THE DEPARTMENT OF NATURAL RESOURCES

mississippi geology

Bureau of Geology
2525 North West Street
Jackson, Mississippi 39216

Volume 3, Number 4
June 1983

SOURCE OF THE VOLCANIC PRECURSOR TO UPPER CRETACEOUS BENTONITE IN MONROE COUNTY, MISSISSIPPI

Robert K. Merrill
Mississippi Bureau of Geology

Abstract

The Midnight Volcano and other volcanic structures associated with the Sharkey Platform are named as the source of ash from which Upper Cretaceous bentonite deposits of Monroe County, Mississippi, were derived. Age dates from three wells acquired by the Mississippi Bureau of Geology combined with previously published age dates give excellent time stratigraphic correlation with nannofossil data reported from the Tombigbee Sand which encloses the bentonite deposits. A Campanian age is assigned to the bentonite deposits as well as to the undersaturated phonolitic source material derived from the Sharkey Platform and Midnight Volcano. Exchangeable calcium in the montmorillonite structure of the bentonite and the lack of associated free silica in the bentonite deposits are compatible with a relatively undersaturated parent volcanic material.

Previous works

Economic bentonite deposits located in Monroe County, Mississippi, south of Aberdeen were first reported by Logan in 1907 as "joint clay," seven feet in thickness. Grim (1928) studied these deposits in more detail and

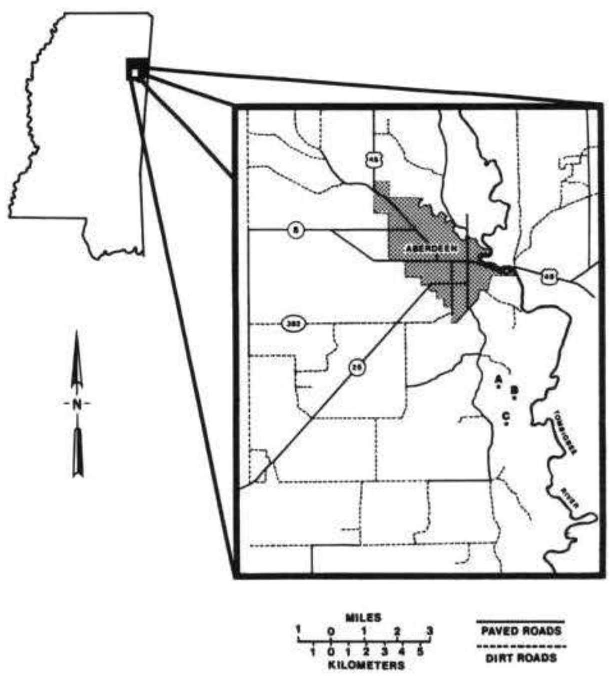

Figure 1. South central portion of Monroe County, enlarged to show sampling localities at I. M. C., Inc. (A), Fowlkes, Inc. (B), and Filtrol, Inc. (C). Adapted from Monroe County, Mississippi, highway map (1976).

reported a volcanic precursor to the alteration product bentonite. Morse (1934) further discussed Monroe County material in a statewide bentonite study. Bay (1935) discussed Monroe County bentonite in a report on bleaching clays of Mississippi. The first quantitative study of these deposits was performed by Torries (1964) and included the physical properties of the clay, x-ray analysis, and scanning electron microscope (SEM) photomicrographs of the clay depicting mineral inclusions and coccoliths present in the bentonite. Grim and Guven (1978) discussed national and international bentonite occurrences in detail, giving SEM, x-ray, and chemical characteristics of the many samples they observed. SEM photomicrographs illustrating volcanic structures and authigenic fabrics of the clay, x-ray analyses to determine expansibility of the bentonite, as well as paleontological and statistical studies of the sediments enclosing the bentonite were reported by Merrill (1981), wherein the bentonite was shown to have been formed by alteration of volcanic ash in seawater.

The purpose of the present study is to ascertain the source and character of the volcanic ash from which the bentonite formed.

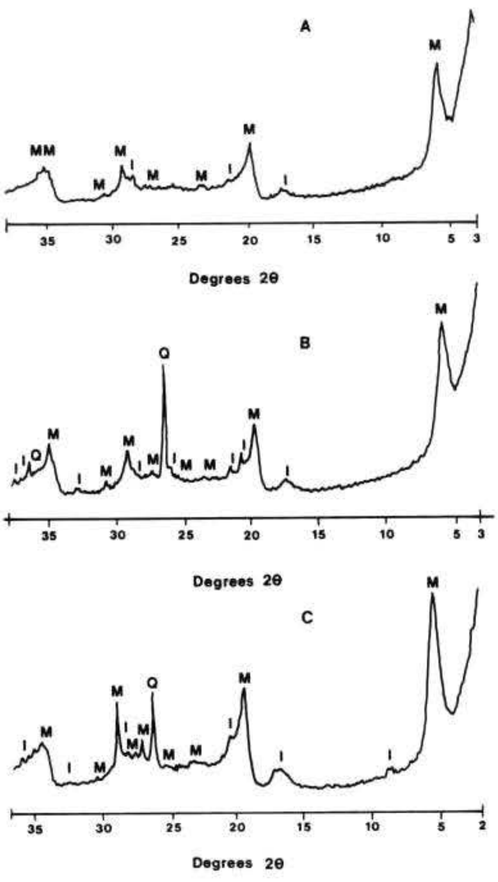

Figure 2. X-ray diffractograms of bentonite from I. M. C. (A), Fowlkes (B), and Filtrol (C). Minerals are indicated above peaks as Montmorillonite (M), Illite (I), and Quartz (Q).

