

Thermal Maturity of the U. S. Atlantic Coastal Plain Based on Legacy Exploration and Stratigraphic Test Wells, Including Hatteras Light Esso #1
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The recent vitrinite reflectance study of the Chesapeake Bay impact structure (CBIS), Virginia, highlighted the dearth of U.S. Atlantic Coastal Plain maturity data available for background thermal framework studies, despite numerous deep exploration wells drilled from 1944 to the 1970's. For that study, comparative background maturities were calculated from two modern equilibrated downhole temperature studies. The goal of the current study is to collect downhole vitrinite reflectance data from several mid-late 20th century exploration and stratigraphic test wells, including the Hatteras Light Esso #1, in order to fill the void in maturity information on the ocean edge of the coastal plain from New Jersey to North Carolina. The study will test hypotheses on the coastal plain/ Outer Continental Shelf (OCS) depth to the oil window (0.6%Ro), whether thermal trends are regionally similar, and, if possible, whether pre-Cretaceous Mesozoic strata are Triassic or post-rift Jurassic in age.

Initial data are available from Hatteras #1, North Carolina, and the E. G. Taylor #1-G, Virginia. Hatteras #1 is the deepest and easternmost of the coastal plain wells; its location is about 65 km southwest of the Manteo Exploration Unit, North Carolina OCS. The well reached basement at 9,853 ft and had a total depth of 10,054 ft. Cretaceous and younger marine and terrestrial coastal-plain sediments extend to 9,145 ft where reflectance is ~0.51%Ro. Between 9,145 ft and basement are sediments that have previously been called Triassic ("Newarkian") or Upper Jurassic(?). Reflectance in these sediments is 0.60%, generally continuous with the reflectance trend in overlying strata. This lack of a dramatic downhole jump or increase in maturity precludes the use of reflectance data to draw any conclusions on age or hiatuses for these pre-Cretaceous strata.

The Taylor #1-G well reached basement at 6,272 ft. Reflectance at 6,005 ft near the base of the coastal-plain section is 0.39%. Cuttings from 6,070-6,180 ft, variably designated Triassic or Lower Cretaceous/Jurassic, are 0.47-0.51%Ro. This jump is insufficient, however, given noise in overlying data, to confirm the strata as lower Mesozoic.

The regressed reflectance trends from Cretaceous and younger strata in both Hatteras #1 and Taylor #1-G are similar to that of the Baltimore Canyon COST B-2 (far shelf) OCS well, suggesting comparable regional thermal gradients and depth to the oil window: 0.6%Ro@ 10,000-11,000 ft (~3,200 m).