
A Tale of Two Basins: Hercynian Structural Evolution of the Permian and Arabian Basins

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The Permian basin in west Texas and the "Arabian" basin between Kuwait and the Yemen-Oman borders are Paleozoic foreland basins that were both affected by the Carboniferous Hercynian tectonic event. The basins were located inboard of the subduction-related fold-and-thrust belt and developed similar forced folds as a result of the Hercynian event. Both basins were relatively unmodified by later tectonism and thus are the home of major hydrocarbon accumulations. Basement-involved faults from the Hercynian event partitioned earlier large basins into several sub-basins, and considerable thicknesses of pre-tectonic section were removed from the crests of the forced folds. After the Hercynian event, a post-tectonic clastic section filled in the relict topography of both basins and was in turn covered by an extensive carbonate section. Both basins were affected by Mesozoic tectonic events while relatively proximal Cenozoic tectonism had a greater effect on the basins. The Arabian basin is today again in the foreland of the Zagros convergence zone.

The structural style of the Hercynian in both basins is similar. Structures in both basins originated as forced folds over high-angle basement faults. Because of seismic acquisition challenges, it has been very difficult to image the basement faults in both basins. Structures in the Arabian basin have been reactivated at least three times since the Hercynian, but there is little evidence of later reactivation in the Permian basin. Plays include structural closure at the crests of forced folds and pinchouts of pre-Hercynian section along the flanks of the folds. Sub-thrust plays on the flanks of uplifts that are seen in the Permian basin may also be important in the Arabian basin.
