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ATHENS SHALE IN THE SUBSURFACE NEAR CALERA, ALABAMA FOLD-AND-THRUST BELT: LITHOFACIES, BASIN PROCESSES AND CONDITIONS, AND HYDROCARBON SOURCE POTENTIAL

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ABSTRACT

Lithologic, petrologic, and geochemical studies were performed on a 140-ft-thick core section of the Middle Ordovician Athens Shale recovered near Calera, Alabama, to (1) characterize mudrock lithofacies, (2) evaluate paleo-environmental conditions and processes, and (3) assess regional hydrocarbon-source potential. Four lithofacies are recognized in the core based primarily on the abundance and character of limestone interbeds. Occurring in ascending stratigraphic order, lithofacies A, B, C, and D record a progressive increase in basin slope stability and/or water depth. Lithofacies A, dominated by skeletal limestone lithoclasts, records slope instability and debris-flow deposition. Progressively thinner and finer-grained limestone beds in lithofacies B and C reflect deposition by proximal and distal turbidity currents, respectively. Carbonaceous shales, which become more prevalent upward in lithofacies B through lithofacies D, mainly reflect pelagic/hemipelagic depositional processes. Common pyrite, moderately high organic carbon contents, lack of benthic body fossils, and preservation of very thin beds and laminae indicate that bottom waters were generally oxygen depleted, although sparse occurrences of compacted burrow fills in lithofacies D indicate at least periodic episodes of slightly improved redox conditions. Geochemical proxies for redox conditions yield ambiguous results, but provide some support for the inferred improvement in basin oxygenation through time. Rock-eval analyses indicate that the Athens Shale in the Calera area is thermally overmature and may be considered a spent source rock.

PINE HALL FORMATION: TYPE SECTION DESIGNATED – DAN RIVER BASIN, STOKES CO., NORTH CAROLINA

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ABSTRACT

The Late Triassic (Norian) Dan River basin is a continuous gas assessment unit (AU). The rift-lacustrine basin, formed from the opening of the Atlantic Ocean, is filled with Triassic strata divided into five formations that in ascending stratigraphic order are: 1) the Pine Hall, 2) Walnut Cove, 3) Dry Fork, 4) Cow Branch and 5) Stoneville formations.

The North Carolina Geological Survey's (NCGS) 2015 "Town of Walnut Cove" (SO-C-01-15) drill hole was continuously cored to a depth of 1,477 ft ending in metamorphic basement rocks (Reid and others, 2015). The purpose of drilling was to investigate the basin's unconventional hydrocarbon resource potential. The drill hole apparently cored the entire Pine Hall Formation, and afforded the opportunity to designate the formation's type section.

The Pine Hall Formation type section is hereby designated as represented by the core from a depth of 423.7 ft to 1,451.2 ft, including a basal pebble conglomerate from a depth of 1,414.5 ft to 1,451.2 ft immediately above the unconformable Paleozoic metamorphic basement contact in core hole SO-C-01-15. Most of the Pine Hall Formation consists of recurring fining upward "packages" of gray, medium- to coarse-grained sandstone (frequently calcareous) deposited as 4-6-inch high foreset cross-bed packages (~1-10 ft-thick) capped by either red siltstone, or gray-to-black, organic-rich siltstone or mud-stone with diverse pedogenic features. Moderate porosity and permeability suggests the Pine Hall Formation as a potential reservoir for continuous hydrocarbon accumulations. The shale and siltstone beds that are interbedded with coarser-grained strata may act as effective seals.

Previous workers did not designate a type section due to lack of stratigraphically informative, continuous sections. Olsen and others (2015) designated a lectostratotype from 573.0-806.2 ft core depth in nearby core hole SO-C-02-81, where it consists primarily of red clastic rocks with abundant carbonate nodules and mottled strata of pedogenic origin.

**MIDDLE PLEISTOCENE ESTUARINE DEPOSITS, BLOUNTS BAY AREA,
BEAUFORT COUNTY, EASTERN NORTH CAROLINA**

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ABSTRACT

Sand and mud beds exposed in river bluffs in the vicinity of Blounts Bay, south shore of the Pamlico River, are the northern equivalent of the middle Pleistocene Flanner Beach Formation, known primarily from outcrops along the Neuse River 45 km to the south. The Blounts Bay deposits are sparsely fossiliferous and record deposition in the inner parts of a large coastal lagoon, comparable to the modern Pamlico Sound. The lower dark-colored mud division is named the Hills Point Member; the upper lighter-colored interlayered sand and mud division is the Mauls Point Member. Both subdivisions are lithologically distinctive and laterally continuous for ca. 15 km, NW to SE, in discontinuous cliff exposures. It appears that little attention has been paid to these important outcrops, which reveal the facies organization of the inner portion of an extensive, interglacial, backbarrier estuarine system. Relationships to apparently coeval deposits exposed in the Lee Creek Mine to the east and to depositional cycles preserved in the thick late Cenozoic succession within the Albemarle Embayment to the north remain unclear.

**THE CYPRAEIDAE AND OVULIDAE (MOLLUSCA; CAENOGASTROPODA) FROM
THE COOK MOUNTAIN FORMATION (BARTONIAN, MIDDLE EOCENE) OF THE
GULF COASTAL PLAIN, SOUTHERN UNITED STATES: A PROVINCE OF
UNSUSPECTED GENERIC ORIGINS**

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ABSTRACT

The fossil assemblage of Cypraeoidea from the Gulf Coastal Plain Lutetian-Bartonian section comprises only one Cypraeidae and six Ovulidae. The five species previously published were misidentified at the generic level. The single Cypraeidae among this assemblage represents a genus new to science. Among the six Ovulidae are precursors of living *Pseudosimnia* (*s.s.*), *Cymbovula* (*s.s.*) and *Primovula* (*s.s.*). New taxa include *Garviea* n. gen., *Allmoniella* n. gen., *A. magnolia* n. sp., *Pseudosimnia* (*Vokesina*) n. subgen., *P. (V.) anteana* n. sp., *Cymbovula* (*Winklea*) n. subgen., and *Primovula* (*Squiresia*) n. subgen. This revision portrays a revolutionary view of generic origins with first appearance data among the middle Eocene Cypraeoidea of the Gulf Coastal Plain of the Southeastern United States. Comparisons are made with the Middle Eocene Ovulidae of western France, and a new ovulid genus *Lozouetina* is named from the French Bartonian.