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RESULTS OF STREAM SEDIMENT SAMPLING IN PARTS OF THE SOUTHERN ALASKA RANGE

By

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Contents

Introduction

Analytical data for stream-sediment samples collected in two areas of the southern Alaska Range are presented in this report. The samples were collected in 1967 during field evaluation of this sector of the Alaska Range as part of the Heavy Metals program of the U.S. Geological Survey. A total of 1123 samples were collected in the three areas shown in figure 1. The geology, geochemical anomalies and metalliferous deposits of area 2 have been described earlier (Reed and Elliott, 1968a, b). Geochemical data for areas 1 and 3 are presented here in tabular form. Geochemical data for area 2 has been released as an open-file report (Elliott and Reed, 1968), and is not included in this report. The data from the three areas are presented in the form of histograms.

Geologic environment

The part of the Alaska Range west of the South Fork of the Kuskokwim consists predominantly of Paleozoic sedimentary rocks intruded by granitic stocks, hypabyssal breccia bodies, and abundant felsic and mafic dikes. Tertiary extrusive rocks, including mafic flows and pyroclastic deposits with interbedded sedimentary units, locally overlie the Paleozoic rocks south of the Farewell fault. A thick sequence of Tertiary conglomerate, sandstone and shale is present locally north of the fault.

Only a stream sediment reconnaissance was carried out east of the South Fork of the Kuskokwim River (area 3, fig. 1). Parts of this area have been described by Brooks (1911) and Capps (1927). Granitic intrusive rocks and some of the more accessible zones of alteration were briefly examined. The area is characterized by complexly folded and faulted sedimentary rocks which strike northeast. The Farewell fault zone transects the area and mafic rocks are emplaced locally along segments of the fault.

Area 1

Sedimentary rocks.--The Paleozoic rocks are predominantly interbedded shale, siltstone, argillite and limestone, but they also include prominent units of thin- to massive-bedded gray limestone. Due to the stratigraphic and structural complexity of the area, these sedimentary rocks are shown on figure 2 as one unit, with the exception of prominent limestone units which are shown locally. These rocks are tentatively assigned a Paleozoic age because fossils of Ordovician and Devonian age have been found in similar lithologies in area 2 (Reed and Elliott, 1968b).

North of the Farewell fault a thick sequence of complexly folded and faulted conglomerate, sandstone and shale is present. The conglomerate is characterized by a predominance of well rounded white "vein" quartz and gray chert pebbles with subordinate light and dark gray chert and granite pebbles. Shale beds locally contain abundant plant fossils (localities F-1, 2, and 3, fig. 2) of probable middle or late Oligocene age (Jack Wolfe, written commun., 1968). Uprooted tree trunks and stumps up to 6 feet long were noted in the conglomerate. These sedimentary rocks are lithologically similar to the thick sequence of quartz conglomerate, shale, and sandstone on the south side of the Farewell fault in the White Mountain area (Sainsbury and MacKevett, 1965). The White Mountain area is about 6 miles west of Big River.

Igneous rocks.--Two large igneous bodies in the central and southern parts of figure 2 are chiefly of granitic composition. The body near the center of figure 2 is a composite intrusive. Igneous float in streams draining the body is chiefly granodiorite and quartz monzonite, but one area at least several hundred feet across (locality A, fig. 2) is a medium-grained syenite in which poikilitic alkali feldspar contains about 10 percent of small euhedral crystals of aegirine-augite. Quartz comprises less than 5 percent of the rock. The southern body is a medium- to coarse-grained, hornblende and (or) biotite granite.

A small igneous body north of Big River in the southwest corner of the map is a medium-grained biotite-hornblende granodiorite in which the mafic constituents comprise 20-25 percent of the rock. The small stock on the Middle Fork (B, fig. 2) is a medium-grained biotite quartz monzonite in which biotite makes up 5 to 10 percent of the rock.

The small body of gabbro on the south tributary to the Middle Fork (C, fig. 2) was examined only near its north contact where it cuts dark-gray, laminated metasiltstone. Near the contact the gabbro consists of labradorite, clinopyroxene and several alteration minerals including epidote, chlorite, carbonate and actinolite. In the samples collected small clots of pyrrhotite make up less than 5 percent of the rock.

A small body of partially serpentinized peridotite (D, fig. 2) contains minor amounts of scattered copper-nickel sulfide minerals. This body, with a maximum exposed dimension of about 50 feet, intrudes complexly folded limestone and argillite, and may have been emplaced along a segment of the Farewell fault.

The small igneous complex in the northeast corner of figure 2 was examined briefly. It consists of abundant dikes of intermediate to mafic composition and extrusive breccias. This igneous complex may be genetically and temporally related to the hypabyssal centers and associated extrusive volcanic rocks mapped in area 2 (Reed and Elliott, 1968b).

Structure.--The oldest structural grain in this part of the Alaska Range trends in a northerly direction. These older structural features, however, are not as easily recognized as they are east of the Windy Fork (Reed and Elliott, 1968b). Locally, for example on the south tributary to the Middle Fork, northerly trending recumbent folds are overturned to the west. The east-dipping thrust faults shown on figure 2 are probably related to this period of deformation. In the northern part of figure 2 east-northeast-trending open folds are superimposed on the earlier north-trending folds.

The most prominent structural feature in this part of the Alaska Range is the Farewell fault zone--a major right-lateral strike-slip crustal feature that is part of the Denali fault system (Grantz, 1966). Linear scars in surficial deposits and the presence of many gouge zones in bedrock (fig. 2) indicate that in this area the fault zone is at least 5 miles wide.

Area 3

Sedimentary rocks north of the Tatina River are chiefly graywacke sandstone, shale, argillite and limestone, and are lithologically similar to the Paleozoic rocks in areas 1 and 2. The rocks are complexly folded and faulted, and strike northeast parallel to the mountain front. On the east side of the South Fork of the Kuskokwim River the rocks form tightly compressed folds that are overturned to the northwest. The folds are broken by northeast-striking reverse faults.

Sedimentary rocks south of the Tatina River (fig. 3) are predominantly a monotonous sequence of dark-gray argillite with an apparent thickness of several thousand feet. These rocks dip to the south and are, at least locally, faulted against sedimentary rocks characteristic of the area north of the Tatina River.

The larger known plutons are shown on figure 3. Samples collected from the pluton in the southwest corner are partially altered hornblende quartz diorite. The Cathedral Peaks intrusive at locality A (fig. 3), south of the Tatina River, is a coarse-grained biotite quartz monzonite that cuts dark-gray argillite. The intrusive east of the Tonzona River (localities B and C, fig. 3) is coarse grained, locally porphyritic biotite quartz monzonite that cuts argillite, marble, and andalusite-bearing pelitic schists. Metamorphic effects on sedimentary rocks in this area are greater than those observed in the area south of Farewell.

Analytical procedure

Standard procedures were followed in the collection and preparation of the stream-sediment samples. Where possible, the sample was collected from the active stream channel; where this was not possible, the sample was collected from higher level stream deposits adjacent to the active channel. The samples were dried, sieved, and the minus 80 mesh fractions submitted for 6-step semiquantitative spectrographic analyses for 34 elements. The spectrographic analyses for Fe, Ca, Mg, and Ti are given in percent, and all other elements are reported in parts-per-million (ppm) to the nearest number in the series 0.5, 0.7, 1.0, 1.5, 3, 5, 7, 10, 15, and so on. The precision of a reported value is approximately plus 100