DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN FILE MAP

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TABLE 1. RAPID ROCK CHEMICAL ANALYSES AND CIPW NORMS OF SELECTED VOLCANIC AND PLUTONIC ROCK SAMPLES

[Sample locations are shown on map as ■1. Analyses by Hezekiah Smith]

Map Unit	TKv					Kv			JPb	Kg	Km				
Field No.	68APa 50	68ANm 25	68APa 12	68APa 15	68APa 18	68APa 9	68APa 97	68APa 2	68ANm 62	68ANm 84	68APa 67	74APa 81	68APa 72	74APa 53A
Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Lat. N Long. W	65°14' 155°54'	65°40' 155°12'	65°40' 154°00'	65°45' 153°38'	65°49' 153°04'	65°30' 155°00'	65°33' 154°35'	65°37' 154°29'	65°02' 155°00'	65°40' 153°59'	65°18' 154°25'	65°19' 154°04'	65°23' 153°50'	65°14' 153°35'
Rapid rock chemical analyses (weight percent)														
SiO_2	81.2	50.9	77.5	63.6	68.8	59.8	63.3	66.4	46.9	65.6	73.5	74.4	66.0	69.0
Al_2O_3	11.0	13.9	12.9	16.2	15.2	16.4	16.4	15.7	13.8	15.9	13.2	13.0	15.2	14.8
Fe_2O_3	.26	3.9	.09	2.8	2.8	2.6	2.1	3.0	5.5	1.8	.36	.38	.46	1.3
FeO	.16	5.5	.28	.76	.52	2.0	1.6	.86	5.1	1.7	1.6	1.6	3.2	2.3
MgO	.15	6.8	.09	2.2	.49	3.4	2.8	1.5	5.0	2.3	.42	.37	1.5	1.0
CaO	.18	10.9	.34	4.4	3.1	5.5	4.9	4.3	10.2	4.0	1.2	1.1	2.6	2.1
Na_2O	2.7	3.0	4.4	4.2	3.5	3.6	3.0	4.6	5.5	4.5	2.9	3.1	2.8	3.1
K_2O	4.4	2.5	4.4	1.8	3.6	1.4	1.2	2.0	.13	2.9	5.3	5.0	5.0	4.1
H_2O^+	.98	1.6	.54	1.1	1.1	2.1	2.3	1.0	2.3	.54	.61	.79	1.1	.81
H_2O^-	.24	1.3	.17	.87	.48	.33	.58	.29	.32	.11	.08	.08	.12	.09
TiO_2	.10	.80	.12	.48	.39	.59	.47	.50	2.9	.49	.27	.22	.67	.43
P_2O_5	.02	.26	.13	.19	.15	.30	.19	.26	.36	.24	.07	.08	.18	.14
MnO	.00	.14	.02	.06	.03	.07	.07	.04	.11	.04	.02	.03	.05	.07
CO_2	.02	1.1	.02	.03	.04	.80	.02	.02	2.6	.04	.03	.02	.05	.04
Sum	101	100	101	99	100	99	99	100	101	100	99	100	99	99
CIPW norms (weight percent)														
q	47.6	-	34.2	20.7	27.5	19.7	21.4	22.0	-	17.4	32.6	33.5	21.6	28.9
c	1.5	-	0.6	-	0.4	1.6	1.8	-	-	-	0.8	0.7	1.0	1.9
or	25.7	14.9	25.8	10.9	21.4	8.4	7.2	11.8	.8	17.1	31.5	29.5	29.9	24.4
ab'	22.6	25.6	36.9	36.3	29.8	30.9	25.8	38.9	44.2	38.1	24.7	26.2	24.0	26.4
an	.6	17.2	.7	20.5	14.2	20.6	23.3	16.3	12.5	14.6	5.3	4.8	11.6	9.3
ne	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-
di	-	22.5	-	.3	-	-	-	2.5	14.9	2.7	-	-	-	-
hy	.4	6.1	.5	5.5	1.7	9.3	7.7	2.6	-	5.4	3.3	3.2	8.3	5.1
ol	-	1.8	-	-	-	-	-	-	4.1	-	-	-	-	-
mt	.2	5.7	.1	1.3	-	3.8	3.1	1.4	7.9	2.6	.5	.6	.7	1.9
hm	.1	-	-	2.0	2.8	-	-	2.0	-	-	-	-	-	-
il	.2	1.5	.2	.9	.7	1.1	.9	.9	5.3	.9	.5	.4	1.3	.8
ap	-	.6	.3	.5	.4	.7	.5	.6	.9	.6	.2	.2	.4	.3
cc	-	2.5	-	.1	-	1.8	-	-	5.9	.1	.1	-	.1	.1

