UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FLUORITE PROSPECTS IN THE NORTHWESTERN KIGLUAIK MOUNTAINS, NOME D-2 QUADRANGLE, ALASKA

By

C. L. Sainsbury, Reuben Kachadoorian, and Thomas E. Smith
U.S. Geological Survey

Open-file report

1970

Contents

Illustrations

INTRODUCTION

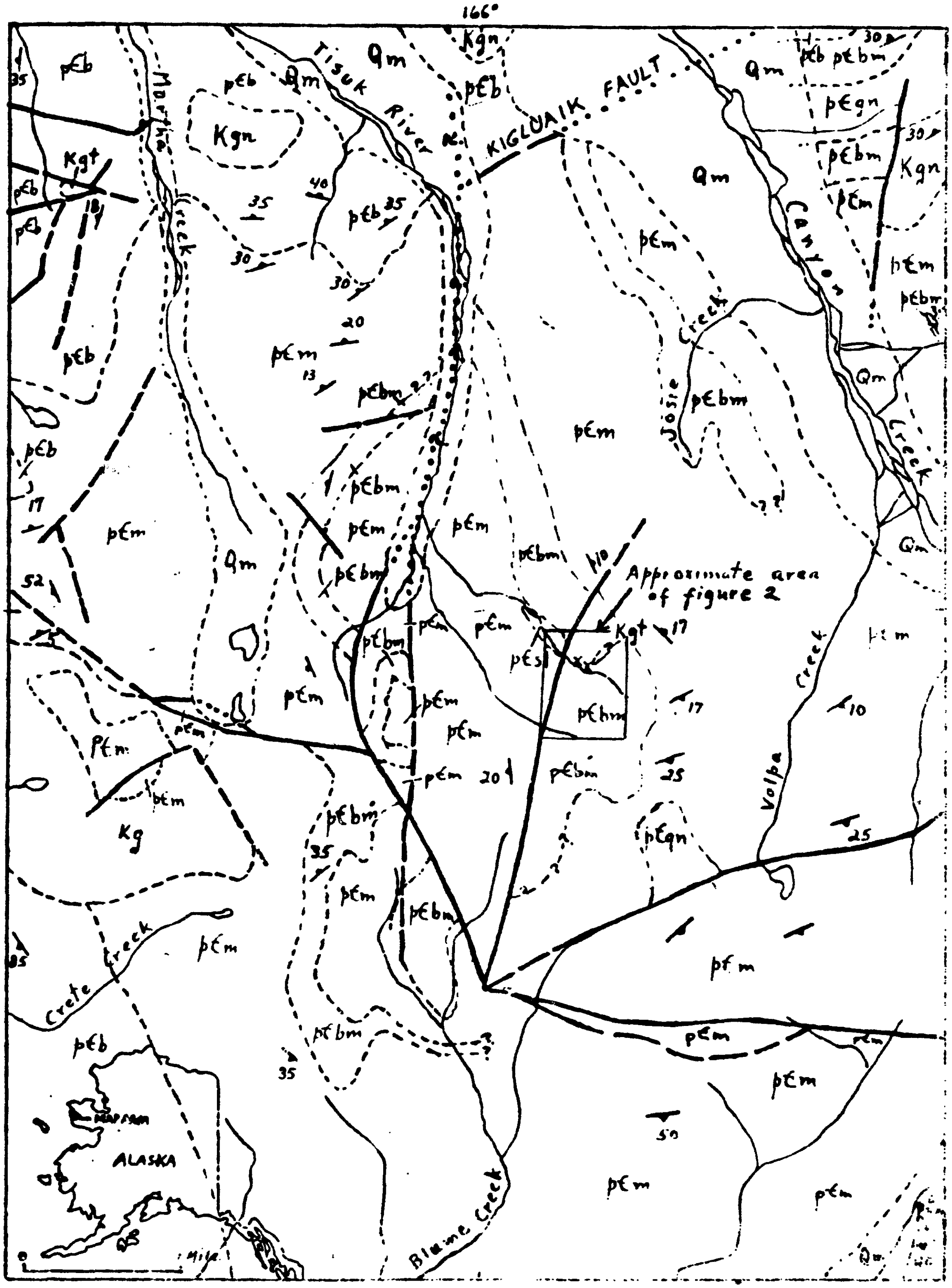
During reconnaissance geologic mapping in 1967 of the western Kigluaik Mountains, fluorite was found in breccia pipes and altered rocks along fault zones on a tributary of the Tisuk River, Nome D-2 and D-3 quadrangles, Alaska. Owing to the renewed interest in fluorspar, the deposits may now be of some economic interest. This brief report describes the fluorspar prospects and presents data on the regional geology.

GEOLOGY

General Geology

The general geology of the area is shown on figure 1, based on detailed mapping by Smith in the area west of the Tisuk River and on reconnaissance mapping east of that river by all the authors. The bedrock comprises diverse metamorphic rocks of Precambrian age and intrusive rocks of Cretaceous age. The general sequence of metamorphic rocks in the Kigluaik Mountains was established by Moffit (1913) and refined by Sainsbury and others (1969). The reader is referred to these reports for information on areas contiguous to that described in this report.

