UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

RECONNAISSANCE GEOLOGIC MAP OF THE TANACROSS QUADRANGLE, ALASKA

By Helen L. Foster

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This map is preliminary and has not been edited or reviewed for conformity with Geological Survey standards or nomenclature.

Reconnaissance geologic map of the Tanacross quadrangle, Alaska

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GENERAL DESCRIPTION

The Tanacross quadrangle includes parts of three major physiographic provinces; the Alaska Range, the Tanana River valley, also called the Northway-Tanacross Lowland (Wahrhaftig, 1965, p. 24), and the Yukon-Tanana Upland. The Alaska Range has rugged glaciated mountains with abundant small cirques, serrate ridges, horns, and U-shaped valleys. Relief is as much as 5,000 feet. The range rises abruptly to over 6,000 feet in altitude from the floor of the Tanana River valley.

The Tanana River flows in a sediment-filled valley that ranges in width from about 1/4 mile to about 16 miles. It is bordered on the north by the hills and maturely dissected mountains of the Yukon-Tanana Upland. The Upland has not been extensively glaciated and relief is mostly less than 1,500 feet.

DESCRIPTION OF MAPPED UNITS

UNCONSOLIDATED DEPOSITS

Unconsolidated deposits in the Tanacross quadrangle consist of fluvial, colluvial, eolian, and glacial deposits.

Glacial deposits occur only in valleys south of the Tanana River and result from Pleistocene glaciers most of which originated high in the Alaska Range west and south of the quadrangle. In the Tok River drainage system well developed moraines are rare and most of the deposits comprise outwash, probably including drainage from the proglacial lake in the Copper River Basin to the southwest (Péwé and others, 1965, p. 363); the glaciers were less extensive in this relatively low part of the Alaska Range than in adjacent areas to the northwest and southeast. The glacial deposits are assigned principally to either the Donnelly Glaciation of Wisconsin age, or the Delta Glaciation of Illinoin age (Péwé and others, 1965, p. 357-361). A few small patches of older (pre-Delta) glacial deposits are mapped along the lower Tok River, indicating that the most extensive glacial advance in this valley may have reached the vicinity of Tok. Minor glacial deposits of Holocene age in the Alaska Range have been included with the Donnelly deposits. Glacial deposits north of the Tanana River shown by Péwé and others (1967) from air photo interpretation were not identified in the field and thus are not mapped here; the possibility of minor glaciation of Delta age or older in some of these small areas is not precluded however.

The Tanana valley is filled with alluvium and some lacustrine deposits to a depth of at least 128 feet, and probably more than 250 feet; eolian deposits occur along its northern margin. Valleys north of the Tanana River contain principally alluvium and colluvium, mostly fine-grained.

Small areas of residuum from metamorphic rocks occur on remnants of an old, warped erosion surface that extends southeast from Mt. Neuberger in the Alaska Range; the surface is about 5,600 feet in altitude near Mt. Neuberger and becomes lower to the southeast. The residuum is at least two feet thick in places but has not been shown on the map. The age of the surface and residuum is not known, but probably pre-dates the oldest glaciation.

Alluvium along major streams.

Qa, Primarily gravel and sand; locally includes silt, organic silt and peat. Occurs as floodplains and adjacent low terraces. Peat and organic silt commonly fill or partly fill old oxbows and other depressions on floodplains. In places floodplain deposits incised by dry channels.

On the Robertson River and some parts of the Tanana River, alluvium occurs as islands surrounded by braided channels which shift laterally. The floodplain of the Robertson River and parts of the Tanana River are covered by overflow ice in winter.

Qas, Primarily silt and sand; contains admixtures of organic material; locally includes gravel and peat. Occurs as floodplains and adjacent low terraces; may include pond deposits. In places floodplain deposits incised by dry channels.

In summer dry expanses of the floodplain are sources of windblown silt which is deposited on other parts of the floodplain, bordering terraces, and nearby hills.

Qs, Silt and peat deposits

Alluvial, eolian, and lacustrine silt mixed with peat and finely divided organic material; occurs throughout the quadrangle in large and small depressions (only the larger areas shown on map).