1 Altered rhyolite flow or welded tuff
2 Vesicular basalt flow
3 Rhyolite flow or welded tuff
4 Andesite porphyry flow
5 Dacite porphyry flow
6 Andesite porphyry flow
7 Altered andesite breccia
8 Dacite porphyry flow or hypabyssal rock
9 Altered spilitic basalt
10 Hornblende-biotite granodiorite
11 Biotite quartz monzonite
12 Biotite quartz monzonite
13 Biotite quartz monzonite
14 Altered biotite quartz monzonite

TABLE 2. MINERALOGICAL COMPOSITION (IN PERCENT) OF 6 SAMPLES OF TYPICAL CRETACEOUS SANDSTONE AND GRAYWACKE

[Sample locations are shown on map as ■2. Composition based on counts of 600 points per thin section]

Map Unit		Kgc	Kx	Kc	Kgm		
Field No.		68APa 104	74APa 168	68APa 25	68APa 15	68APa 45	68APa 33
Sample No.		1	2	3	4	5	6
Lat. N and Long. W		65°40' 153°50'	65°01' 155°21'	65°27' 154°23'	65°37' 153°09'	65°16' 155°05'	65°19' 154°55'
Quartz, quartzite		64	65	49	33	25	9
Chert		-	3	3	1	<1	9
Feldspar		-	9	9	4	23	10
Rock fragments	Volcanic	-	3	10	9	28	14
	Sedimentary	<1	3	7	5	3	4
	Metamorphic (except carbonate)	<1	2	3	10	-	2
	Plutonic	-	-	-	-	-	<1
Mica		-	6	9	4	2	6
Carbonate		-	-	-	-	-	10
Argillaceous material		35	12	10	31	17	24
Miscellaneous (chiefly heavy minerals)		0	1	1	2	1	12

