PITFALLS OF "STRUCTURAL STYLES" ANALYSIS IN FRONTIER BASINS

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RESUMO: "Structural styles" - assemblages of structures thought to be diagnostic of specific stress regimes such as extension or compression - are commonly used as interpretation guidelines in petroleum exploration. However "styles" represent simplistic end members of the very broad spectrum of possible geological structures, and structural trap analysis should consider the entire spectrum of possible structures. Additional complexities are introduced by structural overprinting during multiple tectonic events. The interpreter should consider all structural geometries that are possible as the result not only of tectonic and gravitational stress, but stratigraphic anisotropy, basement anisotropy, prior deformation, and numerous other factors. Shelf-margin structures of the Barreirinhas Basin in northern Brazil provide examples of both atypical structures that do not readily fit into a traditional structural "style", and the complexities introduced by overprinting of multiple deformation events. Initially interpreted as strike-slip features because of their complexity and position near the landward extension of an oceanic fracture zone, the structures represent the overprint of two differing types of gravity-driven thrusting, which Krueger and Gilbert (2008) termed Type III and Type IV deep-water fold belts. Both generations of structures developed along a passive shelf margin over-steepened by massive influx of fine clastics, likely during sea level falls. The initial Santonian (Type III) down-slope sliding occurred along a bedding-parallel detachment that linked a shelfal extension zone (characterized by closely-spaced listric faults) with a downdip zone of stacked imbricate thrust sheets. The entire deformational event was geologically "instantaneous", occurring during an interval in the latest Santonian. A second, Tertiary-age Type IV, cycle of deformation occurred above a non-bed parallel detachment that cut across stratigraphy both in the dip and strike directions to produce a three-dimensionally complex fault system linking listric normal faults updip with imbricate thrusts downdip. This second fault system cut down through the older Santonian system, carrying the older deformed hanging-wall and the footwall within the hanging wall of the Tertiary system. Though not as areally extensive, the latter type of structure was longer lived, with fault motion occurring through much of the Tertiary. Type IV structuration is not unique to the Brazilian Equatorial Margin, occurring along other passive margins, and may provide useful information on the potential collapse of other lithologically homogeneous rock masses such as the Canary and Hawaiian Islands submarine volcaniclastic piles. Similarly, strike-slip or "wrench" structures are erroneously identified in intracratonic basins, based on (1) apparently anomalous variations in stratigraphic thicknesses across faults and (2) what appear to be mixed compressional and extensional deformation across a single fault. In reality demonstrable strike-slip deformation is uncommon. Many "wrench" features prove to be either "Sunda folds" (inverted half-grabens), the margins of partially inverted grabens, or steepening-downward normal faults formed as the result of a strong contrast in mechanical strength between the basement and the sedimentary cover. In actual practice strike-slip deformation can be reliably identified only from map-view analysis, using either specific diagnostic fault map-pattern features or - less commonly - stratigraphic or other piercing points.

PALAVRAS-CHAVE: BARREIRINHAS; DEEPWATER FOLDBELTS.