Clay Morphology and Mineralogy of the Bentonite

Bentonite deposits located approximately 3 miles (4.8 kilometers) south of Aberdeen, Mississippi, are designated in Figure 1 by letters which correlate with x-ray diffractograms shown in Figures 2 through 5. Unoriented slides were prepared to determine the mineralogy of the clay (Figure 2). Samples from each of the three localities were prepared and analyzed according to the method described by Warshaw and Roy (1961). Each sample was prepared from an aqueous suspension of dispersed clay and dried on a porcelain slide at 60°C. The samples were then glycolated and x-rayed again to determine expansibility of the bentonite. The presence of illite was determined by heating each slide to 550°C. Figures 3 through 5 illustrate the expansibility upon glycolation (17 angstrom group) and collapse of the montmorillonite structure upon heating to 550°C. The principal clay mineral observed in the bentonite is montmorillonite, with trace amounts of illite and quartz (Figure 2) found in each locality studied. No cristobalite was detected in any of the samples.

Relict volcanic columnal structures as well as bubble structures and platy, angular fragments that have altered to smectite are illustrated in Figures 6 and 7. Columnal structures are formed as shards are stretched in the flow direction of the tuff under conditions of high temperatures

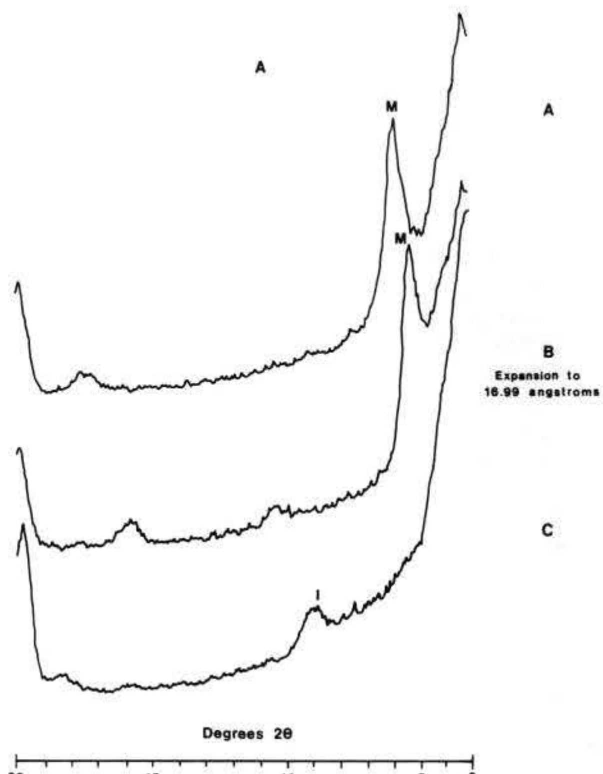

Figure 3. X-ray diffractograms of bentonite sample collected at I. M. C., Inc.; dry (A), glycolated (B), and heated to 550°C (C).

and the presence of volatiles during initial deposition of the ash (Ross and Smith, 1961). Figure 7 illustrates platy, angular morphology of glass shards and relict bubble structures, which also indicate a volcanic origin. Figure 8 illustrates the highly wrinkled and delicate morphology of the bentonite. Highly wrinkled (Figure 8) and honeycomb-like morphologies (Figure 6) are described by Almon, et al. (1976) and Wilson and Pittman (1977) as characteristic of authigenic clays. The homogeneous character as well as the highly developed, delicate, crystalline texture of the smectite would have been destroyed if transport had occurred subsequent to alteration of the parent volcanic glass. Wise and Weaver (1979) report similar structures in Oligocene bentonite from Smith County, Mississippi, and from the island of Ponza off the west coast of Italy.

The Source Volcanic Material

The Tombigbee Sand Member of the Eutaw Formation encloses the bentonite deposits located in Monroe County (Figure 1). Smith and Mancini illustrated planktonic nannofossils (coccoliths) present in the Tombigbee Sand at Plymouth Bluff, in the Biostratigraphy section of Russell et al. (1982), wherein an early Campanian age was assigned to the Tombigbee Sand. According to Odin (1982) the Campanian Stage encompasses that portion of the Upper Cretaceous occurring between 71 and 84 million years (m. y.) ago. Volcanism was widespread in the Gulf Coastal Plain during that time. Hunter and Davies (1979) discussed thick accumulations of volcaniclastic fan materials covering parts of northeastern Texas, southern Oklahoma, and southern Arkansas, composed of phonolitic and trachytic rock fragments in a matrix of peridotitic and phonolitic tuff deposited by braided stream and debris flow processes. Volcanic activity continued into Austin (Upper Cretaceous) time as new centers developed in south-central Texas and the Monroe-Sharkey uplift (Hunter and Davies, 1979). Braunstein and McMichael (1976) reported an Upper Cretaceous buried volcanic vent in the area of the present Mississippi River delta and described angular fragments of porphyritic basic rock radiometrically age dated at 82±3.4 m. y., or Late Cretaceous (Austin). The Tuscaloosa and Eutaw Formations of the Upper Cretaceous contain large amounts of pyroclastic and tuffaceous material in the depositional basin between the Sharkey Platform and the Jackson Dome (Harned, 1960). Cretaceous volcanism was responsible for the uplift of the Sharkey Platform and Jackson Dome (Harrelson and Bicker, 1979). Extrusive phonolite is the most common igneous rock identified from the Jackson Dome (Harrelson, 1981). In Humphreys, Sharkey, Sunflower, and western Yazoo counties, the en-

