Anadarko Petroleum Corporation

A DYNAMIC MODEL FOR THE PERMIAN PANHANDLE AND HUGOTON FIELDS, WESTERN ANADARKO BASIN

Raymond P. Sorenson

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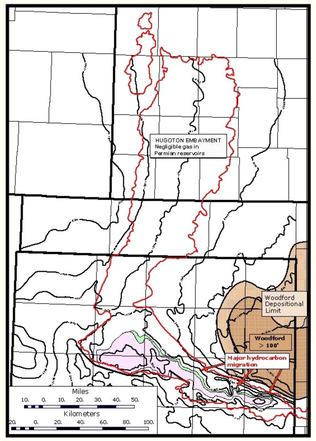
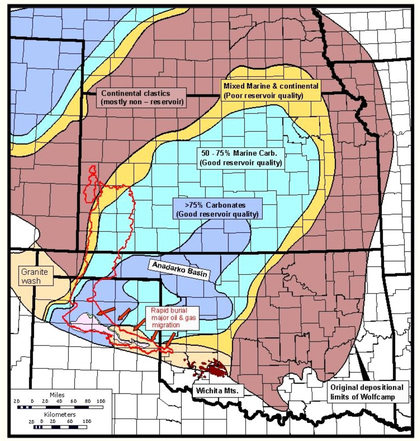
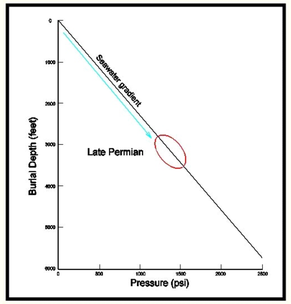
PERMIAN





Upper Wolfcamp facies after Rascoe (1988)



PERMIAN

Early Permian Wolfcampian carbonate deposition took place in an extensive embayment on the northern margin of the Permian Basin.

Regionally continuous carbonate reservoirs were bounded by impermeable continental redbeds along the margins of the depositional basin.

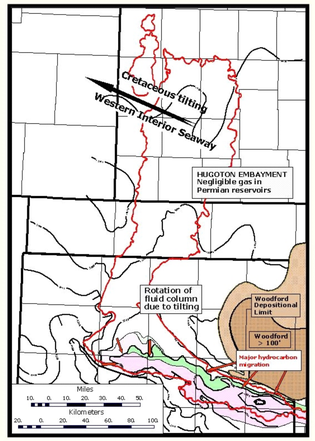
Wolfcampian strata were buried under Middle Permian Leonardian evaporites that originally covered approximately the same geographic area and formed a regional top seal for hydrocarbon accumulation.

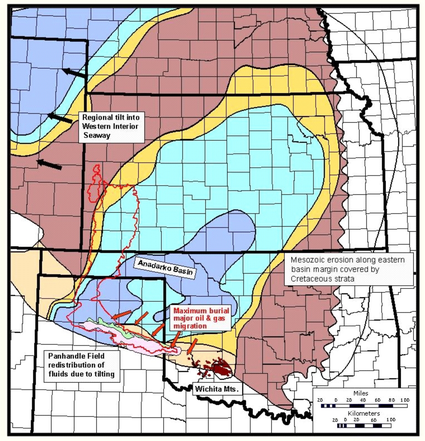
Very early traps formed from drape structures over Amarillo Uplift-Wichita Mountain erosional topography, immediately adjacent to the axis of the Anadarko Basin.

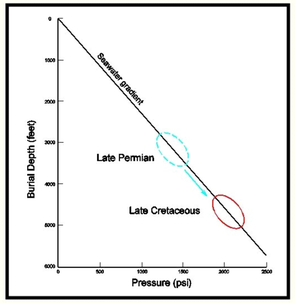
The rapid burial of the deep Anadarko Basin caused hydrocarbon generation from Woodford and other source rocks, with significant migration into the Amarillo Uplift area.

By the end of the Permian, large oil and gas fields had formed in Amarillo Uplift structural traps, with normal reservoir pressures of 1000-1500 psi @ 3-4000 feet burial depths.

CRETACEOUS







CRETACEOUS

The Anadarko Basin and Hugoton Embayment reached its maximum burial depth in the Late Cretaceous or Early Tertiary

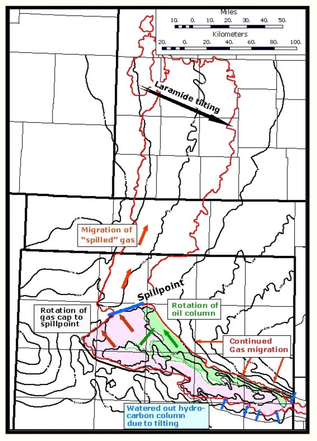
Permian strata were regionally tilted to the west, in the direction of the Cretaceous depositional axis in the Western Interior Seaway

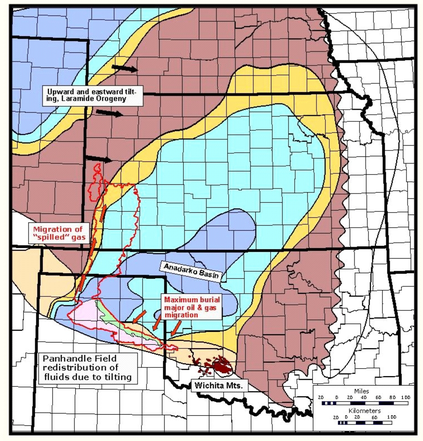
Hydrocarbons continued to migrate into the Amarillo Uplift area throughout the Mesozoic, with increasing gas content as Lower Paleozoic source rocks became overmature, and more gas-prone Pennsylvanian shales reached the generation window

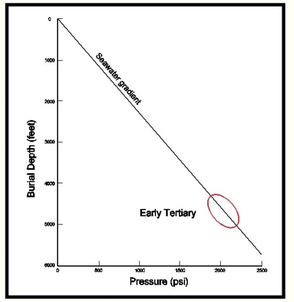
The Panhandle Field became a supergiant structural oil and gas field, with the accumulation shifted to the east of the present - day axis because of the regional western structural tilt

With the gas compressed at a normal pressure gradient of 1500-2500 psi @ 4-6000 feet, the Panhandle Field contained most of the hydrocarbons now found in Midcontinent Permian reservoirs

EARLY TERTIARY







EARLY TERTIARY

The Early Tertiary Laramide orogeny caused regional uplift and eastward tilting in the Midcontinent area.

Removal of Mesozoic overburden began in the Hugoton Embayment area, and erosion of Permian strata occurred near the original depositional margin in eastern Kansas.

Regional tilting redistributed fluids in the Panhandle Field, causing a general westward shift of the oil and gas accumulation, and leaving residual oil saturations throughout large areas of what is now the West Panhandle gas field.

The Panhandle Field maintained a normal pressure gradient of 1500-2500 psi @ 4-6000', as the Wolfcampian reservoirs probably continued to be a regionally sealed container.

If reservoir pressures dropped below approximately 12-1500 psi, the Panhandle Field gas cap would have expanded to the spill point near the West Panhandle – Texas Hugoton boundary, and could have leaked out to migrate north towards Kansas.