DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

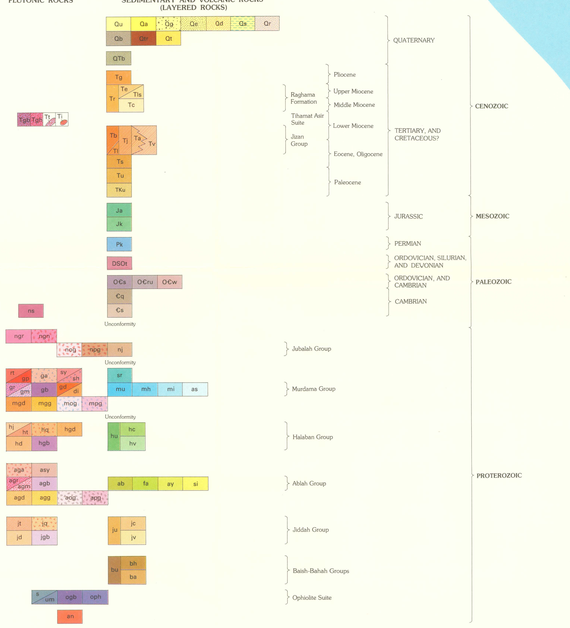
Prepared in cooperation with
THE MINISTRY OF PETROLEUM AND MINERAL RESOURCES
DEPUTY MINISTRY FOR MINERAL RESOURCES
KINGDOM OF SAUDI ARABIA

PROFESSIONAL PAPER 560–A
PLATE 1 (SOUTH SHEET)

## CORRELATION OF MAP UNITS

PLUTONIC ROCKS

SEDIMENTARY AND VOLCANIC ROCKS (LAYERED ROCKS)




## DESCRIPTION OF MAP UNITS

**Qu** **Alluvium**—Undivided

**Qa** **Alluvium**—In wadis

**Qg** **Gravel**—Commonly on pediments and low terraces

**Qe** **Eolian sand and silt**—Undivided

**Qd** **Dune sand**—Conspicuous dune forms present

**Qs** **Sabkhah deposits**—Mostly saline silt

**Qr** **Coral reef**—Along Red Sea mostly in terraces 2 to 3m high; some higher in northern Red Sea area; mostly of latest Quaternary age; most modern fringing reefs not shown

**Qb** **Flood basalt**

**Qbr** **Trachytic flows and cones**—On harrats

**Qt** **Terrace alluvium**—On high terraces and dissected pediments

**QTb** **Flood basalt**—Mostly in large harrats

**Tg** **Sand and gravel in alluvial-fill deposits**—In places grade toward the sea into fine-grained marine deposits including limestone

**Tr** **Raghama Formation**—Continental and marine detrital deposits; includes marl and some evaporites on coastal plain of Red Sea

**Tls** **Limestone of Raghama Formation**—In part reefal; some may be slightly older and equivalent to the middle Miocene Globigerina Marl

**Te** **Evaporite series**

**Tc** **Bathan Formation**—Boulder conglomerate associated with uplift of the Red Sea Escarpment

**Tgb** **Gabbro**—Small plutons, commonly concentrically layered; includes some dioritic and quartz-dioritic rocks

**Tgn** **Granophyre**—Small plutons associated with gabbro

**Tr** **Small, intrusive stocks and plugs of rhyolitic to trachytic compositions**—As at Ad Darb, probably part of Tihamat Asir Complex but some may be late Jizan Group age

**Tb** **Basaltic to gabbroic dikes and sills (Tihamat Asir Complex age)**—Commonly intruded into Jizan Group rocks, abundant but not shown in Jizan Group rocks south of Ad Darb

**Th** **Flood basalt**—Mostly in large harrats; some small outliers as at Harrat Hadan are hypabyssal basaltic and trachytic feeder pipes

**Tj** **Lake bed and fluvial sediments**—Beneath and adjacent to flood basalt; includes lag boulder accumulations of Shumaysi Formation age beneath flood basalts

**Ta** **Baid Formation**—Silicified tuffaceous siltstone in lake beds; fossiliferous, includes some volcanic rocks (Tv)

**Tj** **Jizan Group**—Undivided, continental rift volcanic and sedimentary rocks

**Tv** **Volcanic rocks of Jizan Group**—Intermediate to silicic composition

**Ts** **Shumaysi Formation**

**Tu** **Usfan Formation**

**TKu** **Sedimentary rocks**—Undivided. Older than Jizan Group

**Ja** **Amran Formation**

**Jk** **Khums Formation**

**Pk** **Khuff Formation**

**DSOt** **Tabuk Formation**

**OCs** **Saq Sandstone**

**OCru** **Ram-Umm Sahm Sandstone**

**OCw** **Wajid Sandstone**

**Cq** **Quweira Sandstone**

**Cs** **Siq Sandstone**

**ns** **Nepheline syenite**—Miscellaneous igneous plugs and sills intruded post-tectonically in the Najd fault zone. Composition ranges from gabbro to syenite; radiometric ages falling within the Cambrian time span may be cooling ages or may be of Cambrian emplacement age