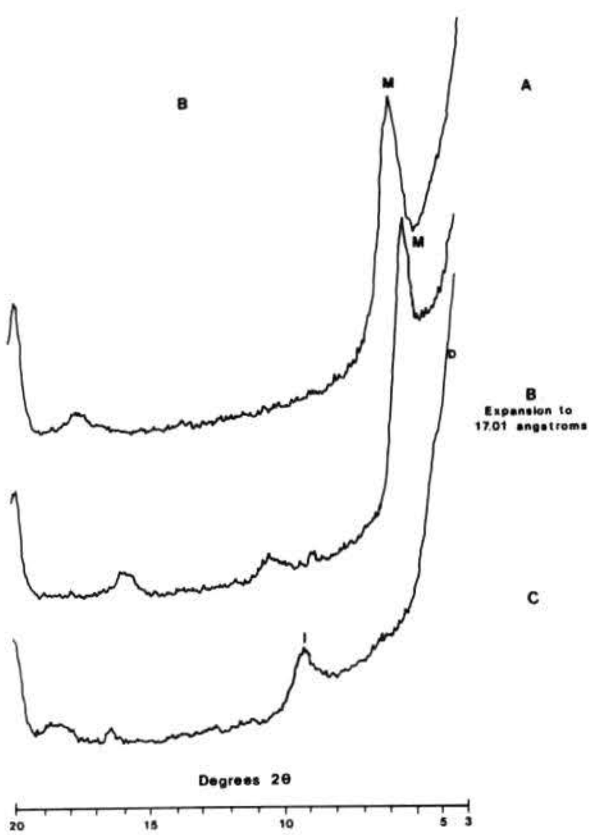

Figure 4. X-ray diffractograms of bentonite sample from Fowlkes, Inc., Mine; dry (A), glycolated (B), and heated to 550°C (C).

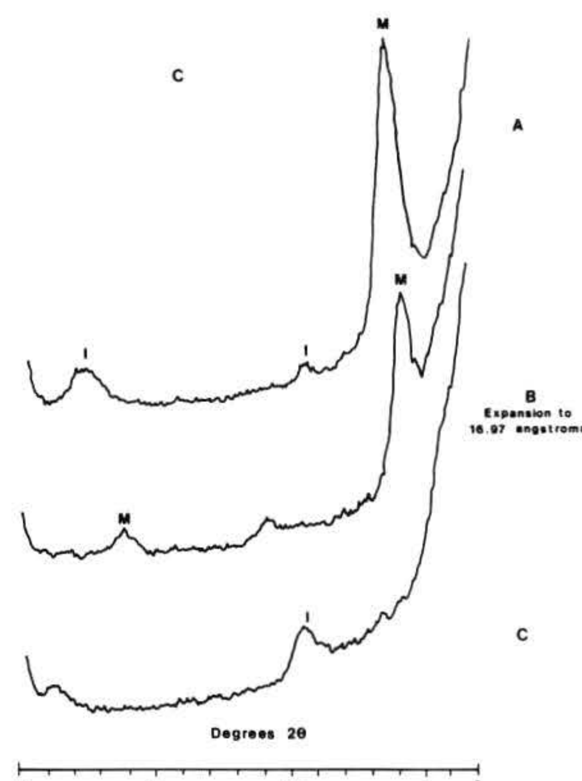

Figure 5. X-ray diffractograms of bentonite sample from Filtrol, Inc., Mine; dry (A), glycolated (B), and heated to 550°C (C).

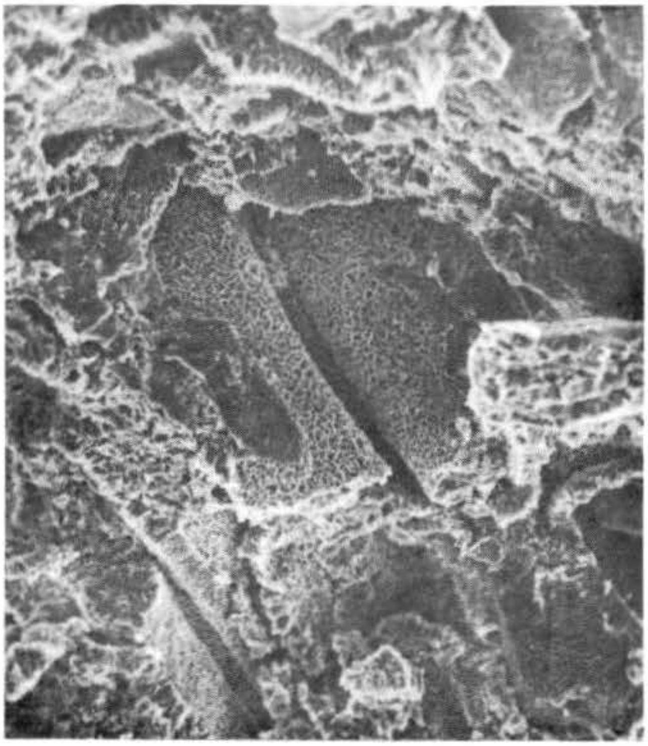

Figure 6. Scanning electron photomicrograph showing honeycomb smectite texture at surface of columnal structures in bentonite sample collected from locality A (750 x).

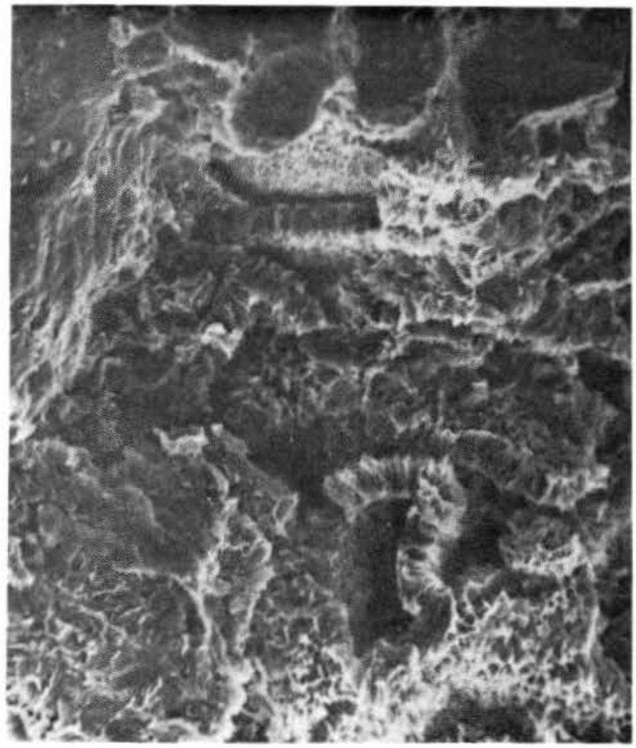

Figure 7. Scanning electron photomicrograph revealing bubble structures and platy, angular fragments of shards that have completely altered to smectite in bentonite sample from locality A (1500 x).