Silt generally tan to dark brown or light gray to dark gray; mostly well stratified and well-sorted.

Surface of deposits generally hummocky; silt commonly perennially frozen below depths of 1 or 2 feet.

Ql, Landslide deposits

Mixed coarse and fine unconsolidated debris deposited by the larger landslides, earthflows and avalanches. Small areas of such deposits not mapped.

Alluvium and colluvium in small stream valleys

Qcg, Primarily gravel, sand, and rubble; occurs on steep valley walls as alluvial fans, alluvial-colluvial aprons and talus cones; locally mixed with glacial deposits. Also in narrow valley bottoms as floodplains and low terraces. Includes alluvial fans bordering the Tanana River valley on the north flank of the Alaska Range.

Qc, Primarily silt and sand; also includes gravel, rubble, organic silt, and peat. Occurs on slopes of valley sides as alluvial fans and mixed colluvial and alluvial deposits; generally poorly stratified and poorly sorted; coarser grained higher on the slopes and finer grained toward valley bottom. Also occurs in better stratified and sorted deposits in narrow valley bottoms as floodplains and low terraces. Includes broad alluvial fans mixed with some colluvial material on east slopes of Mt. Fairplay. Locally includes residual material on gentle slopes and low ridges.

Qb, Beach deposits of Tetlin Lake

Fine-grained sand and silt generally well-sorted; locally includes some organic material.

Qr, Rock glacier deposits

Coarse, angular, rubble from active and inactive rock glaciers. Locally mixed with till. Many rock glacier deposits too small to show on map.

Qe, Eolian deposits on active floodplains

Sand and minor silt with some admixture of organic material; commonly mixed with fluvial and lacustrine deposits.

Qfl, Fluvial and lacustrine deposits

Sand, silt and admixtures of organic material; occurs in areas marginal to low terraces of the Tanana River valley. Gravel present at depths of as little as 10 feet along the Tetlin River, and probably elsewhere within the unit. Deposits commonly perennially frozen below a depth of 2 feet. Probably mostly of Holocene age but may include some late Pleistocene deposits.

Qls, Lake deposits

Fine sand and silt; well-bedded. Contains tiny shells of mollusks. Exposures partly covered and mixed with colluvial and eolian deposits. Probably of late Pleistocene age or early Holocene age.

Qt, Terrace deposits

Primarily gravel and sand; locally includes silt, and commonly overlain by a few inches to a few feet of loess. Material generally well-stratified and fairly well-sorted. In the Tok River valley of both Donnelly and Delta age; in the northern part of area probably of late Pleistocene age. (Only larger and higher terraces along main streams shown).

Qoa, Outwash aprons and alluvial fan deposits of the Donnelly Glaciation

Primarily well-rounded gravel with some sand and minor silt beds; includes dark-colored volcanic rocks from outside of the mapped area. May include some Holocene alluvium. Generally well-stratified; fairly well-sorted.

Qm, Moraines of the Donnelly Glaciation

Primarily till, gravelly and sandy, locally bouldery; includes patches of gravel and sand. Chiefly terminal moraine, but some lateral and ground moraine. Includes some colluvial material. In a few cirques in Alaska Range may include moraines of Holocene age. Hillocks and ridges of moraines are steep-sided; large, closely spaced, slightly weathered boulders cover the surface; ponds common. Upper 1-1.5 feet of till weathered. Till locally mantled by loess or alluvial silt.

Qd, Eolian deposits primarily in dunes.

Medium to fine tan to dark gray sand; cross-bedded and well-sorted; mostly in stabilized dunes; in places some silt or sand overlain by loess. Where sand is gray, dark color is due primarily to dark-colored rock fragments.

Qof, Alluvial fan deposits of the Delta Glaciation.

Primarily gravel, well-rounded; includes dark-colored volcanic rocks, from outside of the mapped area; also includes sand and very minor silt; generally well-stratified; fairly well-sorted; overlain by a few inches to several feet of silt and fine sand, locally in the form of ice-wedge casts; stained by iron to a depth of at least 6 feet; numerous stones coated in part by calcium carbonate.

Qdm, Moraines of the Delta Glaciation.

