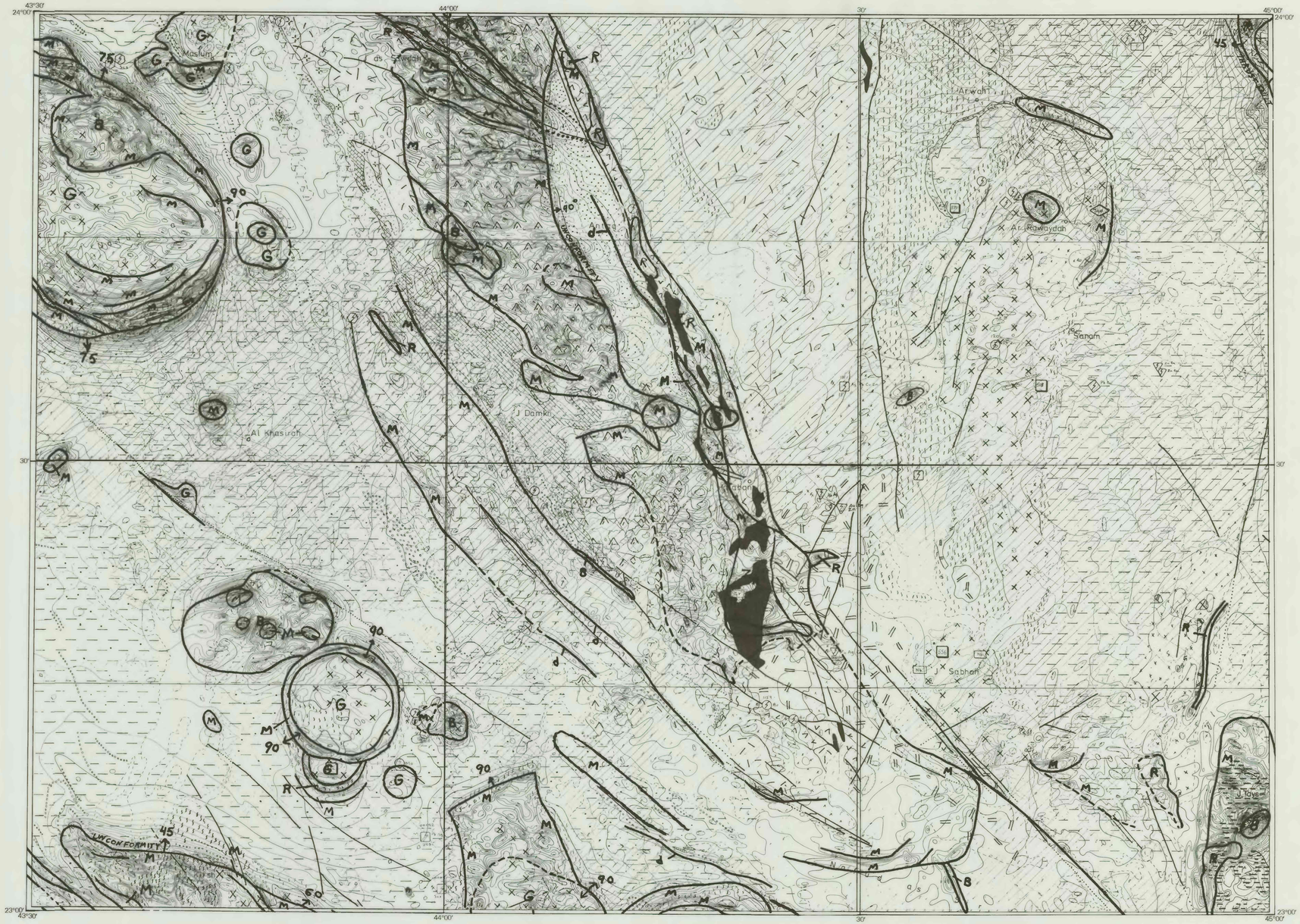
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

KINGDOM OF SAUDI ARABIA

OPEN-FILE REPORT 82-1048
PLATE 10



Original surveys supervised by B.R.G.M.
1:250,000 assembly by the Riofinex Geological Mission, 1980.
For survey details see Airborne Magnetometer and Scintillation Counter Survey Reports of 1961–1962, 1965–1966, 1966–1967.

