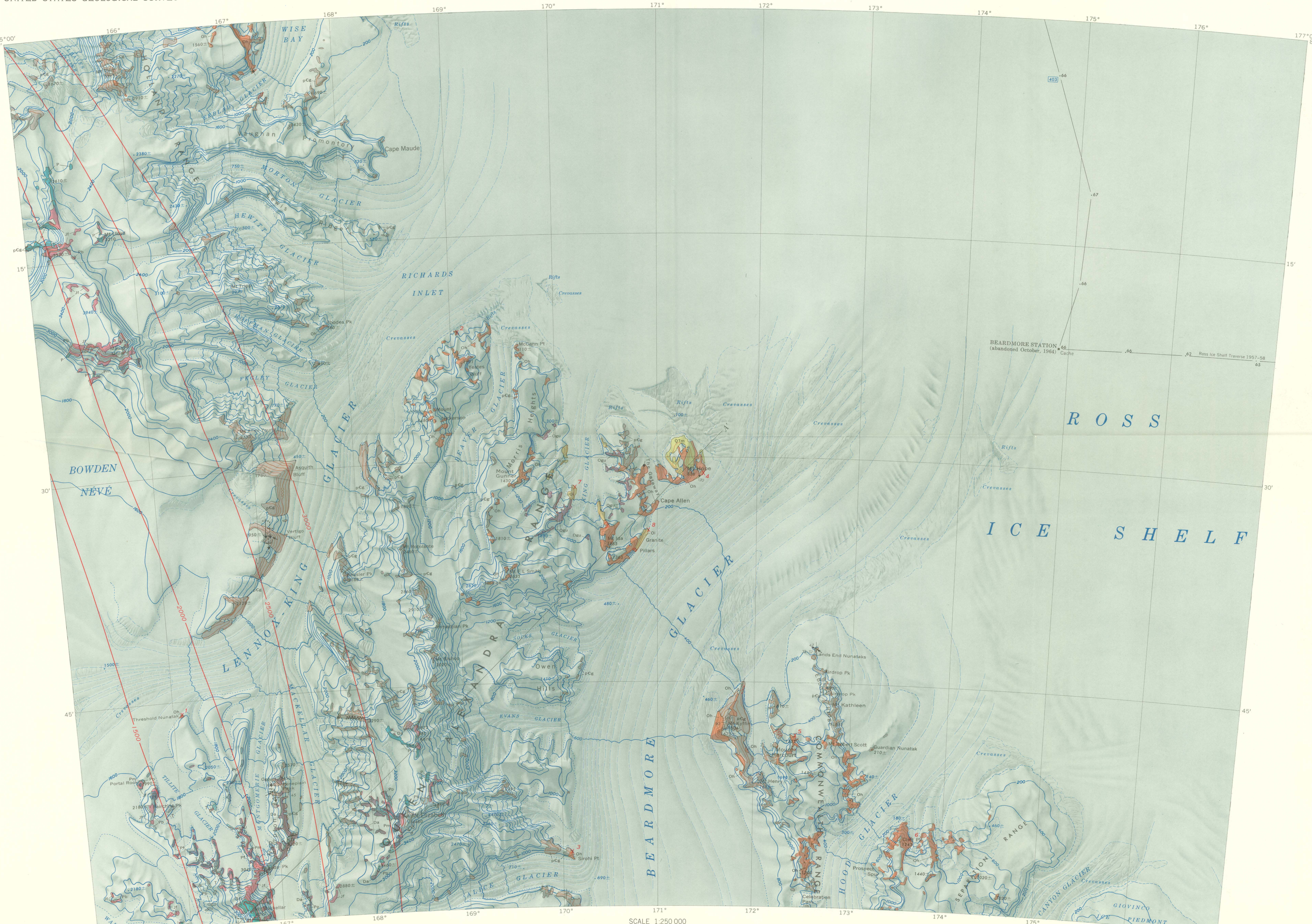
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED BY THE
INSTITUTE OF POLAR STUDIES, OHIO STATE UNIVERSITY
UNDER THE AUSPICES OF THE
NATIONAL SCIENCE FOUNDATION

U.S. ANTARCTIC RESEARCH PROGRAM
MT. ELIZABETH AND MT. KATHLEEN QUADRANGLES
ANTARCTIC GEOLOGIC MAP A-2



SCALE 1:250 000

5 0 5 10 15 20 Statute Miles
5 0 5 10 15 20 25 30 Kilometers
5 0 5 10 15 Nautical Miles