**nj** **Jubalah Group**

**ngr** **Granite**—Nonsheared small plutons in Najd fault zones

**ngn** **Granite gneiss**—Syntectonically intruded granite in Najd fault zones

**mog** **Orthogneiss**—Older intrusive rocks emplaced as gneiss domes in Najd fault zones

**mpg** **Paragneiss**—Older volcanic and sedimentary rocks tectonized in Najd fault zones

**sr** **Shammar Group**

**mu** **Murdama Group**—Undivided

**mh** **Hadiyah Formation**—Mostly even-bedded, fine-grained siltstone and shale; in northwestern region

**mi** **Hibshi Formation**—Interbedded conglomerate, arkose, and wacke; in northeastern region

**as** **Abt Schist**

**rt** **Rhyolite, trachyte, microgranite, and granophyre**—Commonly peralkalic, in hypabyssal intrusions

**gp** **Alkalic granite**—Commonly peralkalic or peraluminous, commonly in circular plutons or ring structures, flow banded to massive, minor biotite and pyroxene

**ge** **Alkalic granite**

**sy** **Syenite**—Commonly in circular plutons

**sh** **Shonkinite**—Commonly in circular plutons

**gr** **Granite**—Commonly red, biotite syenogranite in circular plutons; postectonic; may include monzogranite

**gm** **Granite**—Pink or gray, biotite or biotite-hornblende monzogranite, commonly in large irregularly shaped plutons; includes adamellite; postectonic

**gb** **Gabbro**—Commonly concentrically layered in small circular plutons, in places bimodally associated with granite; posttectonic

**gd** **Biotite-hornblende quartz monzonite; minor quartz diorite**

**di** **Diorite**—Small plutons of hornblende diorite, quartz monzodiorite, and quartz monzonite composition; not abundant

**mgd** **Granodiorite**—Gray, biotite-hornblende granodiorite and low potassium monzogranite, gneissose, commonly in batholiths, in places associated with gneiss domes; late syntectonic intrusion

**mgg** **Migmatite**—Gray, biotite-hornblende granodiorite-monzogranite gneiss, associated with gneiss domes and granodiorite batholiths; late syntectonic emplacement

**mog** **Orthogneiss**—Commonly gray, hornblende-biotite tonalite-trondhjemite emplaced as large gneiss domes through reactivation of Halaban plutonic crust; syntectonic emplacement

**mpg** **Paragneiss, metavolcanic and metasedimentary rocks of Halaban Group**—Reactivated in association with gneiss domes; amphibolite facies; syntectonic emplacement

**hu** **Halaban Group**—Undivided

**hc** **Upper Halaban Group**—Predominantly clastic sequence of sedimentary and volcaniclastic rocks, includes volcanic flow rocks of largely andesitic to dacitic, calc-alkalic composition, and small marble members; mostly metamorphosed to greenschist facies

**hv** **Lower Halaban Group**—Predominantly volcanic sequence of lava and pyroclastic rocks of basaltic to andesitic, calc-alkalic composition; mostly metamorphosed to greenschist facies

**hj** **Trondhjemite**

**ht** **Tonalite**

**hq** **Quartz diorite**—Many feldspars are sericitized, slightly calcareous, chloritsized biotite; syntectonic

**hgd** **Granodiorite**—Many feldspars are sericitized, some chloritization of green hornblende; syntectonic to late tectonic

**hd** **Diorite**—Dark to light gray; commonly mildly metamorphosed; syntectonic or late tectonic; often gneissic, locally epidotized accessory hornblende

**hgb** **Gabbro**—Metamorphosed to greenschist facies

**ab** **Ablah Group**—Metasedimentary and metavolcanic rocks containing thick marble beds and andesitic to rhyolitic volcanic rocks; red oxidized sedimentary and tuffaceous beds are common. Often schistose

**fa** **Fatimah Group**—Clastic-volcanic sequence similar to Ablah Group

**ay** **Al Ays Group**—Clastic-volcanic sequence similar to Ablah Group

**si** **Silasia Formation**—Slate, shale, schist, and lenses of marble; arkose and conglomerate in lower part; jaspilite interbedded with hematite and limestone beds in upper part

**agk** **Alkalic granite**

**asy** **Syenite**—Orange and reddish gray, fine grained, porphyritic; some quartz monzonite

**agr** **Granite**—Commonly red biotite syenogranite in small plutons

**agn** **Granite**—Pink or gray biotite or biotite-hornblende monzogranite

**agb** **Gabbro**—Lower parts of layered, folded, and graded cumulates in northern part of the shield; partly metamorphosed to amphibolite facies

**agd** **Granodiorite**—Gray, biotite-hornblende rock, gneissose, commonly in batholiths associated with gneiss domes; late syntectonic intrusion

