Large (up to 2") Plagioclase Feldspar crystals in Porphyritic Diabase dike float rock
. Note eyeglasses for scale.

Porphyritic 'Devonite' Diabase from dike on southwest of Fredericktown.
This specimen is on display in the public library at Fredericktown.
The big Feldspar crystal measures 4" across.

The last widespread and observable Precambrian event was intrusion of Diabase and Gabbro. Outcrops are mainly dikes, suggesting that the main mass of Gabbro is deeper than the present erosion surface. At two locations there is porphyritic Diabase with large and partly resorbed crystals of Feldspar. Future field mapping may find more rock of this type. Porphyritic texture suggests that Magmatic Differentiation occurred, in which lower density minerals such as Feldspar floated to the top of the magma chamber and, presumably, denser minerals sank to the intrusive floor. Magmatic Differentiation was stronger where magma intruded along the Grand River Tectonic Zone (GRTZ) and abundant groundwater and hydrothermal fluids were available to mix with magma and reduce magma viscosity. At those locations, Cumulate Deposits of dense minerals containing iron, copper, cobalt, chromium, gold and platinum may have formed.

Specimen of Diabase Porphyry Dike on display in Mining Museum at Missouri Mines State Historic Site, Park Hills, Missouri.

48

Figure 10

MAGNETITE MINERALIZATION

1. Kratz Spring
2. Bourbon
3. Pea Ridge
4. Camels Hump
5. Floyd Tower
6. Iron Mountain — Pilot Knob
7. Boss
8. Lake Springs

MAFIC PLUTON

9. St. Francisville
10. Levasy
11. Benton City
12. Wentzville
13. Versailles
14. Eldon
15. Orla
16. Peace Valley
17. Avon
18. Bloomfield
19. Malden