Polar Stereographic Projection—Standard Parallel 80°14′
CONTOUR INTERVAL 200 METERS—DATUM IS MEAN SEA LEVEL
Elevations and ice thickness in meters

Base from U.S. Geological Survey,
Mount Elizabeth and Mount Kathleen, 1966

Geology mapped in 1966–70 by John F. Lindsay, John Gunner, Peter J. Barrett, Henry Brecher, Donald Coates, David H. Elliot, D. Kenyon King, and Izak Rust

EXPLANATION

QTm
Moraine
TERTIARY(?) AND QUATERNARY

Jf
Ferrar Dolerite
Tholeiitic diabase sills intruded into Permian and Triassic strata; rare dikes. Measured sills as thick as 260 m
JURASSIC

Beacon Strata

Ћfr
Fremouw Formation
Only lower part of formation present. Cyclic very light-colored quartzose sandstone and greenish-gray mudstone. At Graphite Peak in Plunket Point quadrangle sandstone contains labyrinthodont jawbone fragments. Thickness 100+ m
TRIASSIC

Pb
Buckley Formation
Cyclic light-colored crossbedded sandstone, carbonaceous shale and high-rank high-ash coal. Logs, stems and glossopterid leaves common. Sandstone beds normally have erosion surfaces at base and shale fragments in lower part. Sandstone is subarkosic to arkosic low in formation but volcanic fragments become abundant between 100 and 300 m above base. Volcanic sandstone, commonly laumontized, dominates upper part. Lower contact of formation marked by appearance of white rounded quartz pebbles. Quartz pebbles occur at higher levels also. Thickness at least 450 m

Pf
Fairchild Formation
Light-colored massive subarkosic to arkosic sandstone with well-developed crossbedding and parting lineation. Thickness 130–150 m

Pm
Mackellar Formation
Dark gray to black finely laminated to thinly bedded shale alternating with light gray and greenish-gray very fine-grained thinly bedded subarkosic sandstone. Ripple-drift bedding widespread. Ripple marks and slump folds at many localities. Thickness 70–90 m

Pp
Pagoda Formation
Grayish-green sandy tillite with boulders as much as 2 m across, interbedded with tan or white quartzose sandstone and minor conglomerate, limestone and shale. Locally basal tillite is very quartzose. Features on grooved surfaces beneath some tillite beds indicate paleo-ice flow to southeast. Crossbedding common in sandstone. Rare plant fragments. Thickness 130–180 m

P
Permian strata, undivided
PERMIAN

DISCONFORMITY

Da
Alexandra Formation
White to light brown medium- to coarse-grained well-sorted quartzose sandstone with abundant crossbedding. Thin beds of black shale and gray fine-grained limestone in Holland Range. Thickness about 300 m
DEVONIAN(?)

NONCONFORMITY AND ANGULAR UNCONFORMITY

Granite Harbour Intrusives

Oi
Ida Granite
Aplitic quartz monzonite and granite. Intrudes Hope Granite at Mt. Ida and Granite Pillars. Light gray (fresh), rusty brown (weathered); weathered rocks commonly hematite stained. Texture fine- to medium-grained, locally porphyritic. Typically consists of aplitic or hypidiomorphic-granular microcline, quartz, and unzoned or slightly zoned albite or sodic oligoclase (An_0 to An_{17}) with accessory biotite, muscovite, apatite, epidote, hornblende, magnetite, sphene and zircon. Medium- to coarse-grained, euhedral, grayish-blue phenocrysts of albite or sodic oligoclase may be present. Myrmekite rare or absent. Includes pegmatite and aplite dikes intruding Hope Granite and Goldie Formation. Foliation, xenoliths and prominent jointing rare. Contacts of Ida and Hope Granites at Granite Pillars are inaccessible, but appear sharp. At Mt Ida the contact is diffuse, with several compositionally intermediate phases separating the two units. Rb-Sr whole-rock isochron date 463±7 m.y. (localities 7 and 8; same isochron as Hope Granite.) (Gunner, 1971a)