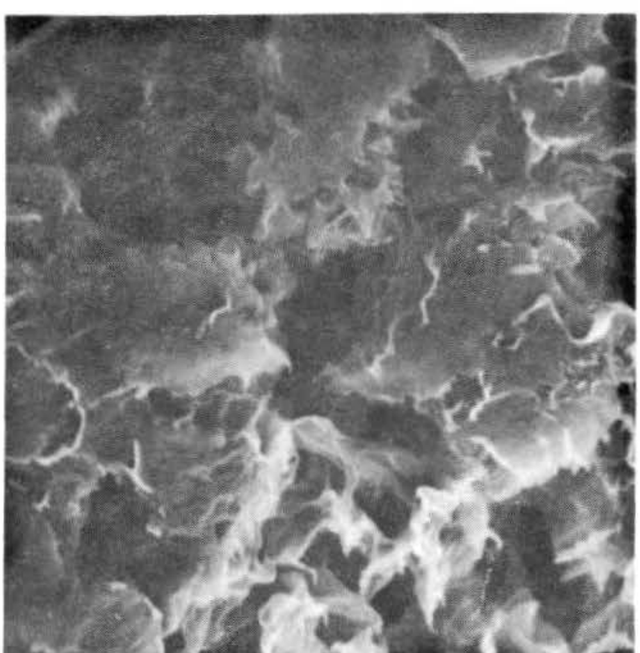

Figure 8. Scanning electron photomicrograph revealing the highly wrinkled, delicate texture of smectite platelets in bentonite sample collected at locality A (5000 x).

tire lower and part of the upper Eutaw Formation contain an abundance of pyroclastic material, and approaching the Sharkey Platform, the entire Eutaw section has increasing amounts of tuffaceous sands and water-laid volcanic material (McGlothlin, 1944). Cook (1975) described a thick sequence of volcaniclastic and volcanic intrusive and extrusive rock in southern Humphreys County. This sequence is referred to as the Midnight Volcano (Mellen, 1958). Sundeen and Cook (1977) reported a phonolite from a depth of 5172 feet radiometrically age dated at 78.3±2.9 m. y., and a biotite analcimite at a depth of 4224 feet having an age of 91.3±3.4 m. y.

Radiometric age dates performed by Krueger Enterprises for the Mississippi Bureau of Geology, for the purpose of an in-depth statewide study of igneous rocks in Mississippi, afford greater insight into Late Cretaceous volcanism in Mississippi. Three of these age dates are reported herein, although a complete report of igneous activity in Mississippi is forthcoming in bulletin form.

Magnetic anomaly maps indicate that the #1 C. B. Box well described by Cook (1975) is on the flanks of a larger structure located in south-central and central Sharkey County. Phonolite from a depth of 4045 feet gives an age date of 65.8±2.7 m. y., indicating that volcanism probably extended over a period of as much as 31.6 m. y. when compared with the biotite analcimite dated at 91.3 ± 3.4 m. y. reported by Sundeen and Cook (1977). Radiometric age dates determined from phonolite recovered from the

Jackson Dome indicate that volcanism associated with the Sharkey Platform and Jackson Dome occurred contemporaneously. Radiometric K-Ar age dates from extrusive material at a depth of 3197-99 feet in the State #2 Fee well in Hinds County and 4075-85 feet in Rankin County's Gulf #1 Hamilton render ages of 73.5 ± 2.8 and 74.8 ± 2.8 m. y., respectively. These dates correlate well with the 78.3 ± 2.9 m. y. phonolite from the #1 C. B. Box well in Humphreys County reported by Sundeen and Cook (1977). A northwest-southeast trend of contemporaneous volcanism in Mississippi is supported by the Door Point volcanic sequence (82 ± 8 m. y.) in the vicinity of the present Mississippi River delta (Braunstein and McMichael, 1976). These age dates indicate that volcanism was widespread in what is now Mississippi in Campanian time, and correlate well with nannofossil data reported from the Tombigbee Sand by Mancini and Smith *in* Russell et al. (1982). The source of volcanic material from which the Monroe County bentonite formed is therefore proposed to be the Midnight Volcano and associated structures on the Sharkey Platform. Minor amounts of volcanic material were possibly contributed by volcanics associated with the Jackson Dome, and possibly from as far south as the Door Point vent. However, due to its proximity to present Monroe County bentonite deposits, volcanic ejecta associated with the Sharkey Platform was probably the main source.

