REGIONAL GEOLOGY AND AEROMAGNETIC MAP OF THE SOUTHERN UNITED STATES

№ 08064

THOMAS, William A., Department of Geology, University of Alabama, University, Alabama 35486

The aeromagnetic map of the United States provides a basis for synthesis and tracing of tectonic elements. In the southern United States, magnetic patterns are affected by expression of one to three different successive assemblages of rocks. The oldest assemblage, the Precambrian (pre-Grenville, > 1.0 b.y. age) basement, is composite and includes rocks and structures of several tectonic cycles of different ages. The medial assemblage, of Paleozoic (and post-Grenville Precambrian) age, encompasses the cratonal sequences of interior North America and the Appalachian-Ouachita orogen along the craton margin. Magnetic data reflect elements of both the divergent and convergent phases of the Appalachian-Ouachita orogenic cycle. The shape of the early Paleozoic rift- and transform-bounded continental margin (Alabama promontory, Ouachita embayment), as indicated by structural and stratigraphic data, is confirmed by abrupt truncation of magnetic patterns. In the southern Appalachians, magnetic trends parallel with structure reflect tectonic accumulation of belts of crystalline rocks, and lack of such a magnetic pattern suggests a different convergent-margin assemblage in the interior belt of the Ouachitas. The youngest assemblage (postorogenic to the Appalachian-Ouachita system) includes Mesozoic-Cenozoic sedimentary and igneous rocks of the Gulf Coastal Plain. Plutons associated with opening of the Gulf are strongly expressed in the magnetic data, but the peripheral fault system indicated by structural and stratigraphic data is not distinct on the magnetic map. Geophysical data suggest a northeast-trending graben at the head of the Mississippi Embayment of the Gulf Coastal Plain on the southern part of the Paleozoic craton, but available geologic data do not tightly constrain the age of the structure.

TECTONIC EVOLUTION OF THE EASTERN OUACHITA-SOUTHERN APPALACHIAN OROGEN

№ 08069

THOMAS, William A., Department of Geology, University of Alabama, University, Alabama 35486

Subsurface data show that a continuous belt of deformed Paleozoic rocks extends beneath postorogenic Mesozoic-Cenozoic strata of the Gulf Coastal Plain from the exposed Paleozoic structures in the Ouachita Mountains to those in the Appalachian Mountains. The trace of the belt of deformed rocks defines a curve from the convex-cratonward Ouachita salient to the concave-cratonward Alabama recess of the Paleozoic orogenic belt. The curved trace of the orogenic belt and the distribution of Ordovician to Pennsylvanian facies and thickness suggest that the Paleozoic continental margin had an orthogonally zigzag outline including the concave-oceanward Ouachita embayment and the convex-oceanward Alabama promontory. The indicated shape of the continental margin, confirmed by aeromagnetic mapping, suggests a rift system offset by a transform fault. No pre-Ordovician rocks are known from the Ouachita embayment, but late Precambrian to early Paleozoic rifting is suggested. Pre-Mississippian rocks include shelf carbonate facies on continental crust on the Alabama promontory and around the Ouachita embayment, and off-shelf facies within the Ouachita embayment. Carboniferous clastic sediment prograded northeastward in shelf and deltaic environments on the Alabama promontory and northwestward into a deep flysch basin off the shelf in the Ouachita embayment. Distribution of synorogenic Carboniferous clastic wedge sediment indicates initial tectonic uplift at the continental margin along the west side of the Alabama promontory. Lateral expansion of orogenesis along strike through time culminated in thrusting in the Ouachita embayment by Middle Pennsylvanian. Cratonward thrusting carried the basinal facies of the Ouachita embayment over the early Paleozoic continental margin and shelf facies and produced the convex-cratonward outline of the Ouachita salient. Eastward, the front of the thrust belt crosses the facies boundary into the shelf sequence, and structures in the Alabama recess are within the Paleozoic shelf sequence of the older Alabama promontory.

CONTINENT-OCEAN TRANSITION: ADIRONDACKS TO GEORGES BANK, GEODYNAMICS TRANSECT E-1

№ 04623

THOMPSON, J. B., Jr., Department of Geological Sciences, Harvard University, Cambridge, MA 02138, ANDO, C. J., BOTHNER, W. A., BROWN, L. D., DZIEWONSKI, A. M., ENGLAND, P. C., FISHER, G. W., ISACHSEN, Y. W., KARABINOS, Paul, KIDD, W. S. F., KLITGORD, K. D., LYONS, J. B., NAYLOR, R. S., RATCLIFFE, N. M., ROBINSON, Peter, ROSENFELD, J. L., SCHLEE, J. S., STANLEY, R. S., and TOKSOZ, N. M.