Primarily till, gravelly and sandy; locally includes gravel and sand. Includes material that is partly colluvial. Chiefly terminal moraine, but some lateral moraine remnants. Morainal topography more subdued and material more deeply oxidized than in moraines of the Donnelly Glaciation. Surface boulders are widely scattered and deeply weathered. Locally the till has been modified by mass movement, eolian deposition, and fluvial action (Holmes, 1965, p. H.9).

Qom, Glacial deposits of pre-Delta age

Small remnants of weathered till and gravel of lateral and ground moraine and glacio-fluvial deposits.

SEDIMENTARY ROCKS

Sedimentary rocks of Late Cretaceous (?) and Tertiary age occur in small patches in several widely separated localities in both the Yukon-Tanana Upland and the Alaska Range. They were subaerially deposited and probably have been extensively eroded as only small remnants, particularly of the Tertiary deposits, remain. A small patch of Late Jurassic to Early Cretaceous sedimentary rocks occurs on the southwest side of the Denali fault and is continuous with more extensive deposits in adjacent quadrangles.

Tc, Gravel and conglomerate

Well-rounded gravel and weakly cemented conglomerate; rests unconformably on rocks of the biotite gneiss and schist unit. Three separate occurrences known:

(1) Thin patch of gravel and conglomerate about 40 acres in area in the northeastern part of the Tanacross quadrangle at an altitude of about 3,800 feet. Mostly yellowish-white quartz pebbles and black well-rounded and polished chert pebbles 1/4 to 5 inches in diameter. Source of black chert unknown.

(2) Gravel, covering an area of about 1/4 square mile at an altitude a little over 3,000 feet in the Alaska Range about 9 miles southwest of Tok. Mostly white quartz pebbles 1/2 to 5 inches in diameter; includes a few light-gray quartzite and gneiss pebbles; well-rounded.

(3) Gravel, covering an area of about 40 acres at an altitude of a little over 3,900 feet about 15 miles southwest of Tok; fragments of quartz and schist; mostly rounded, but some angular. Deposits of this unit all of probably Tertiary age, but most likely deposited separately.

Kr, Detrital rocks

Conglomerate, sandstone, shale, siltstone, tuff, tuffaceous sandstone and shale, lignite, and chert. Folded. Very poorly exposed. In places not distinguishable from tuffaceous sediments included in the felsic volcanic rocks. Locally intruded by volcanic dikes and sills and in places overlain by lava flows. Estimated to be at least 200 feet thick in the vicinity of the West Fork.

In one locality south of the West Fork the conglomerate unconformably overlies metamorphic rocks of the biotite gneiss and schist unit. This conglomerate is composed primarily of well-rounded white translucent quartz pebbles, pebbles of gneiss and schist, and a few pebbles of greenish-gray lava in an arkosic, slightly micaceous matrix. Other pebbly conglomerates occur interbedded with sandstone and shale higher in the section. Pebbles are rock types that are common in the surrounding area. Poorly preserved plant remains and impressions common in shales and sandstone.

Considered of probable Late Cretaceous age on the basis of a poorly preserved palynomorph flora in rocks exposed along the Taylor Highway about 3 miles south of the West Fork Bridge (Foster, 1967 , p. B6) and along the Tanana River in the B-5 quadrangle. In the B-5 quadrangle USGS, Paleobot. loc. D 3510, Estella Leopold (U.S. Geol. Survey, Jan. 28, 1965) identified 2 species of Aquilapollenites, Sequoiapollenites, Taxodiaepollenites, and miscellaneous spores. Aquilapollenites and Taxodiaepollenites also present in the West Fork flora.

Mza, Mentasta argillite

Argillite, shale with minor sandstone and limestone (occurs only on southwest side of Denali fault). Late Jurassic or Early Cretaceous age.

METAMORPHIC ROCKS

The metamorphic rocks consist of a wide variety of metamorphosed sedimentary and igneous rocks which range in degree of metamorphism from greenschist to amphibolite facies. They are tentatively divided into 6 map units on the basis of lithology and metamorphic facies, but the contacts between units, the relationships of units, and their validity for future more detailed mapping are uncertain.

