UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PROFESSIONAL PAPER 403-A
PLATE 1

GEOLOGIC MAP AND SECTIONS OF GUAM, MARIANA ISLANDS

Base map by Army Map Service

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1992

Geologic map by J. I. Tracey, Jr., S. O. Schlanger, D. B. Doan, H. G. May, and J. T. Stark

SCALE 1:50 000

1 0 1 2 3 4 MILES

1 0 1 2 3 4 KILOMETERS

CONTOUR INTERVAL 20 METERS WITH SUPPLEMENTARY CONTOURS AT 10 METER INTERVALS

VERTICAL DATUM IS BASED ON THE MEAN LOWEST LOW WATER

APPROXIMATE MEAN DECLINATION, 1964

EXPLANATION

Qaf — Artificial fill
Shown only where extensive

Reefs
Reef margins and present reef flats of living coral and algae, raised terraced ramps and pools, and cut benches at sea level

Qrb — Beach deposits
Beach sand and gravel, beach rock in the intertidal zone, and patches of recently emerged detrital limestone. Sand generally is less than 15 feet above sea level, seldom as much as 30 feet above

Qrm — Merizo limestone
Reef limestone, mostly 2 to 5 feet thick, capping present-day reef flats and platforms cut in basalt at sea level

Qal — Alluvium
Alluvial clay deposits, mostly 20 to 100 feet thick; muck and clay in marshy estuarine deposits on the west coast, and clay fill in large sinks in limestone areas

Recent — QUATERNARY

UNCONFORMITY

QTmr, QTmn, QTmf, QTmd, QTma — Mariana limestone

Qtmr, *reef facies: massive, generally compact, porous, and cavernous white limestone of reef origin, especially along cliff faces, made up mostly of corals in position of growth in matrix of encrusting calcareous algae.*

Qtmd, *detrital facies: friable to well-cemented coarse- to fine-grained generally porous and cavernous white detrital limestone, mostly of lagoonal origin.*

Qtmm, *molluscan facies: fine-grained white to tan detrital limestone of lagoonal origin containing abundant casts and molds of mollusks, predominantly pelecypods.*

Qtmf, *fore-reef facies: well-bedded friable to indurated white foraminiferal limestone deposited as fore-reef sand.*

Qtma, *Agana argillaceous member: coarse- to fine-grained pale-yellow, tan, or brown fossiliferous detrital limestone containing 2 to 5 percent disseminated clay and as much as 20 percent clay in pockets and cavities; includes undifferentiated lenses of above facies. Formation typically unconformable upon underlying rocks. Maximum aggregate thickness of formation is as much as 500 feet in some cliffs*

Pliocene and Pleistocene — TERTIARY AND QUATERNARY

UNCONFORMITY

Tal, Tt — Alifan limestone

Tal, *massive coarse- to fine-grained recrystallized limestone, generally pale pink, buff, or white but locally red, yellow, or brown. Characterized by dominance of sticklike* Porites *and* Acropora *and by long calcite tubes formed by burrowing worms or gastropods. Locally argillaceous above base.*

Tt, *Talisay member: yellow, green, and red clay and lenticular clayey conglomerate and lignite; gray to green marl containing sticklike* Porites *and* Acropora, *and interbedded limestone lenses, 2 to 30 feet thick. Generally unconformable with the underlying Umatac or Alutom formations; locally overlies the Bonya limestone*

Tj — Janum formation

Well-bedded white, tan, and brown foraminiferal limestone containing abundant globigerinid Foraminifera. Overlies Bonya limestone in north Guam; generally unconformable with overlying Mariana limestone. Deposits are lenticular and tongue into Barrigada limestone; maximum thickness 70 feet

Tbl — Barrigada limestone

Massive well-lithified to friable medium- to coarse-grained white foraminiferal limestone characterized by the Foraminifera Operculina, Gypsina, *and* Cycloclypeus. *Corals and mollusks present at top of the formation where it locally grades upward into the Mariana limestone. Unconformable with the Mariana limestone in parts of north Guam. Maximum thickness unknown but exceeds 540 feet*