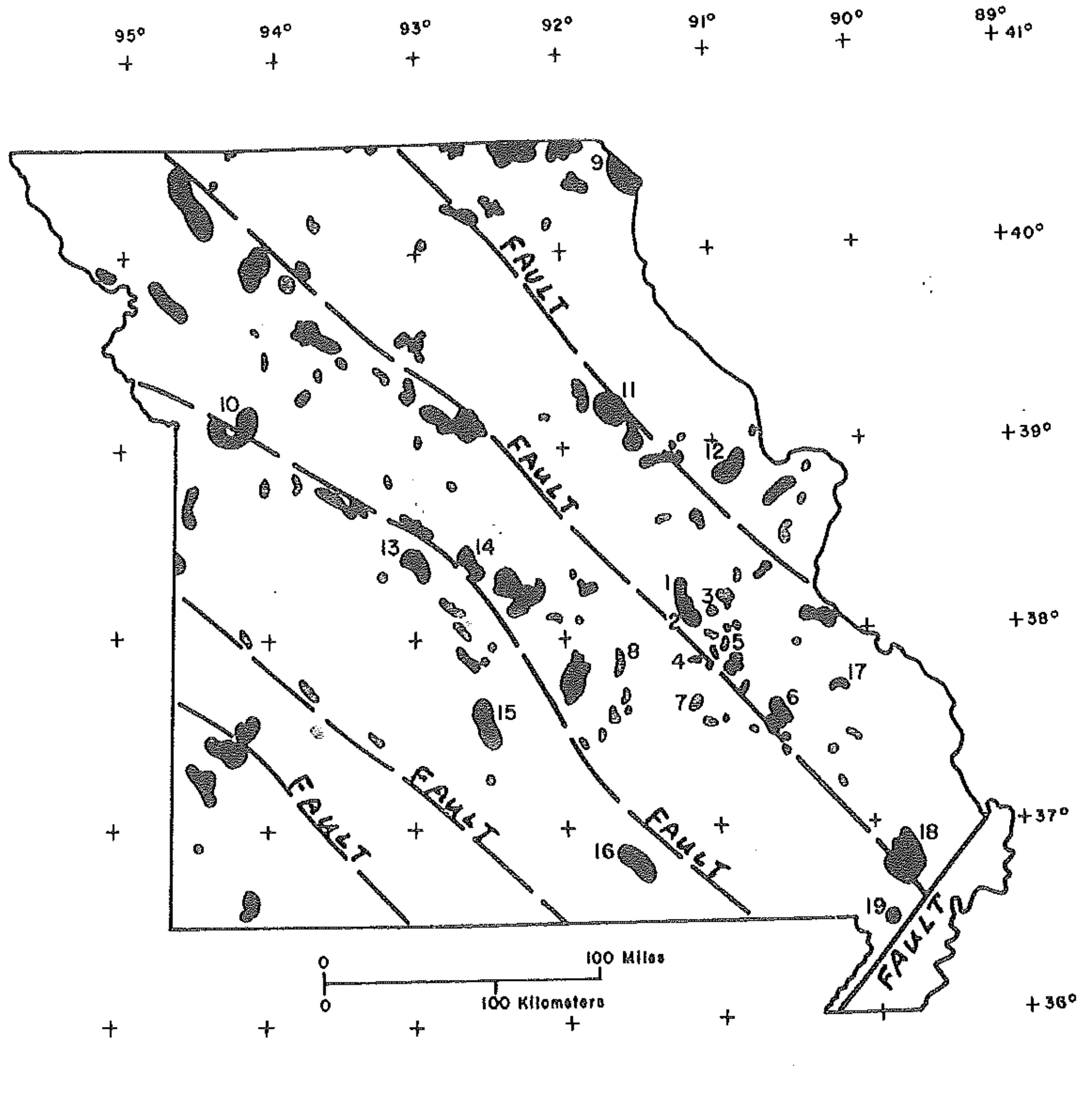