The higher grade metamorphic rocks in the Alaska Range, the biotite gneiss and schist unit, are approximately separated on the map from the lower grade phyllite and schist unit by a dashed line. Rocks transitional in mineralogy and lithology between the two groups occur on both sides of the line for distances of a few feet to a few thousand feet. The line appears to be the approximate biotite isograd and garnet comes in a few feet to a few thousand feet north of the line. Gneissic rocks including augen gneiss occur only north of the line.

The metamorphic rocks with the possible exception of some rocks in the phyllite and schist unit and the metadiorite, are polymetamorphic. They are complexly folded and limbs of large amplitude (several thousand feet) folds are visible in places in the Alaska Range. The foliation in the Alaska Range most commonly strikes northwest, more or less parallel to the trend of the Range and dip is generally southwest. In most places in the Alaska Range and in the Yukon-Tanana Upland, the large folds are not readily apparent, but several sets of small folds (amplitude of an inch to several feet) are evident.

The earliest set of small folds are tight isoclinal folds which have well-developed axial plane schistosity and which fold compositional layering. Preservation of these folds is rare.

A second set of folds deforms the schistosity and has a moderately well-developed axial-plane schistosity or cleavage. In phyllitic or schistose rocks a strong lineation parallel to the fold axis is formed by very small crenulations in the layering, by mineral orientations, or by intersecting schistosites. The second set of folds are well-developed in most of the metamorphic rocks.

A third set of folds, characteristically kink folds, deforms the older schistosites and lineations. Small fractures filled with quartz, subparallel to the axial planes of the kink folds are common. They are best developed in phyllitic rocks.

Fossils have not been found in the metamorphic rocks in the Tanacross quadrangle and these rocks cannot be correlated with well-dated rocks elsewhere. In the northern part of the Nabesna quadrangle, north of the Denali Fault near Mentasta Pass, D. H. Richter (written commun., 1967) found corals in slightly metamorphosed limestone. The corals indicate a Late Silurian or Early Devonian age for the limestone. The section of rocks which includes this limestone appears to be continuous with greenschist facies metamorphic rocks in the southwestern part of the Tanacross quadrangle. This relationship suggests that at least some of these metamorphic rocks may be early Paleozoic in age. However, the thickness of the metamorphic rocks is great and it is possible that several geologic periods, even as old as Precambrian, are represented. Also, because of the complex structure of the area, it is possible that some, or even most of the rocks in the Tanacross quadrangle are separated from those in the Nabesna quadrangle by faults.

Radiometric age dates were obtained on two specimens of the biotite gneiss and schist unit from localities near the Glenn Highway about ten miles southwest of Tok. At locality (1) a Rb^{87}/Sr^{87} date of 120 million years was obtained on biotite. At locality (2) a K^{40}/A^{40} determination on muscovite gave 119 million years and Rb^{87}/Sr^{87} gave 524 million years. A whole rock date (Rb^{87}/Sr^{87}) gave 1173 million years (G. D. Eberlein, written commun., 1964). Igneous intrusions are known to occur nearby and at present these dates cannot be interpreted in terms of the true age or time of metamorphism of these rocks.(Wasserburg and others, 1963, p. 259 and G. D. Eberlein, written commun., 1964). At present the rocks are considered Precambrian and/or Paleozoic in age.

Pza, Phyllite and schist unit

Light pink, light green, tan, and gray phyllite, quartz-sericite schist, quartz-sericite-chlorite schist, quartzite and marble. In the Alaska Range in the southwestern part of the quadrangle, the rock is primarily light pink, light green, gray and tan phyllite with some included greenstone; includes several thin (a few inches to 50 feet) discontinuous marble beds and quartzite. Northward the rocks become more schistose and quartz-sericite schist, quartz-sericite-chlorite schist, quartz-graphite schist and quartzite are the dominant rock types. Rocks of this unit are primarily greenschist facies lower in metamorphic grade to the south and increasing in grade northward.

Pzu, Schist and quartzite unit

Quartz-sericite schist, quartzite, quartz-muscovite schist, actinolite schist, chert and other fine-grained silicic rocks, phyllite, metagraywacke, and schistose greenstones. Locally a minor amount of biotite. Poorly exposed in the Yukon-Tanana Upland. Primarily greenschist facies rocks.

