the East Texas and Central Mississippi salt basins also indicate thinned crust. Thus, a probable explanation for the intervening Sabine and Monroe uplifts is that they represent areas of unstretched or only slightly stretched lithosphere. This juxtaposition of thermally perturbed lithosphere with unperturbed or only slightly perturbed material is similar to interactions between oceanic crust of different ages across a fracture zone. A thermal-mechanical model describing lateral conduction of heat and mechanical coupling of the lithosphere across this boundary is presented. Effects of finite extension rate, increasing mechanical thickness with age as the lithosphere cools, and thermal blanketing by overlying sediment are included. Subsidence history, heat flow, and sedimentary stratigraphy predicted from this model are compared with observational data.

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Geochemical Study of Depletion of Elements During Retorting of Oil Shales from Lewis County, Kentucky

The prospect of oil shales as an alternative means of hydrocarbon production has sparked concerns as to the chemical composition of the original shale as well as that of the spent shale, oil, water, and gas fractions produced due to retorting. This study is concerned with a chemical concentration comparison between raw and spent shales from Lewis County, Kentucky. Eighteen elements (Si, Ti, Al, Fe, Mg, Ca, Na, K, P, Ba, Co, Cr, Cu, Mo, Ni, Pb, V, and Zn) were investigated in two shale lithologies: the Sunbury and Cleveland Shales. Three slightly different modified Fischer Assay procedures were compared for their effects on the resulting spent shale chemistry. Two procedures employed sweep gases (nitrogen and steam), while the third used no gas sweep. The heating rates during the procedure were also varied.

It was found that the employment of a sweep gas throughout the retorting procedure induces a measurable degree of depletion over a no gas sweep procedure. The gas flow enhances the effectiveness of pyrolysis, and aids in the formation of aerosols in which elements are carried out of the retort to be condensed in the oil and water fractions.

It was also found that differences in original shale mineralogy (e.g., elemental substitutions in major minerals and trace mineral compositions) was responsible for differential elemental depletions seen in the two lithologies.

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Paleoslope Models of Miocene-Pliocene and Campanian-Lower Maestrichtian Foraminifera of Maryland and New Jersey

Paleobathymetric or paleoslope models of the distribution of benthic foraminifera have been constructed for strandline to slope environments of deposition for the Campanian-lower Maestrichtian and the Miocene-Pliocene of the coastal plain of Maryland and New Jersey. Samples from outcrops and downdip wells in formations deposited during four cycles of sea level change in the Miocene-Pliocene and four in the Campanian-lower Maestrichtian are the data base from which the models are constructed. Foraminiferal distributions analyzed downdip in a paleoslope direction and vertically in stratigraphic section utilizing Walther's Law provide a rigid measure of the juxtaposition of biofacies and allow integration of biofacies from each sea level cycle into a single paleoslope profile. Distance downdip in the structurally uncomplicated passive margin of the coastal plain, used as a measure of increasing paleodepth, is a constraint on the estimation of bathymetry of each biofacies. The result is a paleoslope model that relates paleodepth to the abundance distribution of benthic species along the profile. This allows a more critical evaluation of the role played by benthic species in the shelf–upper slope environments during Miocene-Pliocene and Campanian-Maestrichtian times.

Miocene-Pliocene species that have maximum development in 0 to 25 m (82 ft) depth include *Elphidium gunteri, Buliminella elegantissima*, and *Nonionella auris*. Species characteristically developed in 30 to 50 m (100 to 165 ft) are *Cibicides lobatulus, Fursenkoina fusiformis*, and *Bolivina multicostata. Hanzawaia concentrica, Florilus atlantica, Textularia agglutinans*, and *Bolivina paula* are among several species with maximum abundance in 50 to 100 m (165 to 300 ft). In 100 to 200 m (330 to 660 ft) are peak occurrences of *Hanzawaia berthelotti, Spihogenerina spinosa, Cassidulinoides bradyi, Bolivina fragilis*, and *Stilostomella bradyi*. Species with distributions greater than 200 m (660 ft) include *Gyroidina regularis, Sigmoilina tenuis, Bulimina spicata, Oridorsalis tener*, and *Pullenia salisburyi*.

Campanian–lower Maestrichtian species with peak abundances in 10 to 50 m (33 to 165 ft) include *Lenticulina pseudosecans, Citharina suturalis, Pullenia americana*, and *Clavulina clavata*. Species abundant in 50 to 100 m (165 to 330 ft) are *Gaudryina stephenson, Clavulina trilatera, Gavelinella pinguis*, and nodosarids. Maximum occurrences of *Praebulimina carseyae, Coryphostoma plaitum, Loxostomum eleyi, Globorotalites micheliniana*, and *Gavelinella spissocostata* are identified with 100 to 200 m (330 to 660 ft). *Heterostomella americana, Osangularia cordierana, Stensioina exculpta gracilis, Pullenia cretacea*, and *Gavelinella ammonoides* are indicative of depths greater than 200 m (660 ft).

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Chemical Composition of 116 Gulf Coast Lignite Samples

Proximate and ultimate analyses, heat content, and forms of sulfur have been determined for 116 Gulf Coast lignite samples. In addition, the chemical composition of 10 oxides and 29 trace elements has been determined. The lignite samples are from strata assigned to the Wilcox Group and were collected from localities in Texas, Arkansas, Mississippi, and Alabama; the Claiborne Group in Arkansas and Tennessee; the Jackson Group in Arkansas; and the Midway Group in Alabama.

The ranges of the geometric means for elements Ga, Hg, Mo, Sc, U, V, and Y show small variation between sample localities; Co, Cr, La, Mn, Se, Zn, and Zr show larger variations. The average ash content for the lignite samples is 20.3%.

The arithmetic means of proximate and ultimate analyses show that moisture, oxygen, and sulfur contents are higher on the eastern side of the Mississippi embayment, and that volatile matter, fixed carbon, and BTUs are higher on the western side.

The trace-element content of the lignite samples in the vicinity of the igneous intrusives of Magnet Cove, Arkansas, show a systematic decrease in concentrations of 13 elements, both areally and stratigraphically away from the intrusives. This strongly suggests a source relationship of the elements to the Magnet Cove area.