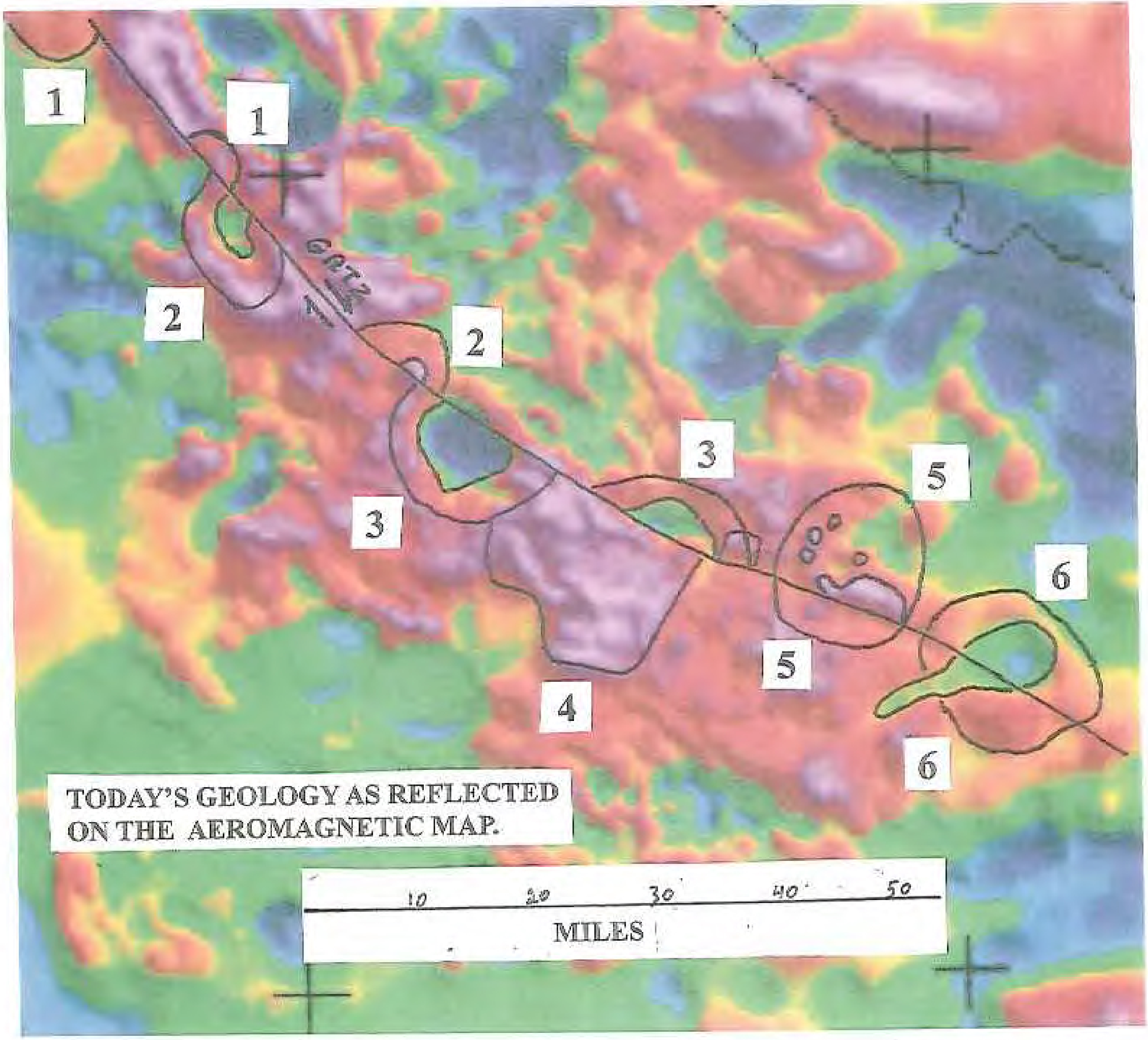