Pzk, Quartz-mica schist unit

Dominantly light-greenish-gray quartz-muscovite-chlorite schist, quartz-sericite-chlorite-epidote schist, quartz-actinolite schist, and feldspar-quartz-sericite schist, with minor dark green chlorite schist and dark greenish-black biotite schist. Sulfides locally abundant. As a whole, rocks in this unit resemble the Klondike Schist (1921, Cockfield) and this map unit is more or less continuous across the Canadian border with the Klondike Schist of Cockfield's map. Primarily greenschist facies rocks.

Pzg, Quartz-graphite schist unit

Mostly dark gray quartz-graphite schist and dark gray quartzite with some quartz-muscovite schist, quartz-muscovite-chlorite schist and light-colored quartzite. In places these rocks resemble those in the northern part of the phyllite and schist unit of the Alaska Range. They extend northward into the Eagle quadrangle. Primarily greenschist facies rocks.

Pzp€b, Biotite gneiss and schist unit

Primarily quartz-biotite gneiss and schist, quartz-hornblende gneiss, quartz-feldspar-biotite gneiss, augen gneiss, quartz-muscovite-garnet gneiss, and quartzite. Many rocks highly garnetiferous. Map unit essentially corresponds to Mertie's "Birch Creek Schist and associated igneous rocks." Granitic gneisses of the Pelly Gneiss type (Mertie, 1937, p. 202) are abundant. In most of the area Pelly Gneiss-type rocks are so intermixed and apparently interlayered with other rock types that it was not practical to map them separately. However, occurrences of augen gneiss, which is a characteristic rock type of the Pelly Gneiss, are indicated on the map by symbol. Also, a large, fairly consistent, area of feldspathic gneiss which may be Pelly Gneiss is indicated by symbol in the northwestern corner of the quadrangle.

Where this unit reaches the Canadian border in the eastern part of the quadrangle the rock is mostly of the Pelly Gneiss type and was mapped in Canada as Pelly Gneiss by Cockfield (1921). These rocks are mostly amphibolite facies.

IGNEOUS ROCKS

The igneous rocks of the Tanacross quadrangle range in composition from silicic to mafic and ultramafic and from fine-grained to coarsely porphyritic. Some rocks have intermediate textures suggesting that they are from shallow intrusions. Also there is considerable gradation from coarse to fine textures and also gradation from porphyritic to equigranular textures.

The largest areas of igneous intrusion are granodiorites of Mesozoic age. The boundaries of these intrusions are very irregular and many large xenoliths and roof pendants are included. In most places these granitic rocks cannot be differentiated on aerial photographs from metamorphic rocks. Thus their boundaries are not known in detail, as it was not possible to field check all ridges. Also, the number of distinct times of Mesozoic intrusive activity is not known. It is possible that most of the Mesozoic granitic rocks are parts of only one or two large plutons.

Qp, Basalt of Prindle volcano

Vesicular alkali-olivine basalt, containing abundant peridotite and granulite inclusions. Basalt composes a small cone and lava flow of probable Holocene age. Basalt consists of clinopyroxene, olivine, opaque minerals and a fine-grained to microcrystalline groundmass believed to contain occult nepheline and potassium feldspar. The ultramafic inclusions consist of several different assemblages of olivine, orthopyroxene, clinopyroxene and spinel. Mineral assemblages of granulite inclusions consist of plagioclase, clinopyroxene, hypersthene, quartz and carbonate with apatite, zircon, magnetite and rutile as accessory minerals (Foster and others, 1966).

QTb, Basalt

Dark gray and dark greenish-gray basalt, including olivine basalt, of flows, dikes and small volcanoes. Also includes basaltic ejecta and basaltic volcanic breccia. Age not definitely known, but probably ranges from Tertiary to Quarternary. Some of the volcanoes still appear to retain some of the original forms of their cones.

Tgb, Gabbro

Coarse-grained dark gray or greenish-black hornblende gabbro. In places appears to grade into basalt. Intrudes metamorphic rocks. Its close spatial relationship to basalt of small volcanoes suggests a possible Tertiary age.