The composition of the ash determines the nature of any bentonite deposits subsequently formed. The nature of the exchangeable cations must be derived from the composition of the parent material (Grim and Guven, 1978). Some interesting differences exist between western U. S. sodium-rich bentonites and southern U. S. calcium-rich bentonites. The original composition of pyroclastic material from which the Clay Spur bentonite and other bentonite deposits in the Black Hills area were derived was akin to that of alkalic rhyolites (Knechtel and Patterson, 1962). These sodium-rich bentonite deposits occurring in the northern Black Hills district and elsewhere in Wyoming, South Dakota, and Montana usually have associated chert-like layers which were probably formed from silica leached from the glassy constituents of the volcanic ash after

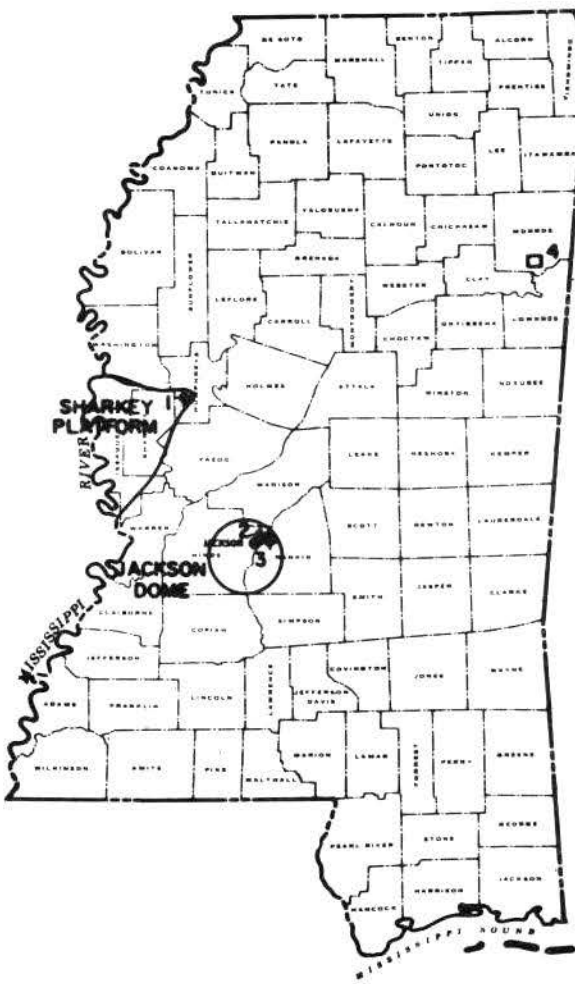

Figure 9

	well	location	depth (feet)	age (million years)	reference
1)	Union Prod. Co. #1 C. B. Box	Humphreys Co. S15, T14N, R4W	4045	65.8 ± 2.7	Miss. Bureau of Geology
			5172	78.3 ± 2.9	Sundeen and Cook, 1977
			4224	91.3 ± 3.4	
2)	State of Miss. #2 Fee	Hinds Co. S25, T6N, R1E	3197-3199	73.5 ± 2.8	Miss. Bureau of Geology
3)	Gulf #1 Hamilton	Rankin Co. S4, T5N, R2E	4075-4085	74.8 ± 2.8	Miss. Bureau of Geology
4)	Study area, south-central Monroe County, Mississippi				

burial. Mississippi bentonites have no associated chert-like or siliceous beds. This is probably due to the relatively undersaturated nature of the source material. No free silica in the form of cristobalite was detected by x-ray analysis of the Monroe County bentonites (Merrill, 1981). It is probable that the calcium in the montmorillonite structure of Monroe County bentonites was derived from the undersaturated ash, and that all available silica was utilized in the alteration process. This undersaturated source material probably contained appreciable magnesium necessary in the formation of bentonite.

References Cited

Almon, W. R., L. B. Fullerton, and D. K. Davies, 1976, Pore space reduction in Cretaceous sandstones through chemical precipitation of clay minerals: Journal of Sedimentary Petrology, v. 46, no. 1, p. 89-96.

Bay, H. X., 1935, A preliminary investigation of the bleaching clays of Mississippi: Mississippi Geological Survey, Bulletin 29, 62 p.

Braunstein, J., and C. E. McMichael, 1976, Door Point: a buried volcano in southeast Louisiana: Gulf Coast Association of Geological Societies, Transactions, v. 26, p. 79-80.

Cook, P. L., 1975, Petrography of an Upper Cretaceous volcanic sequence in Humphreys County, Mississippi: Master's thesis, Univ. of Southern Mississippi, 66 p.

Grim, R. E., 1928, A preliminary report on bentonite in Mississippi: Mississippi Geological Survey, Bulletin 22, 14 p.

Grim, R. E., and N. Guven, 1978, Bentonites: geology, mineralogy, properties and uses: Developments in Sedimentology, no. 24, Elsevier Sci. Pub. Co., New York, 256 p.

Harned, W. V., 1960, Upper Cretaceous igneous activity in Mississippi: Master's thesis, Univ. of Mississippi, 46 p.

Harrelson, D. W., 1981, Igneous rocks of the Jackson Dome, Hinds - Rankin Counties, Mississippi: Mississippi Geology, v. 1, no. 4, p. 7-13.

Harrelson, D. W., and A. R. Bicker, 1979, Petrography of some subsurface igneous rocks of Mississippi: Gulf Coast Association of Geological Societies, Transactions, v. 29, p. 244-251.

Hunter, B. E., and D. K. Davies, 1979, Distribution of volcanic sediments in the Gulf Coastal Province - significance to petroleum geology: Gulf Coast Association of Geological Societies, Transactions, v. 29, p. 147-155.

Knechtel, M. M., and S. H. Patterson, 1962, Bentonite deposits of the northern Black Hills District, Wyoming, Montana, and South Dakota: U. S. Geological Survey, Bulletin 1082-M, p. 893-1030.

Logan, W. N., 1907, The clays of Mississippi. Part I, Brick clays and clay industry of northern Mississippi: Mississippi Geological Survey, Bulletin 2, 255 p.

McGlothlin, T., 1944, General geology of Mississippi: American Association of Petroleum Geologists Bulletin, v. 28, no. 1, p. 29-62.

Mellen, F. F., 1958, Cretaceous shelf sediments of Mississippi: Mississippi Geological Survey, Bulletin 85, 112 p.

Merrill, R. K., 1981, Genesis of bentonite in the Upper Cretaceous strata of Monroe County, Mississippi: Master's thesis, Univ. of Mississippi, 64 p.; Mississippi Mineral Resources Institute, Rept. of student investigations no. 820, 45 p.