TABLE 3. CRETACEOUS INVERTEBRATE FOSSIL COLLECTIONS

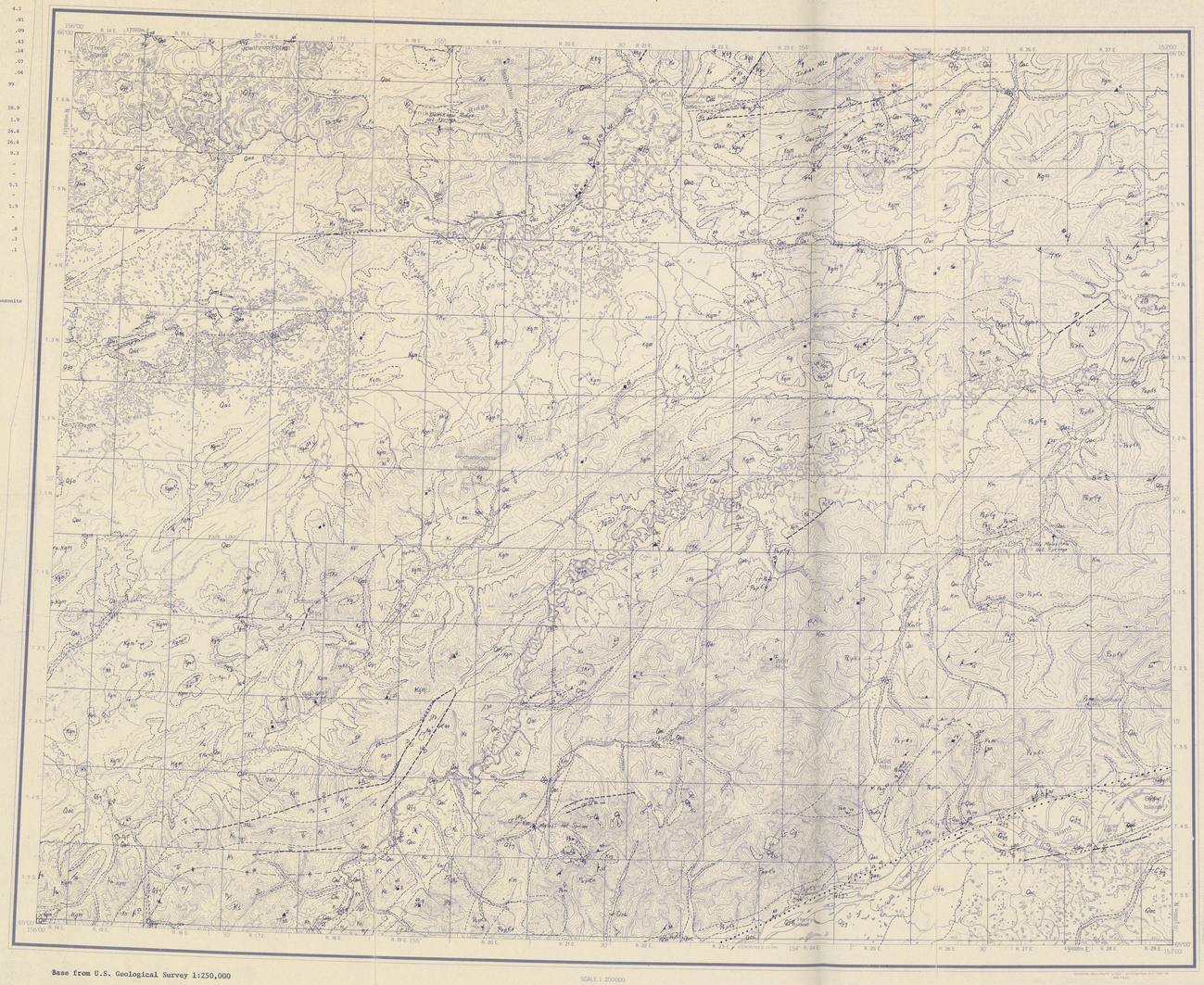
[Sample locations are shown on map as ■3. Fossils identified by D. L. Jones and R. W. Imlay, U.S. Geological Survey]

No.	Field Collection No.	USGS Locality No.	Fossils	Latitude and Longitude
			Igneous pebble-cobble conglomerate (Kc)	
1	68ANm61	Mes. loc. M5041	Indet. pelecypods - some resemble Arctica	65°03' N., 155°03' W.
			Andesitic volcanic rocks (Kv)	
2	53APa433	Mes. loc. 24686	Buchia sublaevis	65°52' N., 154°34' W.
	65ANm10F	Mes. loc. M2962	buloemite	
3	53APa436	Mes. loc. 24687	Buchia cf. B. crassicollis	65°51' N., 154°35' W.
4	65ANm11F	Mes. loc. M2963A	Buchia sublaevis	65°50' N., 154°36' W.
5	65ANm12F	Mes. loc. M2963B	Buchia sublaevis	65°50' N., 154°37' W.
6	68APa38	Mes. loc. M5040	Buchia keyserlingi	65°27' N., 155°17' W.
7	63APa214	Mes. loc. M2075	Buchia sp.	65°59' N., 154°49' W.