Tm, Mafic volcanic rocks

Dark gray, dark greenish-gray and dark maroon lava, breccia, and tuff of mostly andesitic composition. Uniformly fine-grained to coarsely porphyritic. Some vesicular and amygdaloidal lava. Phenocrysts are plagioclase, biotite, amphibole, and pyroxene. Iron oxides and sulfides abundant. Locally much altered. Breccias include fragments of schist and, in at least two places, granitic rocks. Local small areas of felsic rocks included. Of probable Tertiary age.

Tf, Felsic volcanic rocks

White, light gray, light green, light pink, brown and cream-colored lava, tuff, tuff-breccia, pumice-breccia, volcanic conglomerate and tuffaceous sediments. Includes lava of aphanitic to porphyritic texture; tuff is very fine- to coarse-grained and includes lapilli tuff with concretionary lapilli. Breccia includes some fragments of gneiss, schist, quartzite, and rarely granitic rocks. Welded tuff common, especially in the Sixtymile Butte area. Locally, small amounts of more mafic rock.

Quartz phenocrysts are commonly well-terminated crystals of smoky quartz. Iron sulfides locally very abundant, occurring as small crystals or oxidized to form brown limonitic specks in the rock. Most of these rocks are considerably altered. Of probable Tertiary age.

Tp, Granite porphyry

Pink or light gray. Well-terminated quartz phenocrysts 1/8 to 3/4 inch long common. Groundmass composed primarily of quartz, potassium feldspar, and plagioclase and ranges from fine- to coarse-grained. Locally rocks of porphyrytic texture grade into fine- to coarse-grained equigranular rocks of similar composition. Found throughout quadrangle as small intrusive bodies, dikes, and sills; intrudes metamorphic and other granitic rocks. Of probable Tertiary age.

Ts, Syenite of Mt. Fairplay

Dominantly syenite, but includes some monzonite and adamellite. Syenite equigranular to coarsely porphyrytic. Porphyritic phase has gray potassium feldspar with crystals as much as 2 inches long. Discordantly intrudes biotite gneiss and schist unit including augen gneiss. A mean lead-alpha age of 103 million years was obtained on zircon from the syenite (Matzko and others, 1958, p. 531) and an isotopic age of 69 million years was obtained on biotite by the Sr^{87}/Rb^{87} method (Wasserburg and others, 1963, p. 258-259). Age is considered Tertiary(?).

Mmu, Undifferentiated igneous rocks of McArthur Creek area

Coarse- to fine-grained rocks of silicic to mafic composition. Mostly much altered and weathered. Outcrops rare.

Mzgb, Gabbro and basaltic rocks of Ketchumstuk Mountain

Coarse-grained hornblende gabbro. Locally occurs with dark gray basalt and basaltic breccia. Most of rock much altered. Age unknown, but possibly Mesozoic.

Mzs, Hornblende syenite porphyry

Primarily hornblende syenite porphyry, but some other granitic rocks occur within the mapped unit. Locally very coarse-grained with hornblende phenocrysts over 2 inches long. Grades to medium-grained and almost equigranular syenite. Contacts with other granitic rocks covered. Of probable Mesozoic age.

J℞g, Granodiorite of Taylor Mountain batholith

Medium- to coarse-grained equigranular granodiorite; locally adamellite, quartz diorite or diorite. Rock is gneissic in places along the West Fork. Xenoliths of metamorphic rocks are abundant and well-exposed along the north side of the West Fork 0.3 mile west of the Taylor Highway bridge. Granodiorite is cut by dikes of pegmatite, aplite, diorite and lamprophyre.

An age measurement on granodiorite from this pluton collected along the Taylor Highway about 3 miles north of the northern boundary of the Tanacross quadrangle gave an age of 190 million years by Sr^{87}/Rb^{87} determinations on biotite (Wasserburg and others, 1963, p. 258). Considered Late Triassic or Early Jurassic in age.