A geologic-geophysical study transects New England from Thousand Is., NY, to the ocean floor off Georges Bank. Grenvillian (~1.0 b.y.) basement of the North American craton is exposed in the Adirondacks; Avalonian basement (~0.6 b.y.) underlies eastern MA. Reworked Grenvillian basement forms external massifs of the Green Mts. (GM) and Berkshire Highlands. An Ordovician-Cambrian carbonate bank, beneath the Taconic allochthon, lies between these massifs and the Adirondacks. Relict blue-schist metamorphism in the northern GM, ~coeval with allochthon emplacement in Middle Ordovician, may record accretion of an island arc. Tectonic and metamorphic belts east of the GM record successively younger accretionary events, culminating in the Middle Devonian Acadian orogeny and ending with the Alleghenian orogeny (late Paleozoic), which affected SE. and extreme S. New England. Triassic-Jurassic rifting followed. The New England seamounts and White Mountain-Monteregian plutonic volcanic centers may record migration over a mantle hot spot. Offshore, the transect crosses successively a shallow sialic crystalline platform, the deep Georges Bank basin, and a carbonate-rich paleoshelf edge near the landward limit of oceanic crust. The platform beneath the Gulf of Maine is characterized by NE.-trending faults and grabens of late Paleozoic and early Mesozoic age. The platform edge is blockfaulted in a narrow hinge zone and the basin contains more than 8 km of sediment (mostly Jurassic). Late Cretaceous clastic sedimentation overwhelmed carbonate accumulation on the outer shelf, and the main depocenter shifted east to the Continental Rise.

SYNOROGENIC MAFIC INTRUSIONS IN MAINE

№ 00492

THOMPSON, John F.H., Department of Geology, University of Toronto, Toronto, Ontario, M5S1A1

Synorogenic mafic intrusions represent an important class of mafic body throughout the Appalachian/Caledonian orogenic belt. Prominent examples occur in Norway, Scotland, Ireland and Maine. Those in Maine are divided into central and coastal geographic groups, with the majority being clearly syn-Acadian in age.

The central Maine group extends into New Hampshire and shows a progressive increase in the degree of deformation and metamorphism to the southwest. The Moxie Pluton,at the northeast end, is largely unaltered. The intrusion consists of a series of magma chambers and feeder zones. The most primitive olivine cumulates (Fo 86-88) occur in the south and suggest crystallization from a largely unfractionated mantle melt. Subsequent magmas were variably fractionated. Mineral compositions within the body are typical of the range found in classic differentiated mafic intrusions. The Ni/forsterite ratios in olivines are, however, low and document the fractional removal of sulfide during crystallization. The small Katahdin gabbro, southeast of the Moxie Pluton, demonstrates many similar features. The coastal Maine group extends northwards into New Brunswick. The prominent Pocomoonshine gabbro (Westerman, 1972, 1981) within this group resembles the Moxie Pluton in many respects.

Magmatic sulfide accumulations occur in a number of these bodies and others throughout this orogenic belt. Those of central Maine demonstrate the addition of country rock sulfur to a primary magmatic component via assimilation with subsequent complex sulfide-silicate interaction resulting in low tenors of Ni and Cu in sulfide. The prominent Area V deposit in southern Maine is metamorphosed with a consequent ambiguous age and origin.

The restricted distribution of the Maine bodies may be attributed to local tectonics. Generation of the magmas, however, represents a more widespread tectonic phenomena.

CALC-ALKALINE STRATOVOLCANOES ALONG THE RIO GRANDE RIFT AXIS? FIELD AND PETROLOGIC EVIDENCE

№ 07295

THOMPSON, Ren A. and DUNGAN, Michael A., Department of Geological Sciences, Southern Methodist University, Dallas, Texas 75275

Early-rift volcanism (25-22 m.y.b.p.) in the Taos area of the northern Rio Grande Rift represents one of several large coeval volcanic-plutonic complexes (e.g. Questa Caldera, Spanish Peaks) of dominantly intermediate to silicic composition associated with the inception of the Rio Grande Rift.

