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Geology of An Area On The Upper Talkeetna River, Talkeetna Mountains Quadrangle, Alaska

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GEOLOGY OF AN AREA ON THE UPPER TALKEETNA RIVER, TALKEETNA MOUNTAINS QUADRANGLE, ALASKA

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ABSTRACT

In the central Talkeetna Mountains, a band of quartz diorite extends across the Talkeetna River through an area mapped in old reports as mafic volcanics, and connects with another large granitic pluton to the northeast. Similarly, a northeast-trending belt of Mesozoic or older meta-sediments in the Iron Creek area a few miles southwest extends across the river and connects with a belt of sediments northeast of the river. This belt of sediments is the host for copper-iron deposits in the Iron Creek area. In the map area, the sediments are interlayered with greenstone.

Three minor copper occurrences were found during the mapping, and stream sediments derived from a pyritic phyllite unit are moderately to strongly anomalous in copper content.

INTRODUCTION

From an aerial reconnaissance of the northern Talkeetna Mountains in 1965, several zones within the present map area were recognized as strongly iron-stained (Rose, 1965). To follow up this indication, six days during September 1966 were spent mapping in the area and collecting stream sediment samples. The map area is about 15 miles northeast along the regional strike from the copper-iron deposits at Iron Creek (Capps, 1919). The writer was assisted by L.J. Kerin, who collected most of the stream sediments. Access to the area was by light plane to a gravel bar on the Talkeetna River. Don Sheldon of Talkeetna was very helpful in advising on access and transporting the party to and from the map area.

REGIONAL GEOLOGY

Previous geologic work in the northern Talkeetna Mountains has been incomplete and of reconnaissance nature at best (Capps, 1940). The reconnaissance mapping shows that the main part of the Talkeetna Mountains south of the Talkeetna River is underlain by a large granitic pluton, and another large, partly outlined pluton is present east and northeast of the map area. A northeast-trending belt of "pre-Cretaceous basic lavas and tuffs and greenstone" plus minor Triassic limestone bounded on both sides by the granite pluton, trends toward the map area from the Iron Creek area to the southwest. A belt of sediments is also partly outlined northeast of the map area on strike with the belt. According to the older work, the belts of sediments and the granitic rocks are interrupted along the Talkeetna River by basic volcanics. The present work shows that the old mapping is incorrect in this respect. Unconformably overlying the older rocks is a sequence of Tertiary basalts and tuffs occupying the higher hills south of the Talkeetna River.

ROCK UNITS

Silicic Schist and Gneiss (ss)

A zone adjacent to the granitic contact in the southeast part of the map area is composed predominantly of silicic schist and biotite-bearing schist and gneiss, along with some schistose greenstone. The most distinctive lithology is a dark siliceous rock containing scattered "eyes" of smoky gray quartz. The matrix of the rock consists of about 50% quartz along with plagioclase, biotite, and muscovite. The texture and composition suggest that the rock may be a metamorphosed dacite or dacite tuff which originally contained quartz phenocrysts. Other rock types in the unit may be metamorphosed graywacke, and greenstone metasomatised by the granitic intrusive. Small areas of well-foliated quartz diorite are included in the unit, as are numerous dikes of unfoliated volcanic rocks presumed to correlate with the Tertiary volcanics.

Schistose Greenstone and Greenstone (g)

The most common rock type in the area is greenstone and schistose greenstone, which occurs in several layers separated by other rock types. The greenstone varies from fine-grained to porphyritic, and occasionally exhibits banding or bedding, suggesting an origin of some greenstone as a mafic tuff or tuffaceous sediment. Thin beds of metamorphosed chert or quartzite were found within the greenstone in one area. Vesicles and amygdules can be recognized in some zones. A specimen of schistose greenstone about a mile from the quartz diorite gneiss contact is amphibolite composed of blue-green hornblende and andesine, but most of the greenstone is less metamorphosed.

Phyllite (ph)

A belt of pyritic phyllite probably derived from clastic sediments is responsible for one of the prominent stained zones seen from the air. Pyrite comprises 10% of some of the phyllite, and may have been introduced or redistributed by hypabyssal intrusives possibly related to the Tertiary volcanics. The phyllite is up to 1,000 feet thick and can be traced about five miles. Greenstone lies on both sides of the phyllite.

Argillite, Siltstone, and Graywacke (ag)

A belt of thin-bedded argillite, siltstone, and graywacke crosses the northern part of the map area, between two zones of greenstone. Much of the argillite is dark gray and has fair slaty cleavage.

