


Pecos County, located in the Permian Basin of west Texas, is a deep sedimentary basin within which the Delaware Basin and Central Basin Platform are located. Significant oil and gas activity has occurred here over nearly 100 years. This activity has yielded substantial available well data for temperature and heat flow analyses. While several national-scale heat flow and temperature-at-depth data sets exist, very few county-level studies within Texas are known to be available. Well data from the National Geothermal Data System (NGDS) are used to construct a Pecos County heat flow model and four temperature-at-depth models (3.5, 5.0, 6.5, and 10.0 kilometer depths), using 947 data points available in Pecos County. Wells are distributed throughout the county, with higher well densities occurring in the north, northeast, and south-central portions. A radiogenic heat production model was created to account for radioactive decay within the basement and sedimentary sections. Results show below-average heat flow ($< 65 \text{ mW/m}^2$) across the Central Basin Platform and average to above-average heat flow in the Delaware Basin in comparison to previous national heat flow models. High heat flows ($>90 \text{ mW/m}^2$) were calculated in portions of south and south-central Pecos County. Temperature-at-depth models indicate the lowest temperatures occurring across the Central Basin Platform and eastern Delaware Basin. Temperatures are elevated near the center of the county, with the highest temperatures located in south and south-central Pecos County. Temperature-at-depth model values are comparable with recorded well datapoints around the depth intervals of interest. Maximum temperatures for developed models at 3.5, 5.0, 6.5, and 10.0 kilometer depths are $195 \text{ }^\circ\text{C}$, $213 \text{ }^\circ\text{C}$, $232 \text{ }^\circ\text{C}$, and $273 \text{ }^\circ\text{C}$, respectively. Findings show that calculated heat flow and temperature-at-depth in southern Pecos County is higher than those calculated for the region in existing national-scale models. Higher than average heat flow and temperature-at-depth anomalies can be attributed in part to higher radiogenic heat production (15.26 mW/m^2) and increased model resolution since national-scale heat flow and temperature models were created. Other possible explanations include shallow plutonic complexes, advective groundwater flow, and the Sierra Madera impact and crater. Pecos County has suitable temperatures for geothermal electricity production ($> 150 \text{ }^\circ\text{C}$) at as shallow as 3.5 kilometer depth, and most of the county reaches this temperature by 6.5 kilometers depth. There is potential for co-production of oil and gas and geothermal energy from existing wells at depths where this temperature is met or exceeded.

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