Figure 6. *High magnetic anomalies in Missouri and their sources as inferred from drillholes and geophysical data.*

THE PRECAMBRIAN TECTONIC FRAMEWORK OF MISSOURI AS INTERPRETED FROM THE MAGNETIC ANOMALY MAP


1
1
2
2
3
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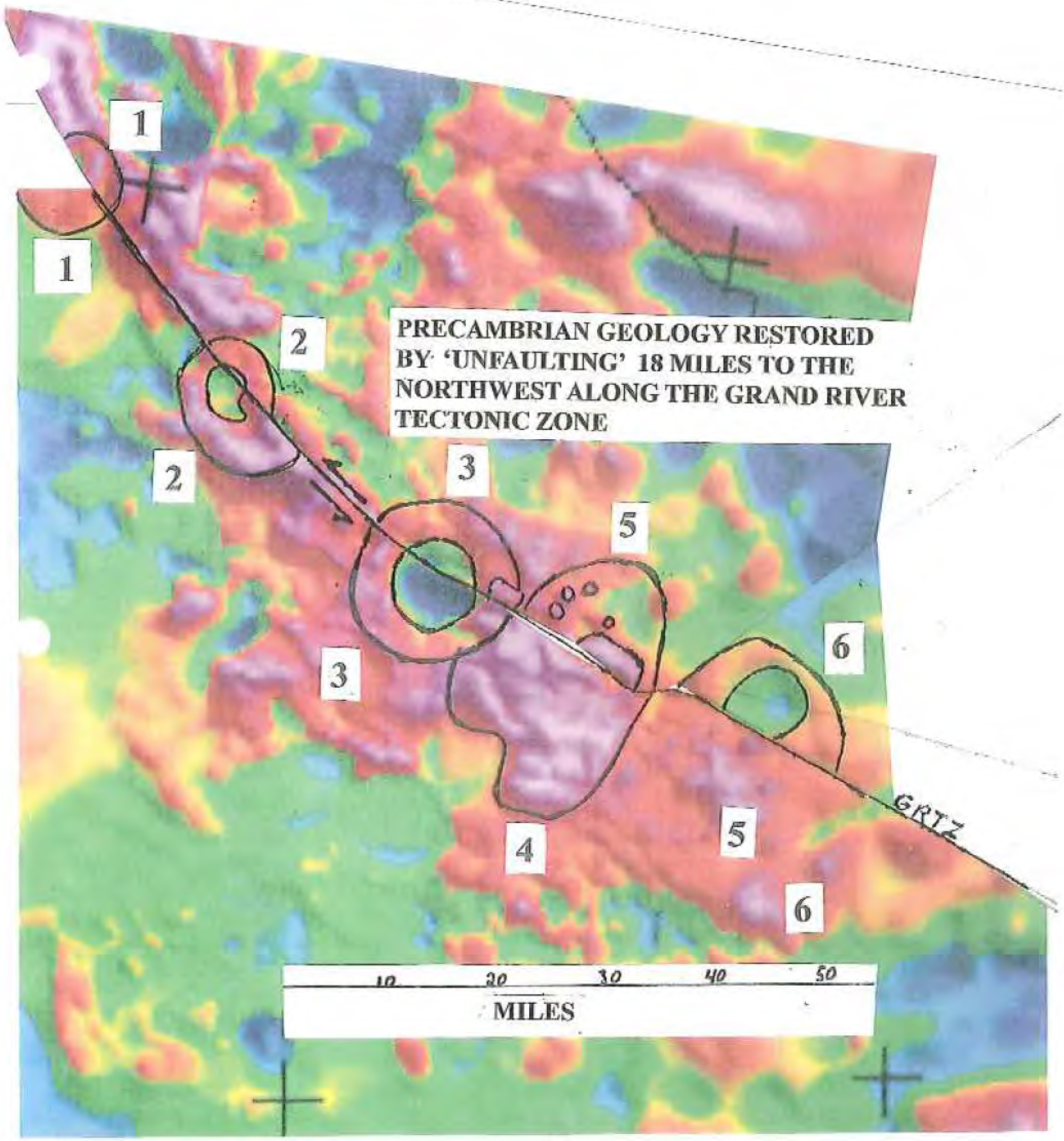
6
6
TODAY'S GEOLOGY AS REFLECTED
ON THE AEROMAGNETIC MAP.
10 20 30 40 50
MILES



