ALASKA DIVISION OF GEOLOGICAL
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PROFESSIONAL REPORT 109
Bundtzen and Laird (1991), sheet 1 of 2
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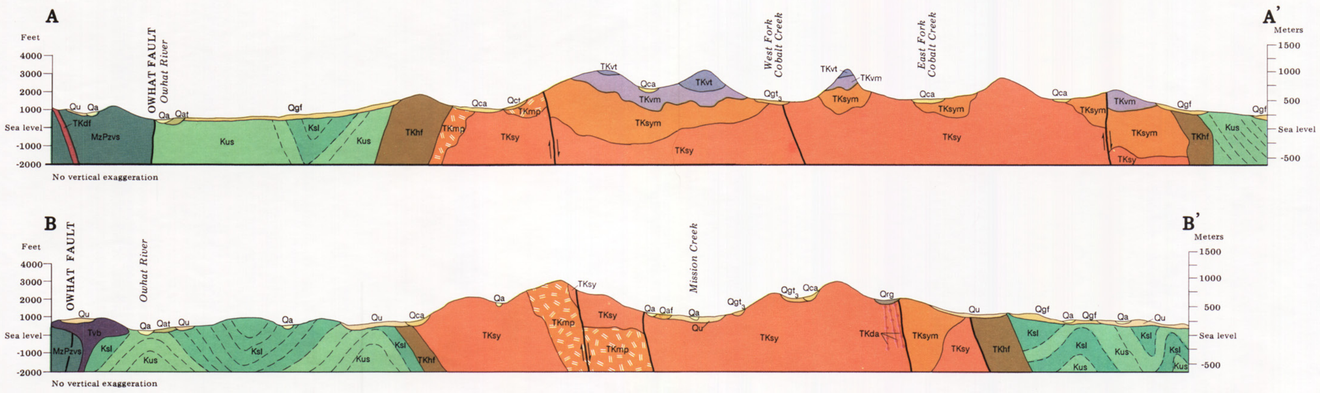

GEOLOGIC MAP OF THE RUSSIAN MISSION C-1 QUADRANGLE, ALASKA

By

T.K. Bundtzen and G.M. Laird

1991

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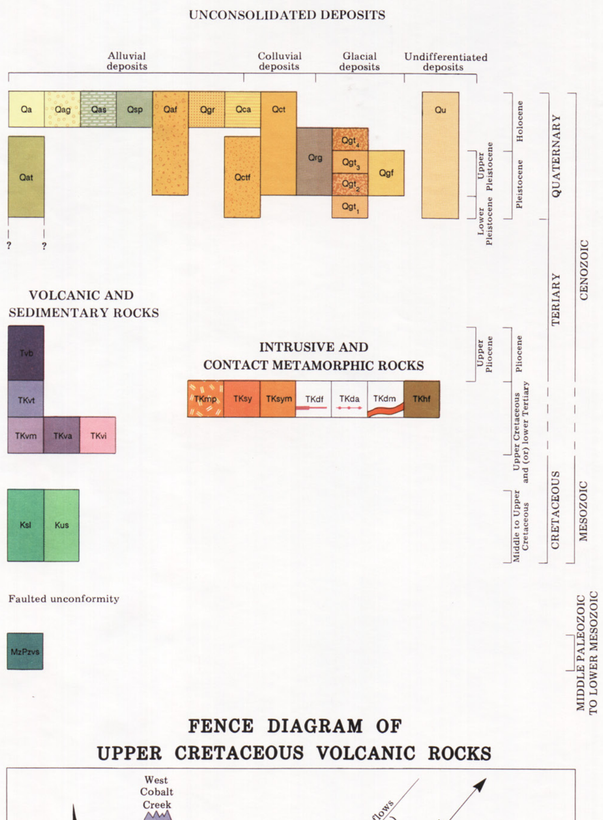
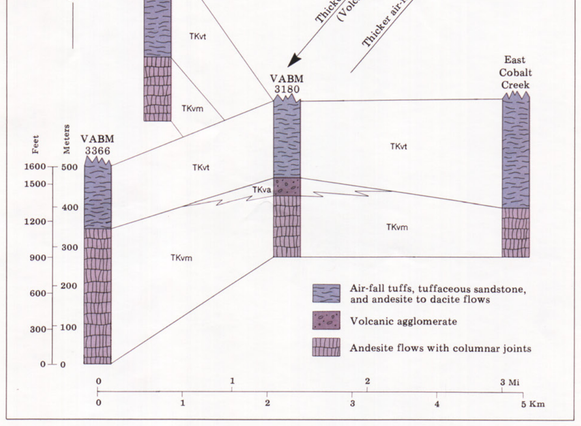
CORRELATION OF MAP UNITS