Morse, H. M., 1934, A supplementary report on bentonite in Mississippi: Mississippi Geological Survey, Bulletin 22-A, 32 p.

Odin, G. S., 1982, The Phanerozoic time scale revisited: Episodes, v. 1982, no. 3, p. 3-9.

Ross, C. S., and R. L. Smith, 1961, Ash-flow tuffs: their origin, geologic relations, and identification: U. S. Geological Survey, Professional Paper 366, 81 p.

Russell, E. E., D. M. Keady, E. A. Mancini, and C. E. Smith, 1982, Upper Cretaceous in the Lower Mississippi Embayment of Tennessee and Mississippi: Lithostratigraphy and biostratigraphy: Field Trip Guidebook, 1982 Annual Meeting of the Geological Society of America, 50 p.

Sundeen, D. A., and P. L. Cook, 1977, K-Ar dates from Upper Cretaceous volcanic rocks in the subsurface of west-central Mississippi: Geological Society of America Bulletin, v. 88, no. 8, p. 1144-1146.

Torries, T. F., 1964, Geology of the northeast quarter of the West Point, Mississippi, Quadrangle, and related bentonites, *in* Mississippi Geologic Research Papers - 1963: Mississippi Geological Survey, Bulletin 102, p. 62-98.

Warshaw, C. M., and R. Roy, 1961, Classification and a scheme for the identification of layer silicates: Geological Society of America Bulletin, v. 72, no. 10, p. 1455-1492.

Wilson, M. D., and E. D. Pittman, 1977, Authigenic clays in sandstones: recognition and influence on reservoir properties and paleoenvironmental analysis: Journal of Sedimentary Petrology, v. 47, no. 1, p. 3-31.

Wise, S. W., Jr., and F. M. Weaver, 1979, Volcanic ash; examples of devitrification and early diagenesis: Scanning Electron Microscopy, v. 1979, part I, p. 511-517.

RECENT ACQUISITIONS, BUREAU OF GEOLOGY LIBRARY

Compiled by Carolyn Woodley, Librarian
Mississippi Bureau of Geology

Appalachian Geological Society, 1982, Structural development and deformation of the Allegheny frontal zone and Wills Mountain anticlinorium - The central Eastern Overthrust belt: Appalachian Geological Society, 108 p.

Asquith, G., 1982, Basic well log analysis for geologists: Tulsa, Okla., American Association of Petroleum Geologists, 216 p.

Baar, C. A., 1977, Applied salt rock mechanics I - the in-situ behavior of salt rocks: N. Y., Elsevier, 294 p.

Case, L. C., 1977, Water problems in oil production: Tulsa, Okla., Pennwell, 163 p.

Collinson, J. D., 1982, Sedimentary structures: London, Allen & Unwin, 194 p.

Condie, K. C., 1982, 2nd ed., Plate tectonics and crustal evolution: N. Y., Pergamon Press, 310 p.

Dahlberg, E. C., 1982, Applied hydrodynamics in petroleum exploration: N. Y., Springer-Verlag, 161 p.

Handford, C. R., et al., eds., 1982, Depositional and diagenetic spectra of evaporites - a core workshop: Tulsa, Okla., Society of Economic Paleontologists and Mineralogists, SEPM Core Workshop No. 3, 395 p.

Elf-Aquitaine, 1982, rev. ed., Exploration for carbonate petroleum reservoirs: N. Y., Wiley, 213 p.

Halbouty, M. T., 1982, Deliberate search for the subtle trap: Tulsa, Okla., American Association of Petroleum Geologists, 351 p.

Harms, J. C., et al., eds., 1982, Structures and sequences in clastic rocks: Tulsa, Okla., Society of Economic Paleontologists and Mineralogists, SEPM Short Course No. 9, various paging.

Link, P. K., 1982, Basic petroleum geology: Tulsa, Okla., Oil and Gas Consultants International, Inc., 235 p.

McElhinny, M. W., 1981, Paleoreconstruction of the continents: Washington, D. C., American Geophysical Union, 194 p.

Matthes, G., 1982, Properties of groundwater: N. Y., Wiley, 432 p.

Miall, A. D., 1981, Analysis of fluvial depositional systems: Tulsa, Okla., American Association of Petroleum Geologists, AAPG Education Course Note Series No. 20, 75 p.

Narasimhan, T. N., ed., 1982, Recent trends in hydrogeology: Boulder, Col., Geological Society of America, GSA Special Paper 189, 446 p.

Rachocki, A. H., 1981, Alluvial fans: N. Y., Wiley, 161 p.

Russell, E. E., et al., 1982, Upper Cretaceous in the lower Mississippi Embayment of Tennessee and Mississippi, lithostratigraphy and biostratigraphy: Geological Society of America, Field trip guidebook for the 1982 annual meeting, 50 p.

Sinkankas, J., 1976, Gemstones of North America: N. Y., Reinhold, pub. in 2 vols.

Steward, D. B., 1981, Tuscaloosa trend of south Louisiana: New Orleans Geological Society, 190 p.

Turner, P., 1980, Continental red beds: N. Y., Elsevier, 562 p.

Wold, R. J., ed., 1982, Geology and tectonics of the Lake Superior Basin: Geological Society of America, GSA Memoir 156, 279 p.

Zimmie, T. F., ed., 1981, Permeability and groundwater contaminant transport: Philadelphia, Pa., American Society for Testing and Materials, 251 p.