Erosional remnants of early rift lavas and pyroclastics are exposed along a N-S trending horst block within the central graben of the San Luis Valley in northern New Mexico. The volcanic suite is dominated by two groups of low silica (62-64% SiO_2) dacites each with distinctive mineralogy and chemistry. The lower unit is potassic ($K_2O/Na_2O>1$), $K_2O=3.8-4.5$ and lacks hydrous mineralogy (plag+2 pyx+mgt+ap). Petrographic and geochemical evidence for mixing of mafic and silicic magmas is prevalent but magma mixing is not solely responsible for the observed compositional spectrum. Minor basalts and silicic pyroclastics unconformably separate the lower dacites from a less potassic suite which is abundantly porphyritic and is dominated by phenocrysts of hornblende±minor biotite and plagioclase with (2 pyx+mgt+ap±sphene). These dacites are further distinguished by lower total REE concentrations and higher La/Lu. Preliminary trace element modeling suggests that fractional crystallization at high P_{H_2O} may play a dominant role in the evolution of this upper dacite sequence.

Stratigraphic relationships reveal the chemically cyclic nature of this early-rift volcanism which, while dominated by dacitic eruptions, is consistently associated with more mafic lava flows and rhyolitic pyroclastics. This petrologic association and the petrographic nature of the entire suite suggest magmatic evolution in large, compositionally zoned magma chambers episodically replenished by mafic magmas.

THE SORET EFFECT: POTENTIAL FOR THERMODIFFUSIONAL TRANSPORT IN A NUCLEAR WASTE REPOSITORY

№ 08621

THORNTON, E.C., and SEYFRIED, W.E., Jr., Department of Geology and Geophysics, University of Minnesota, Minneapolis, MN 55455

Emplacement of high level radioactive waste in geological materials of low permeability such as ocean sediment, shale, or basalt is currently being investigated as a means of nuclear waste disposal. Most investigations in this area, however, have neglected effects of thermal diffusion on chemical processes in fluid-saturated media surrounding a heat source. To evaluate this effect, we have conducted experiments utilizing seawater and marine pelagic clay in thermal gradients characterized by 300°C in the "hot" zone and $\lesssim$100°C in the "cold" zone over a distance of 30 cm. Fluids were periodically sampled from the "hot" and "cold" zones for analysis and reacted solids were examined subsequent to the experiments.

Experimental results indicate profound changes relative to previous experiments conducted at constant temperature. Most important is thermodiffusional transport (Soret effect) which produced large scale separation of aqueous components between the "hot" and "cold" zones in less than 1000 hours. Particularly high fluxes of Na and Cl from the "hot" zone towards the "cold" zone were observed owing to their abundance and tendency to be unaffected by water-rock interaction. Other components, such as Mg and Ca, were retained to varying degrees in the "hot" zone owing to formation of stable alteration phases (e.g., smectite and anhydrite). Mg mobility is of notable importance in this

8 **Kevin Burke, Paul Mann***: DID THE PLIOCENE PANAMA SOUTH AMERICA COLLISION CAUSE INTERNAL DEFORMATION OF A PREVIOUSLY RIGID CARIBBEAN PLATE? [02101] .... 9:45 A

9 **F.W. Taylor*, P. Mann, K. Burke**: QUATERNARY CORAL AND SHORELINE DEPOSITS IN THE CLOSED ENRIQUILLO DRAINAGE BASIN, HISPANIOLA, WEST INDIES [10701] .... 10:00 A

10 **Edmund Stump*, Stephen Self, J.H. Smit**: TIMING OF EVENTS DURING THE BEARDMORE OROGENY, ANTARCTICA, AND COMPARISON WITH PHASES OF THE PAN-AFRICA EPISODE IN SOUTHERN AFRICA [05544] .... 10:15 A

11 **C.S.M. Doake, R.D. Crabtree, I.W.D. Dalziel***: NEW CONSTRAINTS ON THE ORIGINAL LOCATION OF THE ELLSWORTH MOUNTAINS CRUSTAL BLOCK, ANTARCTICA [08226] .... 10:30 A

12 **Mark G. Rowan*, Walter Alvarez**: CORRELATION, PROVENANCE, AND PALEOGEOGRAPHY OF THE UPPER CRETACEOUS HELMINTHOID FLYSCH (NORTHERN APENNINES AND MARITIME ALPS, ITALY AND FRANCE) [05763] .... 10:45 A

13 **Peter Molnar*, Helene Lyon-Caen**: BALANCED LITHOSPHERIC CROSS SECTIONS FOR THE HIMALAYA [05585] .... 11:00 A

14 **Helene Lyon-Caen*, Peter Molnar**: CONSTRAINTS ON THE STRUCTURE OF THE HIMALAYA FROM ANALYSIS OF GRAVITY ANOMALIES WITH AN ELASTIC FLEXURAL MODEL OF LITHOSPHERE [05586] .... 11:15 A

15 **Robert S. Yeats***: NEOTECTONIC SETTING OF THE SOUTHERN HIMALAYA, NORTHERN PAKISTAN [11702] .... 11:30 A

16 **G. Sarwar***: BELA OPHIOLITES, SOUTH CENTRAL PAKISTAN - A CRETACEOUS PLATE BOUNDARY TRANSFORM COMPLEX [03146] .... 11:45 A

POSTER SESSION VII (SYMPOSIUM)

NE Quad, Rooms 1-2, Superdome

Authors will be present 9:00 a.m. - 11:00 a.m.