TABLE 4. POTASSIUM-ARGON AGE DETERMINATIONS

[Sample locations are shown on map as ■4. λ^{40} decay constants: $\lambda_1 = 0.572 \times 10^{-10}$ year^{-1}; $\lambda_2 = 4.963 \times 10^{-10}$ year^{-1}. Abundance ratio: $K^{40}/K = 1.167 \times 10^{-4}$ atom percent. Potassium analysis by Gil Ambats; argon analysis and age calculations by James G. Smith]

No.	Field No.	Latitude and Longitude	Mineral	Map Unit	K_2O Percent	Ar^{40}_{rad} (moles/gm) 10^{-10}	$Ar^{40}_{rad}/K^{40}_{total}$	Calculated Age (millions of years)
1	68ANm31	65°20' N., 155°23' W.	Biotite	Kgi	8.19 8.22 avg. 8.205	9.945	.91	82.3 ± 3
			Hornblende		.306 .312 avg. .309	.4155	.43	89.0 ± 3
2	68ANm67	65°18' N., 154°25' W.	Biotite	Km	7.74 7.77 avg. 7.755	12.77	.87	111 ± 3



Base from U.S. Geological Survey 1:250,000
Alaska topographic series; Melozitna, 1956.

SCALE 1:250000

CONTOUR INTERVAL 200 FEET
DOTTED LINES REPRESENT 100-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

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GEOLOGIC MAP OF THE MELOZITNA QUADRANGLE, ALASKA

BY

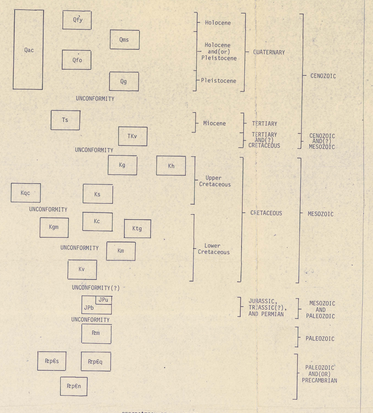
W.W. PATTON, JR., T.P. MILLER, R.M. CHAPMAN, AND WARREN YEEND

1977

Field mapping by W.W. Patton, Jr., 1953, 1958, 1963-64, 1968, 1974; T.P. Miller, 1963-65, 1967-68; R.M. Chapman, 1974; Warren Yeend, 1974; J.M. Hoare and Bond Taber, 1958; and M.D. Mangus, 1953. Map compiled by W.W. Patton, Jr., 1976.

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

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Surficial deposits

[Mapped largely by interpretation of aerial photographs]

Qfy YOUNGER FLOOD-PLAIN DEPOSITS--Light-gray micaceous silt. Sand and gravel along streams that drain bedrock uplands. Characterized physiographically by bars, oxbow lakes, meander scrolls, abandoned channels, and other evidence of recent flood-plain building.

Qfo OLDER FLOOD-PLAIN DEPOSITS--Chiefly light-gray and grayish-orange micaceous silt. Locally include peat, reworked eolian sand, and gravel. Deposits at or near river level but youthful flood-plain features such as oxbow lakes, meander scrolls, and abandoned channels are much modified or absent. Contact with younger flood-plain deposits (Qfy) locally gradational and poorly defined

Qms MODIFIED EOLIAN SAND DEPOSITS--Dark-yellowish-orange and light-gray, fine- to medium-grained eolian sand. Forms broad sheetlike dune field mantling older flood-plain (Qfo) and alluvial terrace (Qac) deposits of the Dulbi Flats. Deposits have strong northeast-southwest trend

Qac UNDIFFERENTIATED ALLUVIAL, COLLUVIAL, AND EOLIAN TERRACE AND SLOPE DEPOSITS--Chiefly silt and very fine sand. Terrace deposits believed to be largely floviatile but may be in part lacustrine; slope deposits chiefly eolian and colluvial. The steep frozen banks of the Palisades along the Yukon River (locally known as the "boneyard") have yielded a Pleistocene vertebrate fauna including mammoth and bison remains