THE NORTHEAST MISSISSIPPI EARTHQUAKES OF 29 JANUARY AND 5 FEBRUARY, 1983

Ann G. Metzger
Tennessee Earthquake Information Center
Memphis State University

Northeast Mississippi is an unusual location for earthquakes, but it was the site of two small quakes that occurred a week apart in early 1983. The first of these, a magnitude 2.4 event, occurred at 1605 GMT (1005 a.m. CST) on 29 January, and apparently was not felt. On 5 February, a magnitude 2.9 earthquake occurred at 1308 GMT (0708 a.m. CST) within a kilometer of the earlier quake and was widely felt and heard throughout the area.

The Tennessee Earthquake Information Center (TEIC) conducted a field investigation in the area on 7 February 1983. The major concern was whether there was any possibility that the shallow events were explosions. The two closest stone quarries, Mississippi Stone and Hoover Inc., were very cooperative. They confirmed no blasting activity during the two Saturday mornings of interest. Numerous residents stated that blasting activity for the nearby Tennessee-Tombigbee Waterway Project was completed in 1982. This was confirmed by the U. S. Army Corps of Engineers. The above information, coupled with a clear, impulsive dilatational first motion for the larger quake at Memphis Area Regional Seismic Network (MARSN) stations PWLA (42 km distance) and EBZ (102 km distance) confirms that these events were not explosions.

There were no reports of damage, but sleepers were awakened in several communities near the epicentral area. Two persons who were outdoors at the time of the quake reported seeing a house and a trailer shaking visibly. Windows and dishes were rattled over a large area, and the description of sounds heard ranged from "a loud explosion" to "a distant rumbling."

The maximum assigned intensity was Modified Mercalli Intensity (MMI) V. No attempt was made to contour intensities, but the approximate limit of the felt area is shown on the accompanying figure. Both the intensity and the size of the felt area, approximately 730 square kilometers, are anomalously large for an earthquake of this magnitude. The computed depth is shallow ($\sim$2 km) but not well constrained; it might explain the first of these effects but makes the second more difficult to understand.

The epicentral area lies within the northern boundary of the Black Warrior Basin (Knight, 1954), where many faults have been identified in the subsurface. Unconsolidated Cretaceous sediments are exposed at the surface, but are only a thin veneer. A. R. Bicker, Jr., Director of the Mississippi Bureau of Geology, examined samples from the Johnson-Daniel #1 R. L. Smith well located less than 3 km from the epicenters. He found the base of the Cretaceous

HYPOCENTRAL PARAMETERS

	29 Jan 83	5 Feb 83
Origin Time (GMT)	16:05:31.7	13:08:19.5
Latitude	34.703 N	34.698 N
Longitude	88.370 W	88.375 W
Epic. Uncert.	± 2.1 km	± 0.8 km
Depth	9.2±3.0 km	2.15± 1.1 km
Magnitude	2.4 (Dur.)	2.9 (Dur.)
No. Stat./Phases	6/10	16/25
RMS residual	0.25	0.26

Epic. Uncert. indicates the possible horizontal error in the location

Dur. means that the duration of the recorded signal was used to calculate the magnitude rather than the amplitude of the 1 Hz. waves (m_{bLg})

No. Stat./Phases is the number of seismic stations and the number of arrivals (P and S waves) used in the calculations

RMS residual is the root-mean-square of all the arrival time residuals (i.e., the difference between the arrival times used and what the computer calculates that they should have been) at a depth of 189 m, overlying approximately 9 m of weathered Mississippian carbonates, and the top of the Devonian at 198 m (personal communication, 1983).

Both the intensity data, gathered by personal interviews, and the magnitude, which was confirmed by independent m_{bLg} calculations (BLA, NEIS), appear to be valid despite the discrepancy between them.

REFERENCES

Bennison, A. P., 1975, Geological Highway Map of the Southeastern Region: Map 9 of the United States Geological Highway Map Series, American Association of Petroleum Geologists, Tulsa, Oklahoma.

Knight, W. H., 1954, Muldon Field, Monroe County, Mississippi, *in* Guidebook for the 11th Field Trip, Mississippi Geological Society, Jackson, Mississippi, p. 39-45.