A second exposure of argillite and graywacke lies along the Talkeena River at the west corner of the area. The correlation of this sequence with those to the northeast is not clear.

Limestone (l)

Limestone is exposed within the argillite unit near the north end of the map area, and also as a thin bed within greenstone near sample 28 in the northwest corner of the area. Aerial observations suggest that limestone forms the low hill just north of the River, along strike, southwest from the latter occurrence in section 21. The limestone at the north end of the area is slabby and cherty with phyllitic interbeds, and is considerably recrystallized, apparently by gabbro sills intruded along the beds. It is not clear whether there are several limestone beds that have been sheared out along strike, or one limestone that has been complexly folded and faulted.

Andesite (a)

Unfoliated but highly fractured andesite with locally interlayered argillite crops out north of the limestone and argillite units. This lithology was not noted in the northwest part of the map area.

Basalt (b)

Fine grained to aphanitic black basalt forms a small wedge in the north corner of the map area. A thin section shows that this basalt is composed mainly of fine actinolite with subordinate plagioclase and magnetite. Irregular gabbro intrusives occur within the basalt and along the contact with the andesite.

Quartz Diorite Gneiss (qd)

Well-foliated quartz diorite and granodiorite form the southern margin of the map area. Two thin sections indicate a composition of about 25% quartz, 10% hornblende and biotite, and 60% andesine along with minor muscovite, orthoclase, and magnetite. Float in the larger streams is all well-foliated, indicating that the foliated rock makes up a large part of the pluton. Exposures on Yellowjacket Creek just south of the map area appear from the air to consist of layered sediments or volcanics, so the granitic intrusive is only a few miles wide where it crosses the Talkeetna River.

A second pluton of foliated quartz diorite or granodiorite crops out in the extreme north end of the area. This body was visited in only one spot, but has been partly outlined from distant views. A thin section shows a composition of 25% quartz, 50% andesine, 3% orthoclase, 7% hornblende, 3% biotite, and minor magnetite and sphene.

Gabbro (gb)

Medium-grained gabbro occurs as sills in the argillite and limestone, and as irregular intrusives in the basalt.

Tertiary(?) Andesite, Basalt, and Related Rocks

Numerous dikes and small irregular bodies of unfoliated hypabyssal andesite, basalt, and latite(?) occur within the metamorphic units. They were particulary noted along the Talkeetna River and at the southwest end of the phyllite unit.

STRUCTURAL GEOLOGY

Within a zone about two miles wide bordering the southeastern quartz diorite gneiss, the volcanics and sediments have a good foliation which is approximately parallel to the contact. Mylonites are locally present in the contact zone. The rocks near the contact show metamorphism to the amphibolite facies. The sediments and volcanics farther northeast are mostly unfoliated and less metamorphosed, but minor folding and crumpling are common in the less competent sedimentary units.

In general the lithologic units parallel the regional northeast trend, but individual units do not persist across the entire area. The andesite and basalt at the extreme north of the map area were not recognized four miles southwest, and a unit of graywacke and argillite along the Talkeetna River was not identified to the northeast. Most likely these units are faulted or sheared out by movements parallel to the quartz diorite contact, but it is also possible that close folding has caused offset of units.

The sediments and volcanics of the map area almost certainly correlate with the limestone, slate, shale, quartzite, and greenstone of the Iron Creek area to the southwest, and with the slate, argillite, graywacke, and greenstone to the northeast. A Triassic age has been suggested for the sediments and a Jurassic age (Talkeetna formation) for the greenstones (Capps, 1940, p. 70-74), but the ages of both these groups of rocks are based on rather tenuous correlations. The granitic intrusives of the region have been dated as Jurassic, and the sediments and volcanics are clearly older than the intrusives.

The continuity of the granitic rocks across the Talkeetna River suggests that the largest granitic body in the Talkeetna Mountains is elongated along the regional trend rather than being two equant masses as shown on the geologic map of Alaska (Dutro and Payne, 1957). The belt of sediments is also more continuous than previously realized.

ECONOMIC GEOLOGY

Locality 1

At this locality, highly-stained quartz diorite gneiss with inclusions of biotite schist contains moderate to abundant pyrite and pyrrhotite, and traces of chalcopyrite. Chips from one of the most highly stained outcrops contained only 0.06% copper and traces of gold and silver.

Locality 2

This locality is a strongly stained patch about 200 feet in diameter on a steep hillside. Float below it includes gabbro with moderate amounts of disseminated pyrrhotite and traces of chalcopyrite disseminated and in veinlets.