Qg GLACIAL DRIFT--Unsorted bouldery till and isolated moraines; may include some younger solifluction deposits near valley sides

Volcanic and sedimentary rocks

Ts SANDSTONE, CLAYSTONE, CONGLOMERATE AND LIGNITE--Includes grayish-white granule conglomerate and sandstone, reddish-brown claystone, and lignitic coal. Exposed at river level at the Palisades along the Yukon River. Pollen of probable Miocene age (E. Leopold and E. Daniels, written commun., 1976)

TKv VOLCANIC ROCKS Indian River, Takhakhdona Hills, and Dulbi River areas--Chiefly light-gray to pink welded tuff, welded(?) tuff, flows, and breccia (table 1, nos. 1 and 3). Subordinate pumice, dark vitrophyre, and obsidian. Obsidian occurrence north of Little Indian River possible source of obsidian found in archeological site in northwestern Alaska (Patton and Miller, 1970). In Takhakhdona Hills unit also includes dark-green to black vesicular basalt flows (table 1, no. 2). Probably Tertiary
Big Creek - Tokhutlikh Creek areas--Chiefly dark-gray to green dacite and andesite porphyry flows and crystal tuffs (table 1, nos. 4-7). Probably correlative with similar flows and tuffs in adjoining Tanana and Bettles quadrangles which have a potassium-argon date of 58 m.y. (early Tertiary) (Patton and Miller, 1973). Locally unmetamorphosed and undeformed
Other areas--Small bodies of rhyolite and dacite flows and hypabyssal rocks

Kgc QUARTZ-PEBBLE CONGLOMERATE--Small isolated patches of light-gray quartz-pebble conglomerate and quartzose sandstone (table 2, no. 1). Minor intercalated light-colored ashy tuff. Conglomerate made up almost wholly of quartz and quartzite clasts. Intruded and thermally altered by granodiorite (Kg). Age is probably early Late Cretaceous

Ks SANDSTONE, QUARTZ CONGLOMERATE, SHALE, AND SILTSTONE--Nonmarine deposits of olive-green, fine- to coarse-grained, crossbedded, quartzose sandstone and grit (table 2, no. 2), quartz-pebble conglomerate, and dark micaceous shale and siltstone. Ironstone lenses and concretions. Abundant carbonized plant debris. Distinguished from volcanic graywacke and mudstone unit (Kgm) by better sorting and by a higher percentage of quartz. Probably correlative with Upper Cretaceous, plant-bearing nonmarine strata in adjoining Kateel River quadrangle (Patton, 1966)

Kc IGNEOUS PEBBLE-COBBLE CONGLOMERATE--Massive poorly sorted conglomerate with pebble- to cobble-size clasts chiefly of mafic intrusive and volcanic rocks and varied colored chert. Clasts of quartz, quartzite, granitic rocks, schist, and limestone locally abundant but generally occur in minor amounts. Interbedded fine-grained to gritty, dark-gray volcanic graywacke (table 2, no. 3) and mudstone. Unit grades upward into tan sandstone, quartz conglomerate shale, and siltstone unit (Ks). In part overlies and in part laterally gradational with volcanic graywacke and mudstone unit (Kgm). Bulk of this unit believed to be late Early Cretaceous (Albian) but may include beds as young as Late Cretaceous. Indeterminable pelecypods (table 3, no. 1)