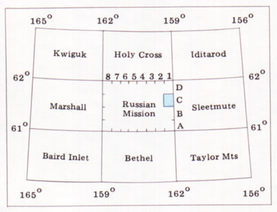
FENCE DIAGRAM OF UPPER CRETACEOUS VOLCANIC ROCKS



MAP SYMBOLS

- Contact—Approximately located
- High-angle fault—Approximately located; dotted where concealed. U, upthrown side; D, downthrown side. Arrows show direction of relative movement
- Syncline, showing trace of axial plane. Dotted where concealed
- Strike and dip of beds
  - Inclined
  - Vertical
  - Approximate
- Strike and dip of joints
  - Inclined
  - Vertical
  - Horizontal
- Strike of vertical cleavage
- Bearing of paleocurrent
- E Glacial-erratic locality
- K-Ar age-date locality (see text, table 1)
- Major-oxide sample locality (see text, table 2)
- Geochemical-sample locality at prospect or site of mineral occurrence (see text, table 3)

LOCATION INDEX



DESCRIPTION OF MAP UNITS

UNCONSOLIDATED DEPOSITS

Qa SANDY FLOOD-PLAIN ALLUVIUM—Unconsolidated, well-stratified, gray- to tan-weathering fine-grained sand, silty sand, and silt deposited by modern streams in mature valleys; locally covered by sphagnum moss and extensive thickets of willow (*Salix* sp.), alder (*Almus* sp.), and cottonwood (*Populus balsamifera*). Unit generally thawed.

Qag COARSE-GRAINED, GRAVEL-RICH ALLUVIUM—Unconsolidated, moderately- to well stratified silt, sand, and gravel deposited by modern streams in glaciated and nonglaciated terrain. Gravel-rich deposits in glaciated terrain consist of locally derived, subangular to rounded igneous cobbles and boulders to 0.5 m (1.6 ft) diam. Deposits in nonglaciated terrain consist of locally and distally derived igneous and sedimentary clasts typically confined to point bars of modern and ancient channels along flood plains of Kuskokwim and Owhat Rivers; only deposits proximal to active channels shown on map. Alluvium generally thawed, except where covered by frozen peat and silt.

Qas FLOOD-PLAIN ALLUVIUM WITH EXTENSIVE OVERBANK DEPOSITS—Alluvium composed of interbedded, dark-brown-gray, organic-rich sand and sandy silt, ranging from 1 to 10 m (3 to 33 ft) thick, that masks sandy flood-plain alluvium (Qa) or coarse-grained, gravel-rich alluvium (Qag). Overbank deposits, representing flood cycles, consist of aggradational successions of rhythmically bedded silt and sandy silt. Individual successions are typically capped by vegetation mat. Unit forms high, flat interchannel areas on flood plains of Kuskokwim and lower Owhat Rivers. Deposits mostly thawed, except for minor discontinuous permafrost.

Qsp SILT AND PEAT—Poorly stratified, black to brown, organic-rich alluvial, lacustrine, or bog silt. Southwest of Chuathbaluk and on Cobalt Creek, unit contains palsas composed of well-stratified peat 2 cm to 2 m (0.8 in. to 6.5 ft) thick and lenses of ice. Bog silt generally mantled with tussocks, grasses, sphagnum, and minor lichen (*Cladonia* sp.). Frequently frozen.

Qaf ALLUVIAL-FAN DEPOSITS—Generally poorly sorted, partially stratified sand and coarse gravel deposited as fans or cones where secondary streams join trunk drainages. Permafrost present locally.

Qgr REWORKED GLACIAL OUTWASH AND TILL DEPOSITS—Well-sorted, moderately well-stratified sand and pebble gravel reworked from coarser outwash gravels and diamicton by perennial streams. Generally laterally discontinuous and covered with pioneer flora, mainly willow (*Salix* sp.) and alder (*Almus* sp.). Thawed.

Qat TERRACE ALLUVIUM—Well-sorted, moderately stratified gravelly sand and silt, locally cemented by iron oxides; probably includes stripped strath terraces. Heavily forested in northeastern and southern parts of map area; covered with sphagnum and tussocks in western part of map area near Owhat River; mantled with eolian silt south of Kuskokwim River. Permafrost present in deposits along Owhat River.