The top map is an enlarged portion of the Missouri State Magnetic map. The trace of the Grand River Tectonic Zone (GRTZ) was drawn on the map. GRTZ cuts through several magnetic features, creating magnetic patterns that are straight lines against GRTZ and curved at a distance from GRTZ. Features are numbered for identification. Number 4 on the northeast side of GRTZ is missing because there does not seem to be a corresponding structure on the southwest side. This map shows the magnetic pattern as it exists today. The large blue area at (2, 3) is the Graniteville Granite.

Continued from previous page...

Unlike a moving railroad train in which the engine and cars all move the same distance at the same speed, faults move in jumps and bursts and go different distances along the fault line. At any time, part of a fault may move, but not another part. Fault motion may be right-lateral, left-lateral, up and down, horizontal, or some combination thereof, and displacement distance may be concentrated along the main fault or dispersed among smaller connecting faults. Geologic features that existed before the fault moved will be sliced and separated by fault movement, but younger features may not be affected at all. For minerals exploration, a practical application is the search for the other half of an ore deposit cut off by GRTZ. If you know which way GRTZ moved and how far, start your search where the other half of the ore deposit should be after GRTZ carried it away.

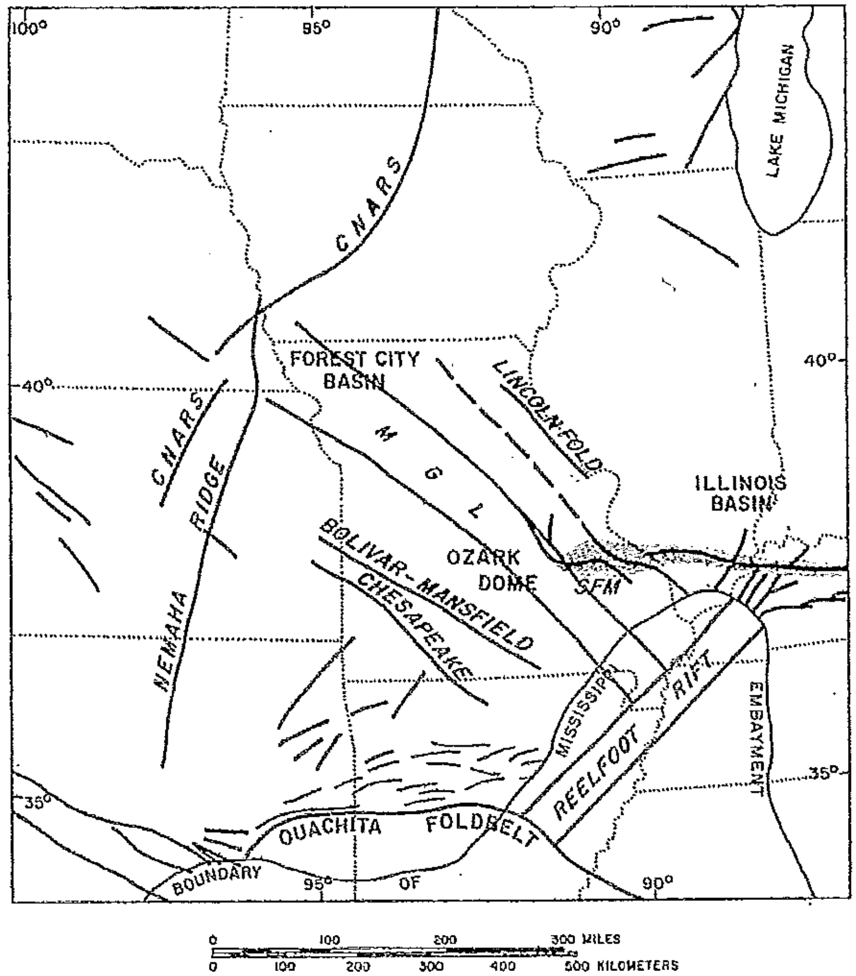
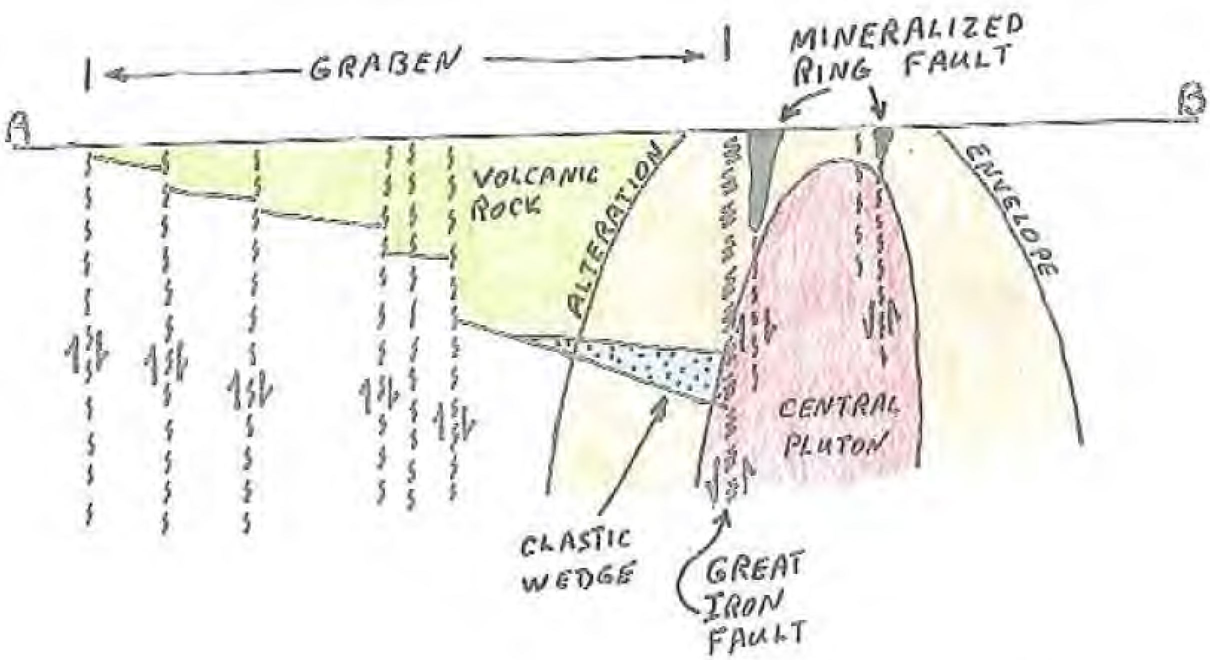