Kgm VOLCANIC GRAYWACKE AND MUDSTONE--Chiefly dark-greenish-gray, fine-grained to gritty, poorly sorted graywacke composed largely of first- and second-cycle volcanic debris but locally containing abundant granitic and metamorphic rock debris (table 2, nos. 4-6). Graded bedding common. Dark-gray mudstone interbeds. Some intercalated rhyolite and dacite hornfels bordering granodiorite intrusives (Kg). Assigned a late Early Cretaceous (Albian) age based upon correlation with similar volcanic graywacke and mudstone units in adjoining Hughes (Patton and Miller, 1966) and Kateel River (Patton, 1966) quadrangles. Unit queried where poorly exposed in lowlands south of Koyukuk River

Ktg TUFF, VOLCANIC GRAYWACKE AND MUDSTONE--Chiefly volcaniclastic rocks of andesitic and dacitic composition. Includes crystal-lithic tuff, lithic tuff, volcanic graywacke and mudstone. Rare andesite flows. Mapped only along northern edge of quadrangle and in adjoining parts of the Hughes quadrangle (Patton and Miller, 1966). Overlies andesitic volcanic rocks (Kv) and may grade laterally into volcanic graywacke and mudstone unit (Kgm). Assigned an Early Cretaceous age

Kv ANDESITIC VOLCANIC ROCKS Koyukuk River area--Pillow basalt and andesite flows; andesitic tuff, volcanic conglomerate and breccia; chert and fine-grained cherty tuff; and coquinoidal limestone composed largely of Buchia. Widely altered to a hard dark-green hornfels in Iuhultitla Mountains. Assigned an earliest Cretaceous (Neocomian) age based upon occurrence of Buchia (table 3, nos. 2, 3, 4, 5, 7)
Dulbi-Melozitna Rivers area--Andesitic and dacitic tuff, breccia, volcanic conglomerate, and tuffaceous graywacke. Flows and hypabyssal bodies of andesite and dacite porphyry (table 1, nos. 6-8). Unit widely altered to a hard dark-green hornfels near granodiorite intrusives (Kg). Assigned an earliest Cretaceous (Neocomian) age based upon occurrence of Buchia (table 3, no. 6) but may include strata as young as late Early Cretaceous (Albian) age

JPb BASALT AND DIABASE--Spilitic basalt and diabase largely altered to greenstone (table 1, no. 9). Along contact with Melozitna pluton (Km), unit is thermally altered to a mafic hornfels. On Melozitna-Dulbi Rivers divide unit includes fine andesitic and basaltic tuffs and chert. Probably ranges in age from Permian to Jurassic and is correlative with a belt of similar mafic rocks that lies on strike to the northeast in the Tanana and Bettles quadrangles (Patton and Miller, 1973)

JPu ULTRAMAFIC ROCKS--Small bodies of serpentinized peridotite and dunite with closely associated gabbro and anorthosite

Pm MARBLE--Small masses of white to light-gray coarsely crystalline dolomitic and calcareous marble. Locally altered to calc-silicate hornfels. Probably Paleozoic

Mzp6s PELITIC SCHIST--Chiefly quartz-chlorite-muscovite schist and micaceous quartzite. Greenschist facies of metamorphism. Includes some micaceous quartzite. Subordinate glaucophane-chlorite-muscovite schist (lat. 65°13' N., 157°30' W.). Paleozoic or Precambrian. Unit contains many small bodies of marble (Pm) but only a few of these bodies have been mapped separately. Unit also includes many unmetamorphosed bodies of greenstone and greenschist which are believed to represent altered mafic igneous rocks and possibly are correlative with basalt and diabase unit (JPb)

Mzp6g QUARTZITE--Chiefly fine-grained, light-gray quartzite and micaceous quartzite. Subordinate quartz-mica schist, marble, and calc-silicate rock. Unit contact metamorphosed over broad areas. Stratigraphic relationship to pelitic schist (Mzp6s) uncertain. Paleozoic or Precambrian

