SE16-1 CARTEL

THE RÍO GRANDE FAULT, A MAJOR MID-TERTIARY LEFT-LATERAL SHEAR ZONE

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It is generally assumed that the last major compressive deformation in the Sierra Madre Oriental took place during the Laramide orogenesis (Upper Cretaceous-Early Eocene). We have studied the N120º Babia lineament inherited from the Jurassic opening of the Gulf of Mexico and located at boundary between United States and Mexico. We demonstrate that it was active during Oligocene. In the Ojinaga area (Chihuahua), Oligocene volcanic sequences overlying the Upper Cretaceous are tightly folded,parallel to the N120º trend of the Rio Grande river.Thus the valley is underlined by a major sinistral fault which separates morphologically the Oligo-Miocene Big Bend Volcanic province of Texas from the tightly folded calcareous Mesozoic limestones of Chihuahua (Mexico). To the east, the sinistral fault-system extends below the Burgos basin. It offsets the Paleocene-Eocene oil-fields of roughly 40-60km.We propose that during the Oligocene,the shear controlled the distribution of the Burgos normal faults as demonstrated by their pattern that is compatible with sinistral wrench.Indeed,the Oligocene depocenters are also offset by ~40km. We conclude that a ~900km long shear zone that might be called the Rio Grande Fault was active during mid-Tertiary with a total offset of 40-60km. Its activity should obviously affect the Tertiary depocenters in southwestern Texas and within the Burgos basin. A major question concerns the possible extension offshore of this system.

SE16-2 CARTEL

GEODYNAMICS OF MID-TERTIARY EXTENSIONAL PHASE IN SOUTHWEST TEXAS AND RELATIONSHIP WITH THE RÍO GRANDE FAULT

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Based on the heat flow,crustal thickness a d deep structural style,Husson et al. and Rangin et al. have argued in preceding papers that southwestern Texas was affected by crustal extension during Tertiary. The extension produced two southwest-northeast elongated zones of lithospheric and crustal thinning that are about 60 km wide and 600 km long. The northwestern one is situated onshore,southeast of the Wilcox fault and the southeastern one is situated offshore,below the Corsair fault zone. The crust appears to have been thinned by about a factor of two,correspondi g to a total extension of about 60 km.The 180 km distance between the two extensional zones gives a wavelength of deformation that is compatible with lithospheric boudi age. Flotté et al. have further demonstrated the existence of a major 900 km long northwest-southeast rectilinear zone of left-lateral shear that was active during mid-Tertiary time with an offset of 40-60 km. The Rio Grande fault zone follows closely the trace of the Rio Grande except where it makes a large eastward excursion in its middle portion. The two extensional zones appear to terminate to the southwest against this Fault Zo e that transfers the 60 km of motion northwestward toward the Big Bend area. The exte sion and the related left-lateral shear are thus parts of a large scale geody amic phenomenon that was most active during mid-Tertiary time. Available evidence indicates that the extensional activity migrated southeastward from Paleocene to Miocene.

SE16-3 CARTEL

MID-TERTIARY CRUSTAL THINNING AND GROWTH FAULT INTERACTIONS ON THE TEXAS SHELF

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Husson et al. have shown that the high heat flow on the southwestern shelf could best be explained by lithospheric extension during mid-Tertiary. Flotté et al. have demonstrated the existence of a zone of left-lateral shear of mid-Tertiary age with an offset of 40-60km, compatible with the amount of extension required by the heat flow anomaly. Yet the usual interpretation of Tertiary tectonics there is purely gravitational. We discuss whether a different structural interpretation can be made involving deep crustal extension. We take into account the fact that the high thermal regime on the southwestern Texan shelf indicates that ductile deformation behavior prevailed during Oligo-Miocene times below about 10km while the upper part underwent a brittle deformation. We discuss on this basis the structural style offshore Texas using recent penetrative reflection seismics. Particular attention is paid to the Corsair fault where the Tertiary infill is up to 10km thick. The heterogeneous distribution of Cretaceous reflectors is interpreted as stretching of the mid-lower crust. Evidence for ductile stretching beneath the main Corsair décollement includes undulations and shearing of that décollement level, and S/C shear bands. Two décollement levels materialize the rheological contrast, according to their respective depths. Additional support and correlations are provided by onshore seismic lines, where older décollement levels also appear at similar depth ranges. Still, gravitational collapse also contributes to extension in the upper crust. The coexistence of the two driving mechanisms is illustrated by crosscutting faults, their orientations and the occasional planar shape of the décollement.

SE16-4 CARTEL

THERMAL EVIDENCE FOR A MID-TERTIARY EXTENSIONAL EVENT IN SW TEXAS

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A systematic analysis of a large database composed of 2000 Reservoir Temperatures and 4250 Bottom Hole Temperatures reveals unexpected features at a regional scale on the Texan and Louisiana shelves,onshore and offshore.A statistical analysis shows that the whole Texas is warmer than Louisiana.At a shorter scale,two NE trending thermal highs lay parallel to one another,along the Corsair (offshore)and Wilcox (onshore)fault zones.

Thermal modeling suggests that a steady state basal heat flow of about 70 to 75 mW/m 2 beneath the Corsair fault zone is required to counteract the heavy blanketing effect,i.e. about 30%higher than the Intermediate zone separating the thermal highs and 50%higher than Louisiana.The temperature distribution with depth altogether with the spatial distribution of the thermal and pressure anomalies exclude fluid flow as a cause of the thermal regime.Our preferred explanation is Tertiary lithospheric extension. The deep seated Tertiary faults on the shelf would be one of the expression of this lithospheric scale extension.The wavelength of the thermal field is compatible with lithospheric boudinage.

A key to the general understanding of the Tertiary tectonics of the Gulf of Mexico shelf is the potential extension of the thermal anomalies toward Mexico.