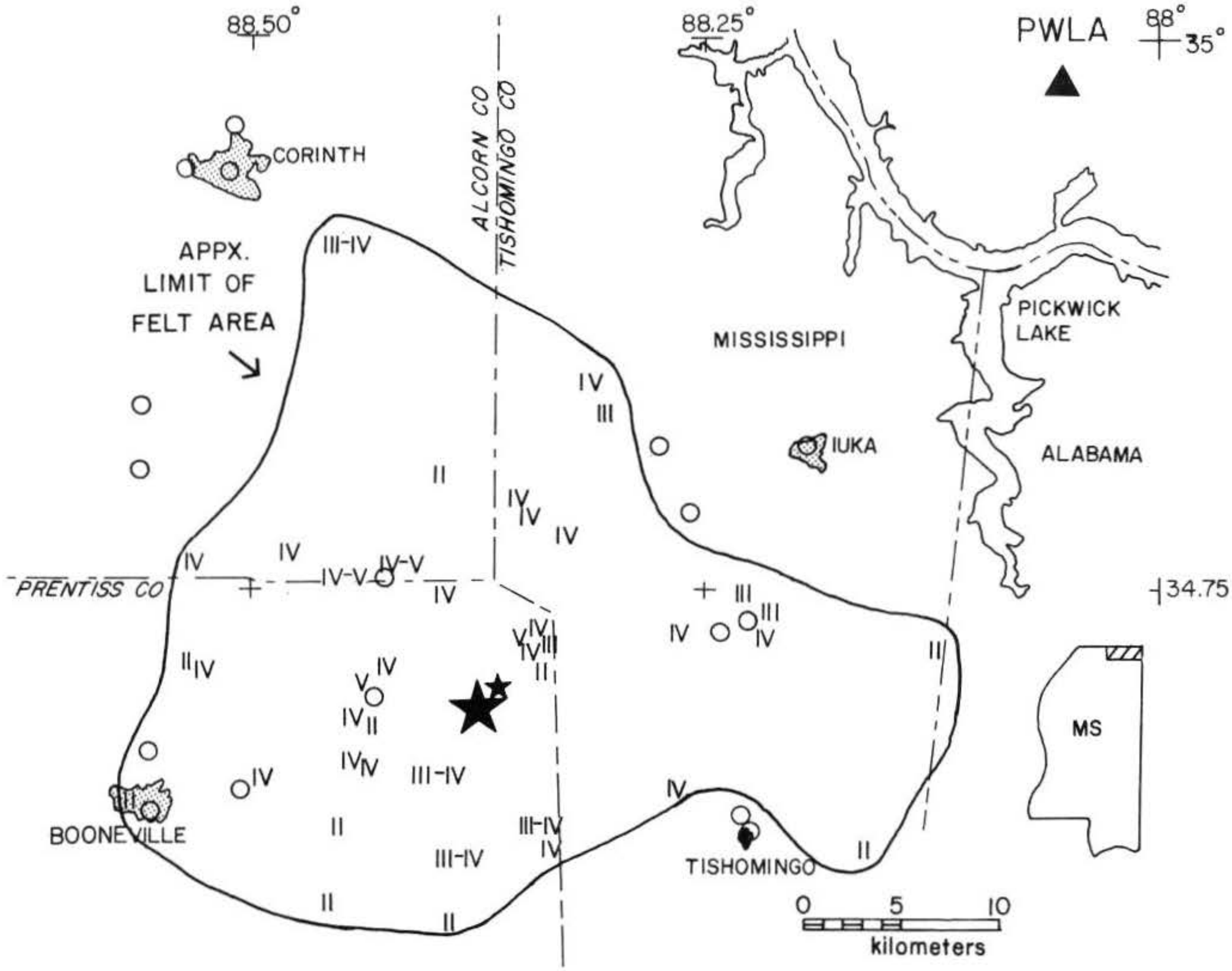

Figure 1. Map showing the approximate limit of the felt area of the 5 February 1983 earthquake. The large star marks the epicenter of the 5 February quake and the small one the epicenter of the 29 January quake. The Roman numerals represent the Modified Mercalli intensity assigned to the various felt reports; open circles indicate not-felt reports.

Attend ! 33rd Annual

Gulf Coast Association of Geological Societies

CONVENTION ...1983

JACKSON, Mississippi

October 25-28

Host: Mississippi Geological Society
P.O. Box 369 Jackson, Mississippi 39205

CALENDAR OF EVENTS

1983 June - October

June 5-10 - Florida - Bahamas modern carbonates, field seminar, Miami. (Teresa Zachary, AAPG headquarters, Box 979, Tulsa, Okla. 74101. Phone: 918/584-2555)

June 13-18 - Modeling pollutant movement in ground water, short course, Madison, Wis. (Philip R. O'Leary, Dept. of Engineering, Univ. of Wisconsin - Extension, 432 N. Lake St., Madison, Wis. 53706. Phone: 608/262-0493)

June 25-July 3 - Georoots, field seminar, Edinburgh. (Teresa Zachary, AAPG headquarters, Box 979, Tulsa, Okla. 74101. Phone: 918/584-2555)

July 13-16 - Energy and minerals, field institute, Golden, Colorado. (Janice C. Hepworth, Colorado School of Mines, Golden, Colo. 80401. Phone: 303/273-3900)

August 4-10 - Modern clastic depositional environments, field seminar, Charleston, S. C. (Miles Hayes, Research Planning Institute, 925 Gervais St., Columbia, S. C. 29201. Phone: 803/256-7322)

September 7-10 - American Institute of Professional Geologists, annual meeting, Jackson, Wyoming. (Gene R. George, Box 2775, Casper, Wyo. 82601. Phone: 307/265-9199)

September 11-15 - Society of Exploration Geophysicists, annual meeting, Las Vegas, Nevada. (Daniel Y. Kim, SEG headquarters, Box 3098, Tulsa, Okla. 74101. Phone: 303/694-2445)

October 25-28 - Gulf Coast Association of Geological Societies, 33rd Annual Convention, Gulf Coast Section, Society of Economic Paleontologists and Mineralogists, Jackson, Mississippi. (John C. Marble, Forest Oil Corporation, 111 E. Capitol St., Suite 500, Jackson, Miss. 39201. Phone: 601/354-1916)

PETROLEUM NEWS

MISSISSIPPI OIL AND GAS STATISTICS, FOURTH QUARTER 1982

Oil

	Bbls. Produced	Severance Tax	Average Price Per Bbl.
October	2,675,468	$ 4,774,155.15	$ 29.74
November	2,878,890	4,660,254.53	26.98
December	2,046,668	3,561,109.99	29.00
Totals	7,601,026	$ 12,995,519.67	$ 28.50

Gas

	MCF Produced	Severance Tax	Average Price Per MCF
October	16,036,301	$ 2,942,594.90	$ 3.06
November	21,470,903	5,288,057.58	4.10
December	17,867,508	4,323,234.80	4.03
Totals	55,374,712	$ 12,553,887.28	$ 3.78

source: State Tax Commission

MISSISSIPPI GEOLOGY
Department of Natural Resources
Bureau of Geology
Post Office Box 5348
Jackson, Mississippi 39216

Mississippi Geology is published quarterly in March, June, September, and December by the Mississippi Department of Natural Resources, Bureau of Geology. Contents include research articles pertaining to Mississippi geology, news items, reviews, and listings of recent geologic literature. Readers are urged to submit letters to the editor and research articles to be considered for publication; format specifications will be forwarded on request. For a free subscription or to submit an article, write to:

Editor, Mississippi Geology
Bureau of Geology
P. O. Box 5348
Jackson, Mississippi 39216

Editors: Michael B. E. Bograd and David Dockery
Typesetter: L. Michele Morphis