Qca COLLUVIAL-ALLUVIAL DEPOSITS—Poorly to moderately well-sorted silt, sand, gravel, and diamicton of alluvial, colluvial, and, locally, glacial origin. Commonly form alternating stratified and unstratified zones and lenses in gullies and steep, minor tributary valleys with intermittent or ephemeral streams. Colluvial-alluvial fans generally most active during spring when seasonal snowpack is melting. Generally thawed.

Qct TALUS—Angular fragments of frost-riven bedrock transported downslope by gravity and deposited as apron or fans at toe of slope. Some debris is relatively in place above bedrock source. Distal zone of talus cone or apron may grade into inactive rock glacier. Generally thawed.

Qctf FAN AND TERRACE DEPOSITS—Composite unit composed of poorly sorted, partially stratified silt, sand, and gravel of alluvial-colluvial fans; moderately sorted sand and gravel of terrace alluvium; and coarse sand and pebbly gravel of alluvial aprons near stream cuts. May have formed by erosion of pediment adjacent to Russian Mountains upland. Thickness reaches about 20 m (65 ft) near Mission Creek. Permafrost present locally.

Qrg ROCK-GLACIER DEPOSITS—Stable, typically tongue-shaped mass of unsorted, angular, frost-shattered boulders and cobbles. Contained considerable interstitial ice (up to 55 percent) when glacier was active. Probably late Wisconsin in age. Deposits present along cirque headwalls from 600 to 680 m (2,000 to 2,240 ft) elevation. Thawed.

Qgt_4 Qgt_3 Qgt_2 Qgt_1 TILL—Unsorted to poorly sorted clay, silt, pebbles, cobbles, and boulders deposited by glacial ice. Till divided into four units that correspond to glacial stratigraphy delineated in Kuskokwim Mountains by Bundtzen (1980) and Kline and Bundtzen (1986): Qgt_4 - Largely unmodified till from Crater Mountain glaciation of early Holocene(?) age; confined to northerly, protected cirques; Qgt_3 - Till from Tolstoi Lake glaciation of late Wisconsin age; consists of fresh, undissected ground moraine; Qgt_2 - Till from Bifurcation Creek glaciation of early Wisconsin age; consists of dissected moraines and other modified glacial landforms; Qgt_1 - Reworked, highly dissected till from Beaver Creek glaciation of pre-Wisconsin age. Morphology of till is varied due to differential erosion.

Qgf OUTWASH-FAN DEPOSITS—Poorly consolidated, moderately well-stratified sand and gravel deposited as large fans proximal to ice-marginal meltwater streams during Late Pleistocene (Wisconsin) time; may include eroded patches of pre-Wisconsin till. Thickness varies from 6 to 40 m (19 to 130 ft).

Qu QUATERNARY DEPOSITS, UNDIFFERENTIATED—Unconsolidated alluvial, colluvial, and eolian deposits, including bedrock-derived talus and alluvial aprons on moderate to steep hillsides; eolian deposits locally ice rich in valley fill. Thickness highly variable, but may reach 70 m (230 ft) on valley floors. Contacts with other units obscured by vegetation. Permafrost present frequently.

VOLCANIC AND SEDIMENTARY ROCKS

Tvb BASALT—Medium- to dark-gray, vesicular olivine-clinopyroxene basalt and minor basaltic andesite. Vesicules locally infilled with calcite and silica. Whole-rock K-Ar age of 6.19 Ma (see text, table 1) determined for basalt from west of Owhat River. Unit unaltered and undeformed, contrasting markedly with older, altered andesite to dacite (TKvi), basaltic andesite and andesite (TKvm), and andesite to dacite flows and tuff (TKvt).

TKvt ANDESITE TO DACITE FLOWS AND TUFF—Medium-green-gray, very fine-grained, porphyritic biotite andesite to dacite flows; light-green-gray, platy-weathering, fine- to medium-grained crystal-lithic tuff; and green-gray, fine-grained tuffaceous sandstone. Thickness about 150 m (490 ft) in northeastern part of study area. Unit caps volcanic rocks in Russian Mountains and grades into underlying basaltic andesite and andesite (TKvm) flows.

TKvm BASALTIC ANDESITE AND ANDESITE—Medium- to dark-green-gray, aphanitic to fine-grained, pyroxene-rich basaltic andesite and andesite; locally contains plagioclase phenocrysts. Displays columnar jointing, which is particularly well-developed in westcentral Russian Mountains where unit reaches maximum thickness of about 325 m (1,066 ft). Unit thins to 150 m (490 ft) in northwestern Russian Mountains and to 100 m (328 ft) on Cobalt Creek (see fence diagram, sheet 1). Generally resistant. K-Ar age of 75.8 Ma (see text, table 1) determined for andesite sample from eastern Russian Mountains. Unit grades into slightly more felsic flows of overlying andesite to dacite flows and tuffs (TKvt).