Oh
Hope Granite
Biotite quartz monzonite, with minor granodiorite and granite. Intrudes Goldie Formation. Gray (fresh), rusty brown (weathered); hematite stained on weathered surfaces. Medium- to coarse-grained, frequently porphyritic. Typically consists of coarse to very coarse subhedral white to pink microcline phenocrysts in a hypidiomorphic- to xenomorphic-granular matrix of quartz, normally zoned calcic oligoclase, andesine, or labradorite (An_{21} to An_{56}), biotite and interstitial myrmekite, with accessory apatite, hornblende, sphene and zircon. Dark xenoliths of biotite schist and granofels, 2 cm to several meters across, locally abundant. Primary foliation by alignment of prismatic microcline phenocrysts and elongate xenoliths occurs locally, especially near pluton margins. Secondary foliation is absent. Marginal contacts of Hope Granite plutons sharply abut indurated and contact-metamorphosed country rock. Biotite K-Ar dates 465 and 450 m.y. from Celebration Pass. (McDougall and Grindley, 1965). Rb-Sr whole-rock isochron date 463±7 m.y. (localities 1 to 6). (Gunner, 1971a)

Ogu
Granite Harbour Intrusives, undivided
ORDOVICIAN

Ogd
Quartz diorite
Gray (fresh), dark brown (weathered). Mineralogy variable. Plagioclase, hornblende and/or biotite and (frequently) quartz essential. Plagioclase (An_{25} to An_{60}) shows oscillatory zoning, overall more albitic toward periphery. Clinopyroxene, hypersthene and K-feldspar accessory in some rocks. Xenoliths, probably metasedimentary, abundant. Crops out as small stocks intruding Goldie Formation. Relation to Hope and Ida Granites unknown. Tentatively included in Granite Harbour Intrusives
ORDOVICIAN(?)

Upper Precambrian
Beardmore Group

p€g
Goldie Formation
Interbedded sandstone, siltstone, shale and minor conglomerate. Schist and slate where metamorphosed. Arenites include principally metalitharenite, feldspathic metalitharenite, sublitharenite, lithic arkose, subarkose. Principal detrital components quartz, muscovite, mica schist, plagioclase, biotite, microcline, and locally chert and granite. Sand-size grains are very fine to very coarse, very angular to sub-round, poorly to very poorly sorted. Graded bedding common in arenites. Sole marks occur locally. Tight to isoclinal folding about north-south trending axes throughout. Fold axes plunge gently north or south. Spacing of fold axes commonly 100 to 500 m; axial surfaces vertical or steeply dipping. Slaty cleavage in argillaceous beds near fold hinges. Weak metamorphism occurs throughout, with ubiquitous conversion of clay matrix to sericite, and development of foliation parallel to bedding in some areas. Higher metamorphic grades (hornblende-hornfels facies) occur in vicinity of Granite Harbour Intrusive plutons; e.g. at Ebony Ridge. Base not exposed. Total thickness unknown. Rb-Sr whole-rock isochron date on composite samples of 538±28 m.y. probably due to isotopic homogenization of strontium since deposition. (Gunner, 1971a)
PRECAMBRIAN

SYMBOLS

90
Vertical
Contact, showing attitude

U
D
Fault
U, upthrown side; D, downthrown side

80 Inclined
33-72 47 Inclined *Showing plunge of lineation*
Inclined *Inferred from aerial photo*
Vertical
Vertical *Inferred from aerial photo*
Near vertical *Inferred from aerial photo*
Strike and dip of beds

40 Anticline *Showing crestline and direction of plunge*
13 Inferred anticline *Showing crestline and direction of plunge*
15 Asymmetric anticline *Showing crestline and direction of plunge; Shorter arrow indicates steeper limb*
10 Inferred overturned syncline *Showing troughline and direction of plunge*
35 Inferred syncline *Showing troughline and direction of plunge*
Isoclinal folds, closely spaced *Showing axial trends*
Folds in bedding

70 Inclined
Vertical
Joints

Dikes; granite, pegmatite or aplite; where abundant

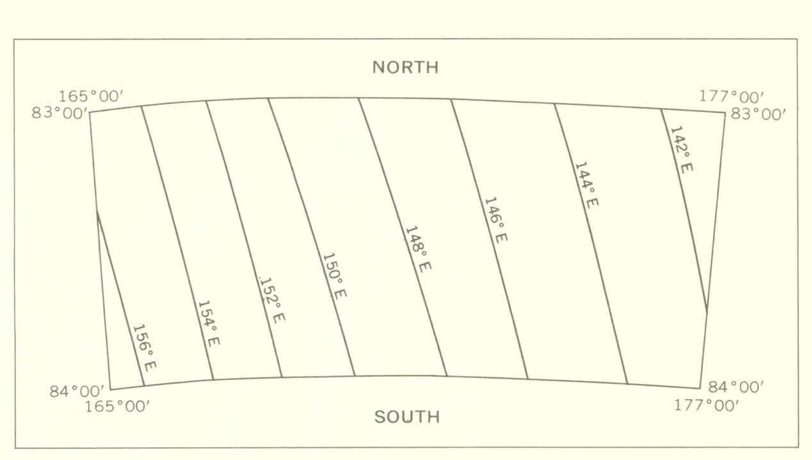
Included blocks in Hope Granite; where abundant