LEGEND

CONTOUR INTERVAL	20 GAMMAS
500 GAMMA CONTOUR	
100 GAMMA CONTOUR	
20 GAMMA CONTOUR	
MAGNETIC LOW	
RADIOMETRIC CONTOUR	
FIDUCIAL POINTS	* 3690
FLIGHT LINES	

SCALE 1: 250,000

5 0 5 10 15 20 25 KILOMETERS
5 0 5 10 15 20 MILES

MAGNETIC INTERPRETATION OF THE HALABAN QUADRANGLE, SHEET 23G

by
Andrew Griscom
1982

Magnetic interpretation on a Universal Transverse Mercator projection. Geology is mosaicked to a UTM grid but geologic base adapted from lithologic maps prepared by the Riofinex Geological Mission are on Lambert Conformal projection.

Geologic base from Riofinex Geological Mission (1979). Geologic Explanation adapted from Riofinex Geological Mission (1979)

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature

EXPLANATION

MAGNETIC INTERPRETATION

- Boundary between rock units of different magnetic properties or of differing magnetic patterns. Dashed where location is uncertain. Dotted where boundary is buried beneath nonmagnetic rocks. Code letters (described below), where present, indicate which side is the more magnetic rock unit.
- M — Magnetic rock unit, lithology uncertain
- R — Magnetic rock unit possessing reverse remanent magnetization
- G, G_R — Magnetic rock unit probably granitic in composition. Subscript "R" where rock unit possesses reverse remanent magnetization
- B — Magnetic rock unit probably mafic in composition
- Z, Z_R — Zone of magnetic anomalies. Subscript "R" if more than half of the anomalies in the zone are magnetic lows that appear to be caused by rocks with reverse remanent magnetization
- 60 — Approximate dip of magnetic boundary as estimated by comparison with a set of calculated models
- d — Linear magnetic anomaly probably caused by a dike

LAYERED ROCKS 1

Include virtually unmetamorphosed to moderately metamorphosed (greenschist to lower amphibolite facies) and deformed rocks, with original volcanic and sedimentary character preserved.

PREDOMINANTLY VOLCANIC ROCKS: proximal volcanic sequences with flow rocks, volcaniclastic rocks, and minor sedimentary rocks of clastic and chemogenic origin.

- Undifferentiated mafic to felsic volcanic rock
- Predominantly andesitic volcanic rock
- Undifferentiated felsic volcanic rock (dacite to rhyolite)
- Predominantly rhyolitic rock
- Predominantly subaerial volcanic rock of felsic composition including tuff, breccia, agglomerate, ignimbrite, and so forth; in some areas has significant sedimentary component (tuffite, sandstone, siltstone). Grades into distal volcanic sequences
- Agglomerate and breccia
- Volcaniclastic conglomerate
- Extrusive-intrusive complex, mainly of dioritic composition including fine-grained diorite and andesite with some gabbro and sedimentary rock
- Extrusive-intrusive complex of ultramafic to mafic composition (so-called 'Ophiolite Complex') including gabbro, basalt, and serpentinite with subordinate greenstone, pyroxenite, and metasedimentary rocks. In most areas all strongly deformed

MIXED VOLCANIC-SEDIMENTARY ROCKS: distal volcanic sequences with flow rocks and volcaniclastic rocks interbedded with sedimentary rocks of clastic and chemogenic origin (siltstone, sandstone, conglomerate, chert, marble)

- Mixed volcanic-sedimentary rocks including andesite and rhyolite flow and pyroclastic rock, siltstone, chert, and conglomerate
- Interbeds of dacitic volcanic rock (flow rock and tuff) in sedimentary sequences
- Mixed volcanic-sedimentary rocks including siliceous vitric tuff, tuffaceous graywacke, and siltstone (in some places present as chlorite-sericite schist)

PREDOMINANTLY SEDIMENTARY ROCKS

In some areas include minor volcanic interbeds.

- Clastic rocks, mainly medium to fine-grained sandstone (impure arenite to graywacke) with some siltstone (chlorite-sericite schist) and conglomerate. Locally include volcanic interbeds
- Clastic rocks, mainly siltstone (argillite, pelitic schist, chlorite-sericite schist) and fine-grained sandstone (graywacke). Locally contain calcareous siltstone and sandstone, marble, and some volcanic interbeds
- Calcareous siltstone (argillite) and(or) some marble and calcareous sandstone
- Clastic rocks, mainly coarse-grained lithic (volcaniclastic) sandstone with some conglomerate and argillite
- Clastic rocks, mainly graphitic siltstone, sericite-chlorite schist; locally include sericitic marble and conglomerate
- Undifferentiated, unmetamorphosed sedimentary rocks, including polymict conglomerate, sandstone, siltstone, variegated shale, and cherty limestone, with some andesite and rhyolite
- Limestone and marble, including black marble and gray dolomitic marble; locally include chert and commonly intraformational and extraformational (polymict) conglomerate. Stromatolites reported from Jabal Damkh and Jabal al Badr areas
- Polymict conglomerate

LAYERED ROCKS 2

Include moderately to strongly metamorphosed and deformed rocks, the original volcanic and sedimentary character of which has been blurred or destroyed.