Mzp6n GNEISS AND QUARTZITE--Quartz-feldspar-biotite gneiss which is commonly garnetiferous and locally contains sillimanite-almandine-amphibolite facies of metamorphism. Some augen gneiss. Gray, coarse-grained quartzite with thin layers of biotite. Subordinate quartz-biotite schist and small undifferentiated bodies of greenstone and mafic to ultramafic rock. Unit includes many bodies of gneissic and nongneissic quartz monzonite which have not been mapped separately. Contacts with pelitic schist (Mzp6s) and quartz monzonite (Km) are gradational and indefinite. Unit appears to underlie pelitic schist (Mzp6s). Broad structural relationships suggest that this unit may compose a northeast-trending gneiss dome

Intrusive rocks

Kg GRANODIORITE--Chiefly fine- to medium-grained hornblende-biotite granodiorite (table 1, no. 10). Subordinate quartz monzonite and quartz diorite. Assigned a Late Cretaceous age based upon a potassium-argon determination of 82.1 and 89.0 m.y. from the Dulbatna Mountain pluton (table 4, no. 1) and 111 m.y. from the Indian Mountain pluton in adjoining Hughes quadrangle (Patton and Miller, 1966)

Kh HYPABYSSAL ROCKS--Small bodies chiefly of dacite and rhyolite porphyry. These intrusives are widespread in volcanic graywacke and mudstone unit (Kgm) and in andesitic volcanic rocks (Kv), but only a few have been mapped

Km QUARTZ MONZONITE--Pinkish coarse-grained porphyritic biotite quartz monzonite (table 1, nos. 11-14). Becomes gneissic in southern part of Melozitna pluton. Altered and slightly cataclastic in small pluton west of Gold Mountain. Assigned an Early Cretaceous age based upon a potassium-argon age of 111 m.y. from the Melozitna pluton (table 4, no. 2)

Note: The Kaltag fault is projected along the north bank of the Yukon River from the adjoining Ruby and Nulato quadrangles where its trace can be seen in the surficial deposits (Patton and Hoare, 1968). No evidence of the fault was found in the surficial deposits of the Melozitna quadrangle but its presence in the subsurface is strongly suggested by a steep gradient linear gravity anomaly which parallels the north bank of the Yukon River (Barnes, 1976).

EXPLANATION OF SYMBOLS

Contact, approximate contact, inferred contact, or indefinite contact

Fault, approximately located or inferred. Dotted where concealed. Arrows indicate apparent direction of offset. U, upthrown side; D, downthrown side

Prominent lineament in surficial deposits in Dulbi Flats. May be the result of recent faulting

Anticline showing direction of plunge. Approximately located or inferred; dotted where concealed

Syncline showing direction of plunge. Approximately located or inferred; dotted where concealed

Strike and dip of beds. May include overturned beds

Strike and dip of vertical beds

Horizontal beds

Strike and dip of beds based on photointerpretation or distant observation

Strike and dip of foliation

Strike and dip of prominent foliation or bedding based upon photointerpretation or distant observation

Locality of sample for chemical analysis and CIPW norms. Number refers to sample list in table 1

Locality of sample of Cretaceous sedimentary rock for modal analysis. Number refers to samples in table 2

Invertebrate fossil locality. Number refers to fossils in table 3

Location of potassium-argon age sample. Number refers to samples in table 4

Thermal spring

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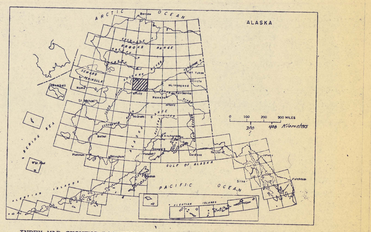
MAP OF MELOZITNA QUADRANGLE SHOWING LOCATION OF FIELD OBSERVATION POINTS (dots) AND CONTINUOUS FOOT TRAVERSES (lines)

Geology extended between field stations by aerial reconnaissance and by interpretation of aerial photographs. Surficial deposits mapped almost entirely from aerial photographs



INDEX MAP SHOWING LOCATION OF MELOZITNA QUADRANGLE, ALASKA

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