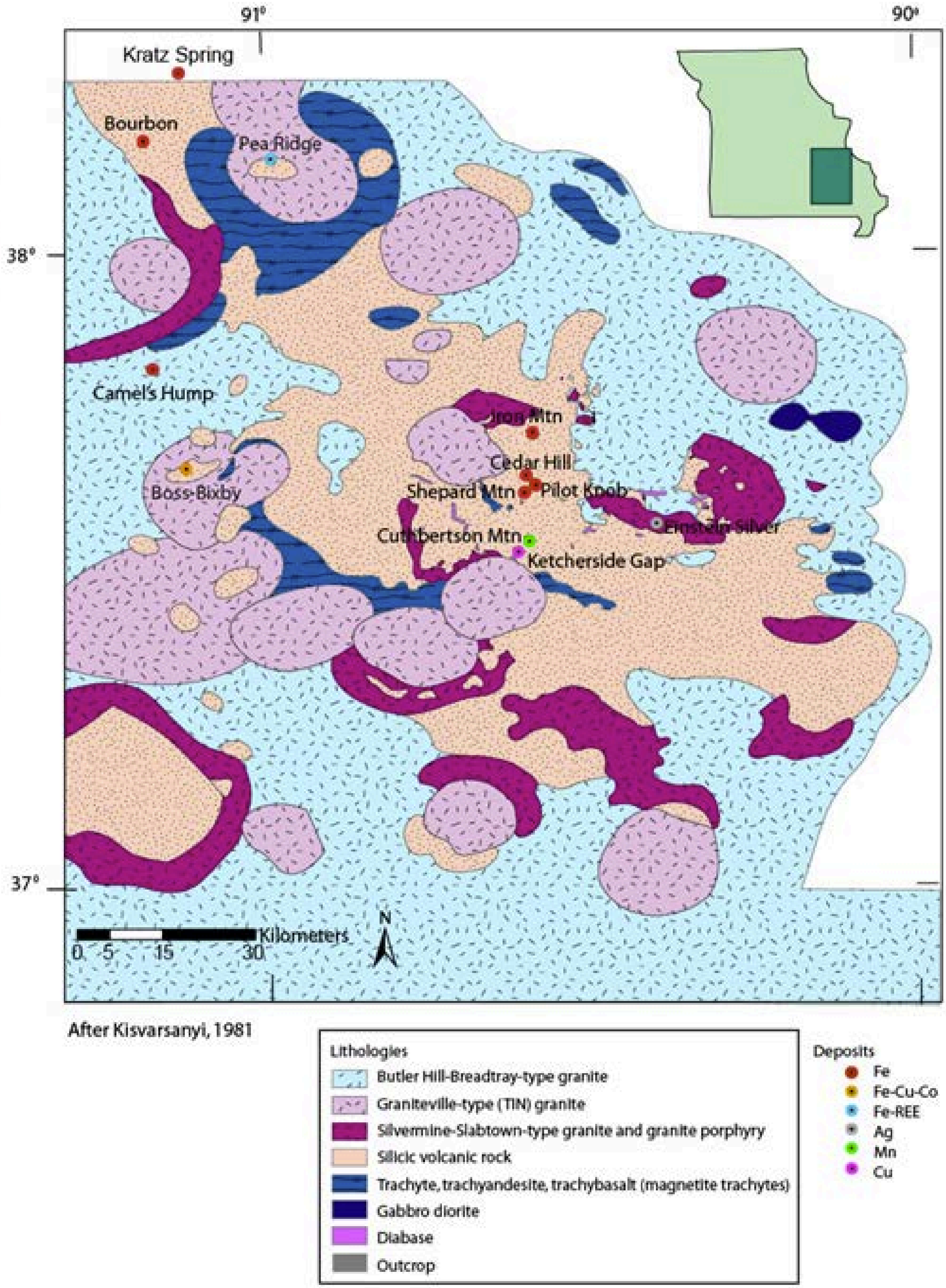
Figure 1. *Sketch map showing major structures in Missouri and surrounding states. CNARS — central North American rift system (from King and Zietz, 1971); MGL — Missouri gravity low (from Guiness and others, 1982); SFM — St. Francois Mountains Precambrian outcrops; Reelfoot rift from Kane and others (1981). Other structures shown are after King (1969). Faults along the 38th parallel lineament (Heyl, 1972) in Missouri, Illinois, and Kentucky are shaded; they include the Ste. Genevieve, Cottage Grove, and Rough Creek fault systems.*



DIAGRAMMATIC CROSS - SECTION

NOT TO SCALE

This is a generalized cross-section of geological components and relationships likely to be found in the exploration area. A central pluton of igneous rock intruded along or close to the Grand River Tectonic Zone (GRTZ), probably because GRTZ is a zone of weakness in Earth's Crust and provided an easy path for rising magma to follow. Magma surfaced as a volcano. When volcanic eruptions sufficiently depleted the magma chamber there was no longer enough pressure to support overlying volcanic rocks and the volcano collapsed along a ring fault and sank into its own magma chamber. Hydrothermal fluids rose along the ring fault and deposited iron oxide and other minerals in the ring fault. Hydrothermal fluids leaking from the magma entered nearby rock and altered rock composition. Clastic wedge sediments in the adjacent graben bounded on the east side by GRTZ provided porous and permeable travel paths for exiting hydrothermal fluids, and reactive rock in which various kinds of ore deposits could form. On this sketch, GRTZ is called Great Iron Fault.



Map showing Precambrian basement geology of southeastern Missouri. From: Kisvarsanyi, E.B., 1981, Geology of the Precambrian St. Francois terrane, southesastern Missouri: Missouri Department of Natural Resources, Division of Geology and Land Survey Report of Investigations, No. 64, 58 p.