- Biotite schist, mainly in zones of contact metamorphism
- Amphibolite, mainly of volcanic derivation
- Heterogeneous paragneiss, including hornblende–biotite schist, amphibole gneiss, feldspathic amphibolite (metamorphosed andesite), metarhyolite, leucocratic quartzofeldspathic gneiss (metamorphosed rhyolite), chlorite-sericite-biotite and calc-schist (metamorphosed graywacke), quartzite, marble, and calc-silicate gneiss (metamorphosed impure dolomitic marble or marl)
- Biotite-hornblende-garnet gneiss, amphibolite, and biotite-hornblende schist (inferred to be mainly metamorphosed mafic volcanic rocks)
- Migmatite zones

PLUTONIC ROCKS

- Posttectonic alkalic granite (perthitic orthoclase–albite–sodic amphibole, and accessory biotite)
- Late to posttectonic calc-alkalic granite (two feldspar-hornblende–biotite) and granodiorite; locally alkalic. Accompanied by gabbro and diorite. Circa 556±23 to 518±12 Ma: postdates Murdama group. Typically has contact aureoles
- Microgranite ring dike (calc-alkalic biotite granite) grading to porphyritic rhyolite. Circa 571±22 Ma
- Graphic (micro) granite porphyry; includes graphic granite and granophyre. Mainly calc-alkalic, in places soda-alkaline. Considered to be pre-Murdama group
- Heterogeneous granitic rocks including trondhjemite, granodiorite, and calc-alkalic granite. Commonly contain biotite and hornblende. Commonly lineated with inclusions of gabbro, diorite, and metamorphic rocks. Syn- to posttectonic with respect to the Hulayfah group: typically pre-Murdama group. One date of 590±12 Ma
- Biotite granite with numerous xenoliths of biotite schist and ultramafic rocks. Possibly equivalent to heterogeneous metagranodiorite
- Granodiorite
- Heterogeneous syntectonic metagranodiorite: ranges from quartz diorite to calc-alkalic granite. Typically lineated, schistose, or gneissic; commonly migmatitic with inclusions of country rock
- Undifferentiated, partly lineated, locally gneissic granitic rocks, including biotite-amphibole granite, trondhjemite, granodiorite, and diorite, with some inclusions of biotite gneiss. Age uncertain: possibly represent mobilized basement rocks
- Diorite to quartz diorite
- Foliated, metadiorite to quartz diorite with inclusions of country rock
- Gabbro
- Ultramafic rocks, largely serpentinite with some peridotite, pyroxenite, and gabbro. Associated with talc schist and marble (ultramafic rocks with carbonate)

MINERALIZATION

Major or dominant commodity	Host environment (shown under commodity symbol)
iron sulfides	Vf Volcanic felsic
gold	Vi Volcanic intermediate
copper	Vm Volcanic mafic
zinc	Vsp Proximal volcanic/clastic
lead	If Intrusive acid
silver	Ii Intrusive intermediate
iron oxides	Im Intrusive basic
tungsten	Iu Intrusive ultramafic
tin	Scs Sedimentary clastic
chromium	Scc Sedimentary carbonate clastic
fluorine (fluorite)	Scb Sedimentary carbonate
niobium	M metamorphic
	Sk skarn

Types of mineralization (shown within commodity symbol)	Surface expression (shown on the left of commodity symbol)
disseminated	Ancient working
stockwork/stringer zone/ breccia fill	Ancient working, drilled
shear/fracture vein filling	G Gossan
stratiform-massive	S Staining
unknown	M Mineralized outcrop
	Alteration zones

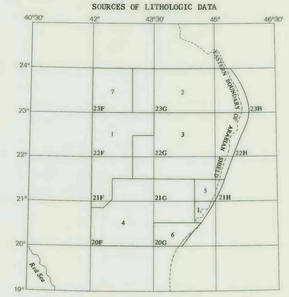
AGE DATING

- Whole rock Rb/Sr isochron
- Whole rock K/Ar isochron
- Rb/Sr determination on biotite

OTHER SYMBOLS

- Wadi boundary
- Geologic boundary
- Fault
- Concealed fault

SOURCES OF LITHOLOGIC DATA



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