Locality 3

A sample of highly altered phyllite from this vicinity contained traces of gold and silver, but no copper, lead, or zinc. See the section on geochemistry for further discussion of the pyritic phyllite.

Locality 4

A vein and replacement zone in a small gully at this locality strikes N65E and dips 70° southeast. The zone contains a few percent pyrrhotite and chalcopyrite replacing greenstone across widths of six inches to two feet. A one inch quartz vein lies along one side of the zone. No alteration of the adjacent schistose greenstone (probably amphibolite) was noted.

Locality 5

A zone about a foot wide in altered argillite at this locality on the river is copper-stained and contains minor chalcopyrite and pyrite. The zone strikes N87W and dips 54° SW, almost parallel to bedding, and is located about 10 feet from the axial plane of a small isoclinal fold. Minor copper stain was also noted a few hundred feet upstream in pyritized and bleached greenstone.

STREAM SEDIMENT GEOCHEMISTRY

Thirty-nine stream sediment samples were collected from active stream channels in the area and have been analyzed for total copper, zinc, lead, molybdenum, and nickel after drying and sieving to -80 mesh. Based on the results for these stream sediments and others in the Alaska Range, contents higher than 150 ppm copper and 200 ppm zinc are considered anomalous. No definite anomalies are recognized for lead, molybdenum, and nickel.

The moderate to strong copper anomalies in samples 23 and 26 are the most interesting feature of the data. Both streams drain the pyritic phyllite, and it is likely that the copper anomalies are related to the high sulfide content of this unit. Samples 11 and 27 are weakly anomalous in copper and also drain the pyritic phyllite. A sample of the phyllite collected at mineral locality 3 contained less than 500 ppm copper, but higher values almost certainly occur in some parts of the unit in order to furnish the sediment anomalies. Prospecting and additional sampling of this unit is definitely recommended.

Sample 14 is weakly anomalous in copper and has a relatively high nickel content. The sample was taken just below a zone of highly stained greenstone schist within the silicic schist unit. The weak anomaly combined with the relatively small size of the stained zone does not encourage further work.

A weak zinc anomaly in sample 2 is outside the mapped area and cannot be evaluated.

SUGGESTIONS FOR PROSPECTORS

Additional sampling of stream sediments and rocks along the pyritic phyllite unit should be undertaken in order to evaluate the origin of the copper anomalies in these drainages.

The belt of sedimentary rocks mapped in this project is almost certainly the extension of the sediments of the Iron Creek area where copper-iron deposits replacing limestones are known. Further exploration of this belt of sediments, especially on the south side of the Talkeetna River, seems worthwhile to search for similar mineralization.

REFERENCES

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Table 1. Geochemical Data on Stream Sediments

All analyses by Rocky Mountain Geochemical Laboratories, Salt Lake City, Utah.

Map No.	Sample No.	Concentration (ppm)				
		Copper	Zinc	Lead	Molybdenum	Nickel
1	6N-323	90	85	10	2	30
2	6N-324	100	240	10	1	10
3	6N-325	85	65	5	2	35
4	6N-320	95	70	5	2	45
5	6N-319	50	80	5	2	10
6	6N-318	50	85	5	2	5
7	6N-317	65	105	5	4	15
8	6N-322	80	95	10	2	50
9	6N-321	90	85	10	1	35
10	6E-748	140	100	10	1	85
11	6E-749	190	115	10	4	85
12	6N-307	105	105	5	2	50
13	6E-756	90	80	-5	3	20
14	6E-751	190	70	5	1	180
15	6N-312	45	65	5	2	-5
16	6N-313	45	75	5	3	10
17	6N-316	35	70	5	1	40
18	6N-315	25	55	5	1	25
19	6N-314	30	50	5	2	30
20	6N-308	40	35	5	2	-5
21	6N-309	135	105	5	2	50
22	6N-310	120	130	5	3	30
23	6N-306	460	185	10	3	45
24	6N-311	90	100	5	4	30
25	6N-326	115	80	10	1	35
26	6E-729	420	170	10	2	25
27	6N-303	170	130	15	3	35
28	6N-304	140	95	10	2	80
29	6N-305	65	95	15	2	25
30	6E-762	60	85	20	1	20
31	6E-759	60	105	5	3	25
32	6E-758	40	80	5	2	40
33	6E-710	40	75	5	1	25
34	6N-300	35	80	5	1	15
35	6N-327	35	70	10	5	10
36	6N-302	65	75	5	2	10
37	6N-301	30	85	10	3	20
38	6N-329	105	90	10	3	
39	6N-328	55	70	5	4	10