TRANSECTS PROGRAM

R.C. Speed*: COLLECTED TECTONIC SECTIONS FROM 26 NORTH AMERICAN CONTINENT-OCEAN TRANSECT PROGRAM CORRIDORS [05432] .... Booth 1

D.W. Scholl*, A. Cooper, E. Engdahl, J. Hein, M. Marlow, B. Marsh, H. McLean, T. Vallier, S. Vath, W. Patton, Jr.: THE ALEUTIAN-BERING SHELF TRANSECT A1 [11814] .... Booth 2

R. von Huene*, R. Detterman, M. Fisher, J.C. Moore, H. Pulpan: ALEUTIAN ARC-TRENCH SYSTEM FROM THE KODIAK SHELF TO THE KUSKOKWIM MOUNTAINS, ALASKA: TRANSECT A2 [11815] .... Booth 3

Arthur Grantz*, D.F. Barnes, N.N. Biswas, W.P. Brosge, T.R. Bruns, J.W. Cady, R.M. Chapman, J.T. Dillon, T.D. Hamilton, D.L. Jones, A.H. Lachenbruch, C.G. Mull: A CONTINENT-OCEAN TRANSECT (CORRIDOR A-3) ACROSS CENTRAL ALASKA FROM THE PACIFIC TO THE ARCTIC [11820] .... Booth 4

C.J. Yorath*, G.J. Woodsworth, R.G. Currie, R.D. Hyndman, R.P. Riddihough, G.C. Rogers: THE PACIFIC CONTINENTAL MARGIN - QUEEN CHARLOTTE IS. AND COAST MOUNTAINS, BRITISH COLUMBIA: TRANSECT B1 [11807] .... Booth 5

J.W.H. Monger*, R.M. Clowes, R. Currie, T. Hoy, R.D. Hyndman, V.A. Preto, R.A. Price, R.D. Riddihough, P.S. Simony, J.O. Wheeler, G.J. Woodsworth, C.J. Yorath: SOUTHERN CANADIAN CORDILLERA: TRANSECT B2 [00670] .... Booth 6

C.J. Potter*, D.S. Cowan, B. Lewis, R. Crosson, D.M. Fountain, D.W. Hyndman, A. Qamar, P.D. Snavely, R.J. Stewart, D.A. Swanson: JUAN DE FUCA RIDGE TO NW MONTANA: TRANSECT B3 [00671] .... Booth 7

M.C. Blake, Jr.*, Andrew Griscom, D.P. Hill, D.L. Jones, A.H. Lachenbruch, D.S. McCulloch, D.A. Stauber, R.L. Bruhn, R.B. Smith, W.P. Leeman, E.L. Miller, E.M. Moores: CONTINENT-OCEAN TRANSECT C-1, NORTHERN CALIFORNIA TO WYOMING [11821] .... Booth 8

J.B. Saleeby*, M.C. Blake, A. Griscom, D. Hill, D.L. Jones, R.W. Kistler, D. McCullough, D. Ross, D. Stauber, M. Zoback, R. Allmendinger, P.B. Gans: OCEAN-CONTINENT TRANSECT C2, CENTRAL CALIFORNIA TO CENTRAL UTAH [11823] .... Booth 9

David G. Howell*, Duane Gibson, Gary Fuis, Gordon Haxel, Barry Keller, Thane H. McCulloh, Marc L. Sbar, Leon T. Silver, John G. Vedder, Laurel Vedder: CONTINENT-OCEAN TRANSECT C-3, SOUTHERN CALIFORNIA TO NEW MEXICO [11831] .... Booth 10

Jaime Roldan-Quintana*, Luis Miguel Mitre, Fernando Ortega-Gutierrez, Gerardo Sanchez-Rubio: OCEAN-CONTINENT TRANSECTS PROGRAM CORRIDOR H-1; BAJA CALIFORNIA-MAZATLAN-DURANGO-MONTERREY [00476] .... Booth 11

