation of the Tunisia-Sicily shelf during the Late Triassic to Jurassic at the junction of the south Sahara and Gilbraltar fracture zones created a complex array of ridges and furrows and localized pull-apart basins. This block-faulted shelf region was buried during the Cretaceous and early Cenozoic beneath a cover stratigraphy that ranged widely from a thin pelagic limestone succession devoid of terrigenous components in Sicily to a considerably thicker neritic Tunisian succession containing terrigenous and carbonate rocks. Differences in stratigraphic character across the shelf relate to the relative position of Sicily and Tunisia between the unstable and subsident Tethyan margin and the stable and emergent Saharan platform. As the North African continental margin subducted northward beneath the accretionary Kabyle-Calabrian belt in the late Cenozoic, the thin carbonate successions of Sicily responded by detaching in a series of southward-migrating thrust sheets. Along strike in Tunisia, the thrust sheets die out and stress was taken up by folding the thick marly succession weakened by numerous Late Triassic evaporite diapirs. Despite differences in structural style, the orientations of the structures in both Tunisia and Sicily have been guided by the crustal template created by middle Mesozoic rifting.

Hydrocarbons on the Tunisian-Sicily shelf are related to (1) Mesozoic or younger structures that deform the early Paleozoic black shale–orthoquartzite succession of the Saharan platform, (2) synrift anoxic basin facies, (3) the Cretaceous–early Cenozoic shelf margin in the Tunisian section, and (4) late Cenozoic synorogenic clastic facies.

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Structural Style, Stratigraphic Variability, and Hydrocarbon Traps in Gulf of Suez

Hydrocarbon traps in the Gulf of Suez, whether of a structural or a stratigraphic type, fundamentally are all products of the highly complex late Cenozoic fault-block mosaic. Understanding the geometry and the evolution of this tilt-block mosaic is the key to further successful exploration in the Gulf.

The major faults forming the Gulf of Suez basin are listric normal faults broken along strike by synchronous cross faults that serve as transform or "transfer" structural elements. The cross faults are a consequence of the inability to form uniform and laterally continuous listric fault surfaces within the mechanically anisotropic and inhomogeneous crystalline basement terrane of the Gulf. The combination of contemporaneous Gulf-parallel listric faults and cross-strike "transfer" faults gives rise to the complex mosaic of polygonal tilt blocks. Vertical variations in the structural behavior result from a synrift stratigraphy dominated by thick marls and evaporites. The ductile synrift rocks exhibit shallow secondary detachments, drape folds, and compaction and/or diapiric structures that are decoupled from, but appear controlled by, the brittle underlying basement-rooted tilt-block mosaic.

Lateral stratigraphic variability observed in the Gulf is the consequence of sea level rising and falling relative to the higher structural elements in the tilt-block mosaic. This has resulted in deeply eroded basement highs, clastic apron and perched reef reservoirs associated with the highs, and thick organic-rich marl accumulations in the intervening lows that serve as "kitchen" areas.

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Remote Detection of Anomalous Mineralogy Associated with Hydrocarbon Production, Lisbon Valley, Utah

Diagenetic mineral assemblages within the Wingate formation are closely associated with hydrocarbon production at Lisbon Valley, Utah. The Wingate formation, exposed along the southwestern flank of the anticline, has a relatively uniform composition and appearance over the entire Colorado Plateau, except at isolated localities such as Lisbon Valley, where it is locally bleached. Previous workers have suggested that hydrocarbon microseepage may account for bleaching of the Wingate Sandstone and the presence of uranium mineralization in outcrops overlying the reservoir at Lisbon Valley. Using broad-band, Landsat Multispectral Scanner (MSS) and airborne Thematic Mapper Simulator (TMS) data, the bleached facies was mapped on the basis of brightness and lack of ferric iron. Examination of the TMS data provided further discrimination of bleached facies because relative abundances of clay minerals are detectable with this sensor.

Analysis of high-resolution airborne spectroradiometric data, thin sections, and x-ray diffraction suggests that the bleached rocks overlying the reservoir at Lisbon Valley contain abundant kaolinite and minor amounts of feldspar. Unbleached exposures contain substantially less clay and abundant feldspar.

This study shows a correlation between the abundance of clay minerals, particularly kaolinite, and hydrocarbon production at Lisbon Valley. Because one of the principal differences between the bleached and