TKva VOLCANIC AGGLOMERATE—Medium- to dark-green-gray lapilli tuff and agglomerate containing elliptical bombs and subangular to rounded fragments of andesite to 1.5 m (5 ft) diam. Thickness unknown.

TKvi ANDESITE TO DACITE—Poorly exposed, light- to medium-green-gray, porphyro-aphanitic pyroxene andesite to dacite flows. Thickness unknown. Flows present southwest of Russian Mountains. Stratigraphic relations with other volcanic units uncertain.

Ksl CALCAREOUS LITHIC SANDSTONE—Gray to tan, subangular to rounded, fine- to coarse-grained calcareous lithic sandstone and interbedded micaceous siltstone, locally plant rich. Carbonate content, which is of detrital origin, ranges from 1 to 8 percent. Characteristic rip-up clasts, Bouma Ta-e divisions, and scour-and-fill features suggest deposition by turbidity currents. Sandstone equivalent to calcareous clastic units (Ksl, Kslt) of Kuskokwim Group mapped by Bundtzen and Laird (1982) and Bundtzen and others (1988). Thickness unknown.

Kus SEDIMENTARY ROCKS, UNDIFFERENTIATED—Heterogeneous unit of fine to coarse, generally noncalcareous, micaceous sandstone, siltstone, and minor shale. Contains turbidite features similar to those of calcareous lithic sandstone unit (Ksl). Bedding trends, determined from aerial photographs, are delineated by dashed lines. Quaternary and vegetative cover obscures contacts with other rock units. Thickness unknown. Unit generally nonresistant.

MzPzvs METASANDSTONE, ARGILLITE, AND MAFIC META-IGNEOUS ROCKS—Poorly exposed, highly deformed heterogeneous package of green, feldspathic, tuffaceous metasandstone; dark-gray to brown argillite; dark-green, fine- to coarse-grained metabasalt and metadiorite; and green, porphyritic greenstone. Unit probably equivalent to Gemuk Group (Cady and others, 1955) or volcanic-dominated succession of Nyac terrane (Box, 1985).

INTRUSIVE AND CONTACT METAMORPHIC ROCKS

TKmp PORPHYRITIC QUARTZ MONZONITE—Light-gray, locally bleached, fine-grained to porphyro-aphanitic, clinopyroxene-bearing, biotite-rich quartz monzonite. Biotite occurs as separate grains and as inclusions in clinopyroxene; feldspars locally display rapakivi and myrmekitic textures. Most samples examined petrographically show extensive chloritization and epidotization of groundmass, which locally contains axinite.

TKsy QUARTZ SYENITE—Medium-gray, medium-grained, equigranular, biotite-rich quartz syenite. Contains abundant to trace amounts of axinite and minor to trace amounts of clinopyroxene. Ankerite and sericite alteration indicated by stippled pattern.

TKsym SYENITE TO MONZONITE AND QUARTZ MONZONITE—Medium-gray, subporphyritic, biotite-pyroxene syenite to monzonite and quartz monzonite; transitional between quartz syenite (TKsy) and porphyritic quartz monzonite (TKmp) units. Sample of biotite-pyroxene quartz monzonite yielded K-Ar age of 70.3 Ma (see text, table 1). Ubiquitous zones of ankeritic alteration to 100 m (328 ft) wide present near mineralized veins; purple to colorless axinite clots averaging 1 cm (0.4 in.) diam found near Mission Creek and Headwall gold-arsenic-copper prospects.

TKdf TKda TKdm DIKES AND SMALL HYBABYSSAL INTRUSIONS—Fine-grained to porphyro-aphanitic dikes and small, shallow intrusions of variable composition; TKdf - Fine-grained, locally porphyro-aphanitic biotite quartz porphyry. TKda - Medium-green-gray, very fine-grained to porphyro-aphanitic biotite-axinite andesite porphyry; axinite locally well developed. TKdm - Olivine-rich, fine-grained gabbro to picrite with distinct columnar joints. All dikes intrude along joints in intrusive host rock or along faults in layered host rock.

TKhf HORNFELS—Brown to gray, massive to locally porphyroblastic chlorite-biotite hornfels, partly tourmaline rich. Dark-gray varieties difficult to distinguish from aphanitic mafic volcanic rocks (TKvm). Volcanic units overlying Russian Mountain pluton are thermally altered by intrusive but not shown as hornfels.

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