Tb — Bonya limestone

Pure to argillaceous limestone. In south Guam, generally well bedded, coarse grained, and sandy; in north Guam, mainly massive, compact, white foraminiferal limestone. Maximum thickness about 120 feet

Tub, Ttud, Ttum, Tuf — Umatac formation

Tuf, *Facpi volcanic member: basal 900 feet made up of pillow basalt with columnar jointed flows cut by dikes; upper 500 feet made up of flows interbedded with tuffaceous shale and sandstone containing lenses of the Maemong limestone member.*

Tum, *Maemong limestone member: reef facies in central Guam consists of compact white recrystallized limestone containing larger Foraminifera and algae, and corals in position of growth; at some places overlain by the Bolanos pyroclastic member. Fore-reef facies in south Guam consists of conglomeratic lenses grading into calcareous tuffs and fine-grained limestone containing abundant globigerinid Foraminifera; forms lenses within the Facpi volcanic member. Maximum thickness 260 feet.*

Tub, *Bolanos pyroclastic member: basal part consists of massive reworked tuff breccia and volcanic conglomerate containing fragments of the Maemong limestone member; upper part consists of tuffaceous sandstone and shale interbedded with minor amounts of conglomerate. This member rests on the Facpi volcanic member in the vicinity of Umatac and interfingers with the Dandan flow member on the eastern slopes of Mount Almagosa. Maximum thickness about 750 feet.*

Tud, *Dandan flow member: compact medium- to coarse-grained porphyritic basalt flows separated from the underlying Bolanos pyroclastic member by a flow breccia approximately 10 feet thick; maximum thickness of member 50 feet. Aggregate thickness of formation about 2200 feet*

Miocene — Tertiary e

Tam, Ta — Alutom formation

Ta, *Alutom formation: well-bedded fine- to coarse-grained gray, green, and brown tuffaceous shale and sandstone; lenses of fine- to coarse-grained, tuffaceous foraminiferal limestone; pyroclastic conglomerate containing limestone fragments; interbedded lava flows. Maximum thickness exceeds 2900 feet.*

Tam, *Maklac member: thin-bedded to laminated friable buff to tan or yellow-tan calcareous foraminiferal shale; maximum known thickness 200 feet*

Miocene and Pliocene — Tertiary g and h

Eocene and Oligocene — Tertiary b and c

TERTIARY

Contact
Dashed where approximately located, gradational, or inferred

Fault, showing dip
Solid where definitely located; dashed where approximately located; dotted where concealed. Queries indicate uncertainty as to existence of fault. Arrows show relative movement. U, upthrown side; D, downthrown side

Breccia zone
Crushed and brecciated zone in limestone. Zone may grade into joint and fault zones along its strike, and into massive, structureless rock perpendicular to its strike

Thrust fault
Dashed where inferred. T, indicates upper plate

Anticline
Showing crestline and bearing and plunge of axis

Syncline
Showing position of trough and bearing and plunge of axis

30 — Strike and dip of beds

60 — Strike and dip of joints

Strike of vertical joints
A line of joint symbols indicates a prominent joint or structural lineament, along which unbrecciated limestone is cut by a dominant set of joints in which solution has produced deep fissures bounding elongate, pinnacled ridges or along which volcanic rocks are cut by recognizable structural lines that show as a series of knobs and ridges crossing topographic trends or as fine fissures. In places, drainage patterns and valley-wall alinements are determined by these lines. Minor movement at the zone may have occurred, but significant stratigraphic displacement is not shown

INDEX MAP OF GUAM

A–A′ — Qtmm, QTmd, Qal, Tal, QTmr, Ta, Tbl, Tb
B–B′ — QTmm, QTmd, QTmr, Qrb, Ta, Tbl
C–C′ — Qal, Tal, Ta, QTma, QTmr, Tal
D–D′ — QTmr, Qrb, Tuf, Tum, Tal, Tud, Tub, Tb, Qal, QTma, Tam, QTmf, Ta
E–E′ — Tuf, Qal, Tum, Tud, Tub, QTma, QTmr