x 6
Locations of dated samples

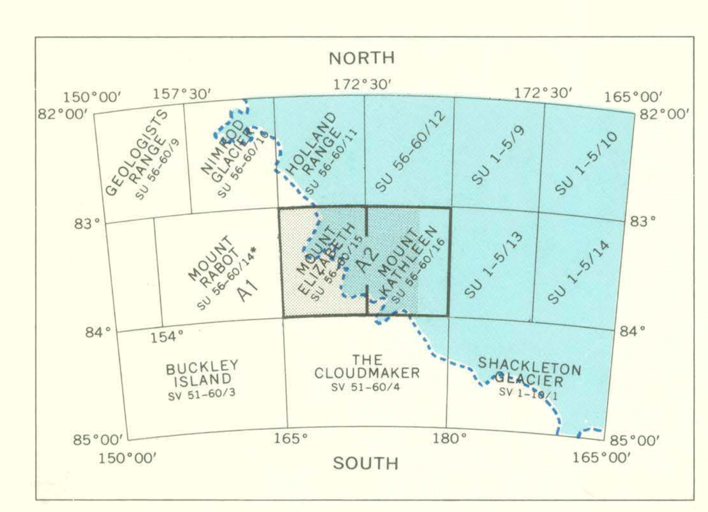
3000
Structure contour
Drawn on base of Beacon Strata. Contour interval 500 meters; datum is mean sea level

Base of measured stratigraphic section

T
Toreva block
Dashed where contact hidden. T, part of block



Compiled from U.S.N.O.O. chart 1706 S, 1960
ISOGONIC LINE DIAGRAM



Sheet numbering system based on International Map of the World
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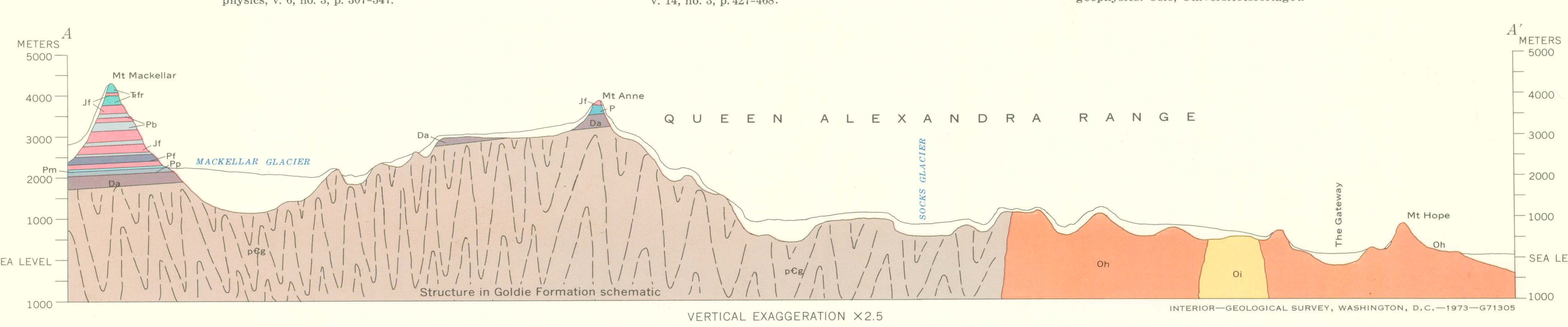

VERTICAL EXAGGERATION X2.5

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D.C.—1973—G71305

RECONNAISSANCE GEOLOGIC MAP OF THE MOUNT ELIZABETH AND MOUNT KATHLEEN QUADRANGLES, TRANSANTARCTIC MOUNTAINS, ANTARCTICA

By
John F. Lindsay, John Gunner, and Peter J. Barrett
1973

For sale by U.S. Geological Survey, price $1.00