Luis Miguel Mitre*, Fernando Ortega-Gutierrez, Miguel Carrillo-Martinez, Gerardo Sanchez-Rubio: OCEAN-CONTINENT TRANSECTS PROGRAM CORRIDOR H2: COCOS PLATE - ACAPULCO - MEXICO CITY - TUXPAN - GULF OF MEXICO [00455] .... Booth 12

Fernando Ortega-Gutierrez*: OCEAN-CONTINENT TRANSECTS PROGRAM: CORRIDOR H3 FROM THE ACAPULCO TRENCH TO THE GULF OF MEXICO ACROSS SOUTHERN MEXICO [07947] .... Booth 13

Richard T. Buffler*, Charles D. Winker, George W. Viele, Sherman Suter, Thomas W. Hilde, Alfred E. Miles, Rex H. Pilger: TRANSECT ACROSS DEEP GULF OF MEXICO BASIN FROM OUACHITA MOUNTAINS TO YUCATAN: TRANSECT F1 [00430] .... Booth 14

Ray G. Martin*, William A. Thomas, George T. Moore, David J. Hall, Stuart A. Hall: TRANSECT ACROSS DEEP GULF OF MEXICO BASIN FROM SOUTHERN APPALACHIANS TO CUBA: TRANSECT F2 [00469] .... Booth 15

J.B. Thompson, Jr.*, C.J. Ando, W.A. Bothner, L.D. Brown, A.M. Dziewonski, P.C. England, G.W. Fisher, Y.W. Isachsen, Paul Karabinos, W.S.F. Kidd, K.D. Klitgord, J.B. Lyons: CONTINENT-OCEAN TRANSITION: ADIRONDACKS TO GEORGES BANK, GEODYNAMICS TRANSECT E-1 [04623] .... Booth 16

John A. Grow*, Avery A. Drake, Jr., Nick Ratcliffe, Roger Faill, Warren Manspeizer, Deborah Hutchinson, Kim Klitgord, William Bonini, Tony Watts, Brian Tucholke: U.S. GEODYNAMICS TRANSECT E-2: NEW JERSEY [04592] .... Booth 17

Lynn Glover III*, Louis Pavlides, L.D. Harris, Kim Klitgord, John Grow, M.J. Bartholomew, R.B. Mixon, A.J. Froelich, J.K. Costain, David Elliott, K.C. Bayer, Wallace Dewitt, Jr.: GEODYNAMICS TRANSECT E-3: OHIO TO BALTIMORE CANYON TROUGH [11827] .... Booth 18

D.W. Rankin*, K.C. Bayer, D.F.B. Black, S.E. Boyer, R.J. Butler, D.L. Daniels, W.P. Dillon, D.W. Elliott, Richard Goldsmith, J.A. Grow, L.D. Harris, J.W. Horton: CONTINENT-OCEAN TRANSITION, KENTUCKY TO CAROLINA TROUGH: GEODYNAMICS TRANSECT E-4 [00464] .... Booth 19

Robert D. Hatcher, Jr.*, A.W. Bally, D.J. Colquhoun, Frederick Cook, W.P. Dillon, K.D. Klitgord, Carl Merschat, R.C. Milici, A.E. Nelson, D.T. Secor, R.E. Sheridan, J.A. Snoke: CONTINENT-OCEAN TRANSITION, CUMBERLAND PLATEAU, TENNESSEE TO BLAKE PLATEAU BASIN: GEODYNAMICS TRANSECT E-5 [04611] .... Booth 20

Richard T. Haworth*, Charlotte Keen, Harold Williams: NORTHERN APPALACHIANS AND ATLANTIC MARGIN: TRANSECT D1 [11810] ..... Booth 21

C.E. Keen*, R.T. Haworth: PRESENT PASSIVE MARGINS OF EASTERN CANADA: TRANSECTS D2-4 [00461] .... Booth 22

U. Mayr*, H.R. Balkwill, L.W. Sobczak, J.F. Sweeney: CANADIAN ARCTIC ISLANDS TO CANADA BASIN: TRANSECT G [00467] .... Booth 23

SEDIMENTOLOGY

Susan J. Gaffey*: BLACKENING OF OOIDS FROM BAFFIN BAY, TEXAS [01317] .... Booth 24

ABSTRACTS with PROGRAMS 1982

95th Annual Meeting
The Geological Society of America

The Paleontological Society (74th)
The Mineralogical Society of America (63rd)
The Society of Economic Geologists (62nd)
Cushman Foundation (33rd)
Geochemical Society (27th)
National Association of Geology Teachers (23rd)
Geoscience Information Society (17th)

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