**agg** **Migmatite**—Gray biotite-hornblende granodiorite gneiss associated with gneiss domes and granodiorite batholiths of Ablah age; late syntectonic emplacement

**aog** **Orthogneiss**—Commonly gray, hornblende-biotite tonalite-trondhjemite emplaced as large gneiss domes through reactivation of plutonic crust of Jiddah age; syntectonic emplacement

**apg** **Paragneiss**—Metasedimentary and metavolcanic rocks of Jiddah Group, reactivated in association with gneiss domes; amphibolite facies; syntectonic emplacement

**jg** **Jiddah Group**—Undivided

**jc** **Upper Jiddah Group**—Predominantly clastic sequence of sedimentary, volcaniclastic rocks; includes volcanic flow rocks largely of andesitic and dacitic, calc-alkalic composition; mostly metamorphosed to greenschist facies

**jv** **Lower Jiddah Group**—Predominantly volcanic sequence of lava and pyroclastic rocks of basaltic to andesitic calc-alkalic composition; mostly metamorphosed to greenschist facies

**jt** **Tonalite and trondhjemite**—Light gray, medium- to coarse-grained quartz and oligoclase; some amphibolite facies

**jq** **Quartz diorite**—Leucocratic, cleaved, often gneissic; minor granodiorite; syngenetic

**jd** **Diorite**—Hornblende, gray; massive, less commonly layered; syngenetic

**jgb** **Gabbro**—Olivine or tholeiitic, commonly metamorphosed to amphibolite facies or retrograded to greenschist facies; locally tectonized; massive and banded

**bu** **Basih-Bahash Groups**—Undivided. Metasedimentary and metavolcanic sequences largely tholeiitic

**bh** **Bahash Group**—Parashists, chlorite-sericite quartz feldspar retrograded mostly to greenschist facies except near intrusives

**ba** **Baish Group**—Metabasalt and meta-andesite with interbedded mafic pyroclastic rocks metamorphosed to greenschist and amphibolite facies; minor graphitic and quartzitic schist, slate, and chert; tectonized. Northernmost outcrops include marble and almandine amphibolite. Pillow structures in some flows

**oph** **Ophiolite suite**—Commonly as parts of dismembered and incomplete ophiolites, possibly of differing ages in different regions of the shield; fragments of sematic ocean-floor rocks generally in a melange, and irregularly metamorphosed to greenschist or amphibolite grade. Ultramafic and malic igneous rocks, anorthosite, plagiogranite, and chert may be present

**s** **Serpentinite**—Commonly in fault zones, largely after ultramafic rocks of ophiolite suite, includes listwanite, (secondary dolomite, magnesite, talc, and oxidized and hydrated sulfides). May include anthophyllite or tremolite

**um** **Ultramafic rocks**—Largely associated with ophiolitic suite of several different ages in different parts of the shield; includes peridotite, pyroxenite, dunite, and hanburgite; frequently serpentinized and metamorphosed to amphibolite or greenschist facies

**ogb** **Metagabbro**—Associated in large fault zones with rocks of the ophiolite suite

**an** **Anorthosite**—Essentially andesine and labradorite; with kinky, deformed-feldspar twin laminae, minor zoisite, or clinozoisite, calcite, biotite, chlorite, hornblende. Large tectonic block in southeastern part of the shield

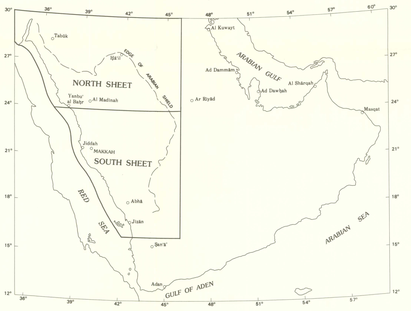
## EXPLANATION OF MAP SYMBOLS

Contact—Dotted where concealed

Fault—Dashed where approximately located; dotted where concealed

Thrust fault—Sawteeth on upper plate

●108 Rock sample location—Number refers to analysis described in tables




Base from U.S. Geological Survey, 1963, Map I-270 B-2, Arabian Peninsula, scale 1:2,000,000
Lambert Conformal Conic projection; standard parallels 17° and 33°

SCALE 1:1 000 000
25 0 25 50 75 100 125 150 175 KILOMETERS
25 0 25 50 75 MILES
DATUM IS MEAN SEA LEVEL

Compiled by Glen F. Brown, Dwight L. Schmidt, and A. Curtis Huffman, Jr. from mapping by the authors and geologists of the U.S. Geological Survey, Bureau de Recherches Geologique Minieres, King Abdulaziz University, Japanese Geological Survey, and the Ministry of Petroleum and Mineral Resources, Kingdom of Saudi Arabia, 1963 to 1983.

# GEOLOGIC MAP OF THE SAUDI ARABIAN SHIELD