Mu, Granitic rocks

Fairly fine-grained equigranular to coarsely porphyrytic rocks ranging in composition from diorite to granite, but dominantly biotite and biotite-hornblende granodiorite. Granite and granodiorite porphyry common, especially along the north side of the Tanana River. Minor associated pegmatite and graphic granite. Some areas of fairly uniform granitic rock types occur but areas of mixed granitic rubble common. Granitic rocks have been intruded as dikes, sills and plutons. Roof pendants and xenoliths of metamorphic rocks abundant. Contact relationships generally obscure, but contact metamorphism appears to be very limited.

Probably mostly of Mesozoic age, and about the same age as the granodiorite of Taylor Mountain batholith; but includes rocks intruded at several different times.

PMu, Ultramafic rocks

Peridotites, mostly serpentinized, occurring as dikes and small masses. Some slightly foliated. Appear to be intrusive into the metamorphic rocks. Age considered late Paleozoic or early Mesozoic.

Pzd, Metadiorite

Gray, altered and metamorphosed rocks of probable dioritic composition; intruded into the metamorphic rocks of the phyllite and schist unit primarily as sills, dikes and small masses. Age considered Paleozoic(?).

FAULTING AND STRUCTURAL TRENDS

Topographic features such as the trend of ridges and of stream valleys suggest a northeast-striking structural control in the Tanacross quadrangle. A second, possibly younger, trend at right angles, results in a roughly rectangular topographic pattern. These trends, particularly the northeasterly trend, seem to be somewhat obscured in the areas of extensive Cenozoic rocks, suggesting that the pattern originated, at least in part, in pre-Tertiary time. Several east northeast-striking faults are mapped, and many others are suspected. However, many small faults are known which show no apparent relationship to these trends.

The large Denali fault, a part of a major fracture zone which cuts the Alaska Range, trends northwest and crosses only the southwest corner of the quadrangle. There is evidence along this fault of at least 0.2 miles of displacement in a right lateral sense in post-glacial time only a few miles to the southeast in the Nabesna D-5 quadrangle (H. R. Schmoll, written commun., 1967). Landslides, which may also be indicative of recent movement, occur along the fault in the Tanacross quadrangle. The Denali fault marks the southern boundary of the metamorphic rock units.

The straight courses of the Tok River and Clearwater Creek suggest faults, but major faults were not recognized in the field. In the southwestern part of the quadrangle displacements of marble beds and of metadiorite intrusions suggest movement along small east northeast trending strike-slip faults primarily with a left lateral sense. Only a few small thrust faults were verified in the field, but thrusting is probably more wide-spread and significant than these faults would indicate.

The Tanana River valley may have a structural origin (St. Amand, 1957, p. 1368), but definite evidence of faulting, other than physiographic, has not been found in the Tanacross quadrangle. No significant difference between the rocks of the Yukon-Tanana Upland on the north side of the river and the Alaska Range to the south is recognized. Local brecciation of the granite rocks along the north side of the river has been noted in places but might be related to small local faults.

ECONOMIC GEOLOGY

Significant mineral deposits have not been discovered in the Tanacross quadrangle. Antimony in the form of the sulfide, stibnite, occurs in a vein on Stibnite Creek, but has not been economic to mine (Moffit, 1954, p. 207-208). Traces of gold are found in some streams, particularly in the Alaska Range, but none have been rich enough for placer mining. Small concentrations of copper, chromium and nickel minerals have also been reported. A small geochemical anomaly is indicated in the vicinity of Burnt Lake from stream sediment and bedrock sampling. Slightly anomalous values were attained for copper, lead, molybdenum, gold, and silver.

A body of magnesite marble in the southwestern part of the quadrangle north of Lost Creek has been quarried to a limited extent for ornamental stone (Richter, 1967, p. 19). The marble occurs in a band 10 to 30 feet thick and about a mile long. It "consists of thin laminae, lenses, and veins of magnesite, dolomite, and quartz in a multicolor of various shades of apple green, cream and white."

Gravel from glacio-fluvial and alluvial fan deposits is fairly abundant along much of the Alaska Highway and Glenn Highway. It has been used extensively in building and maintaining these roads and an abundant supply remains for such future use. Most of the gravel has been used very locally.

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