

Burial and Thermal Maturity Modeling of Mesozoic Basins in the South-Central and Southeastern U.S. to Aid in Assessing Hydrocarbon Potential
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The Atlantic Coastal Plain and Piedmont provinces of the U.S. are punctuated by post-Alleghenian extensional basins that formed in response to the opening of the Atlantic Ocean beginning in the Triassic. Five of these basins, Newark (PA and NJ), Taylorsville (VA), Deep River (NC), South Georgia (GA), and an unnamed basin (SC), are being examined to determine whether possible source rock intervals have sufficient thermal maturity for hydrocarbon generation. Exploration in these basins has been sparse; relatively few oil or gas shows have been reported, and there is no commercial hydrocarbon production.

Burial history and thermal maturity models of possible source rock intervals have been constructed for the deepest portion of each basin. Each model stratigraphy was developed from seismic and well data (where available), or from composites of well logs from published and (or) proprietary sources. Source rock thermal maturities are calculated based on temperature, time, and kerogen kinetics, and are expressed in terms of vitrinite reflectance. Given the overall scarcity of vitrinite reflectance and BHT (bottom hole temperature) data for model calibration, the models were constructed using ranges of values for the variables that determine thermal maturity. Examples of these variables include eroded overburden (or maximum burial depth), heat flow, and thermal conductivity. Probabilities associated with the thermal maturity levels were obtained using a Monte Carlo approach. Preliminary model results indicate that at least three of the basins examined may have source rock intervals in the hydrocarbon generation window. The data and model results will ultimately be used by the USGS to assess the undiscovered, technically recoverable oil and gas resources in these basins.