Within the area of figure 1, the Precambrian rocks are subdivided into three map units. The oldest unit consists of quartz-rich gneisses and schists that include such diverse types as biotite-quartz-andalusite schist, biotite schist, interbedded biotite schist and tactite, and leucocratic banded gneiss. Within this unit are subunits that are sequences of interbedded calcareous rocks consisting of marble schist as much as 100 feet thick, calcareous biotite schist, silicified limestone, and leucocratic gneiss with minor calcareous beds. All these calcareous sequences were mapped separately as indicated on figure 1, for they are the most favorable host rocks for the



Strike and direction of dip
of foliation or schistosity

×
Fluoritized breccia and fluoritized limestone

Figure 1. Reconnaissance geologic map of the Tisuk River-Canyon Creek area, Nome D-2 and D-3 quadrangles, Alaska. Geology by C. L. Sainsbury, Thomas E. Smith, and Reuben Kachadoorian, 1967. Base from U.S. Geological Survey Nome D-2 and D-3 quadrangles, 1:63,360, 1950.

EXPLANATION

QUATERNARY

Pleistocene

Qm

Moraine

Includes outwash and reworked moraine

CRETACEOUS

Kg

Kgt

Granite

Kg, medium- to fine-grained biotite granite

Kgt, tourmaline-bearing biotite granite

Kgn

Gneissic granite

Garnet-bearing fine-grained granite

PRECAMBRIAN

Upper Precambrian

p€b

Graphitic biotite schist

p€m

p€bm

p€gn

p€bm

p€sl

Schist, gneiss, and marble

p€m, metamorphic rocks undifferentiated; principally biotite schist and quartz-bearing semigneiss and minor andalusite-tourmaline hornfels and calcareous schist

p€bm, banded marble, calcareous biotite schist, and tactite

p€gn, leucocratic gneiss; minor calcareous beds, lenses, and pods

p€sl, silicified limestone and calcareous schist

— — —?— · · ·

Contact

Dashed where sharp, gradational, or approximately located; dotted where concealed; queried where doubtful

———— — · · ·

Fault

Dashed where approximately located or inferred; dotted where concealed

Strike and dip of foliation or schistosity

fluorite as well as the most dependable indicators of geologic structure. At present, it cannot definitely be stated that the calcareous rocks represent a single depositional sequence repeated by folding and thrust faulting, or diverse depositional sequences, but most likely several sequences are present. The youngest Precambrian rocks consist of a thick unit of biotite schist and graphitic quartz-biotite schist that forms a wide belt along the west and north flanks of the Kigluaik Mountains.

Intrusive into the Precambrian metamorphic rocks are numerous granitic stocks, bosses, and sills, ranging in age through the Cretaceous. The oldest of these intrusives consist of fine-grained granite gneiss or gneissic granite, which forms a sill several hundred feet thick east of Canyon Creek, as well as isolated bodies elsewhere on the north side of the mountains. Presence of red garnet distinguishes this rock from all younger granites, which consist of unfoliated biotite granite that forms a stock between Martha and Crete Creeks and both larger and smaller bodies elsewhere in the Kigluaik Mountains. The intrusive rock of economic interest consists of tourmaline-bearing granite that occurs in scattered localities as small bodies as much as a few hundred yards in longest dimension, and with which the fluorspar deposits are spatially associated (figs. 1 and 2). Small dikes of granite, diabase, pegmatite, and andesite are common, but are not shown on the maps.

Glacial moraine, and stream-reworked moraine and outwash, mantle the floors of all large valleys; elsewhere, bedrock is well exposed and no difficulty is encountered in mapping altered rocks, veins, and rock units.

Structure

The Kigluaik Mountains are a horst of older rocks bounded on the north and south sides by normal faults--the Kigluaik fault on the north side displaces glacial moraines of Wisconsin age and is the loci of several modern earthquakes, whereas the south boundary faults are complex and are not known to cut moraine of Wisconsin age. Surrounding the Kigluaik Mountains on all sides is a terrane characterized by intensive overthrust faulting (Sainsbury, 1969, 1965; Smith, 1910) with Paleozoic carbonate rocks in thrust contact with themselves and with Precambrian rocks locally similar to those in the area of this report. Individual thrust faults have been mapped along the Kigluaik Mountains east of the area of this report, but have not been mapped within the area of figure 1, although they probably exist. The distribution of units along the Kigluaiks can best be explained by upwarping, on an east-west axis, of thrust slices originally folded on north-south axes.

Several sets of normal faults displace the rocks in the area of figure 1. Along many, the wallrocks contain pyrrhotite and pyrite, as well as traces of other sulfide minerals. The youngest faults trend northerly, and many are marked by large amounts of quartz and tawny jasperoid commonly brecciated. A large number of such altered zones were sampled during the work, and although sulfided zones commonly yielded traces of gold and anomalous mercury and arsenic, none contained sufficient metal to be of economic interest.

Fluorite Prospects

The known fluorite pipes lie near a small boss of tourmaline-bearing granite on the north side of a small tributary of the Tisuk River (figs. 1 and 2), which has been informally named "Fluorite Creek." A geologic sketch map of the area, made during a single traverse down the creek, is shown on figure 2. The pipes occur in the calcareous unit, which crops out all along the north side of the creek (fig. 1). The easternmost pipe is well exposed in the left bank of a small gully where, for a distance of at least 80 feet, fluorite and fluorite-cemented jasperoid form the bedrock. The pipe is at least 20 feet wide. The pipe consists of a central porous mass of pink, purple, and white fluorite, crystalline to coarsely crystalline, surrounded by a margin in which banded silica and fluorite with pyrite occur. Locally, silicified and pyritized breccia is cemented by

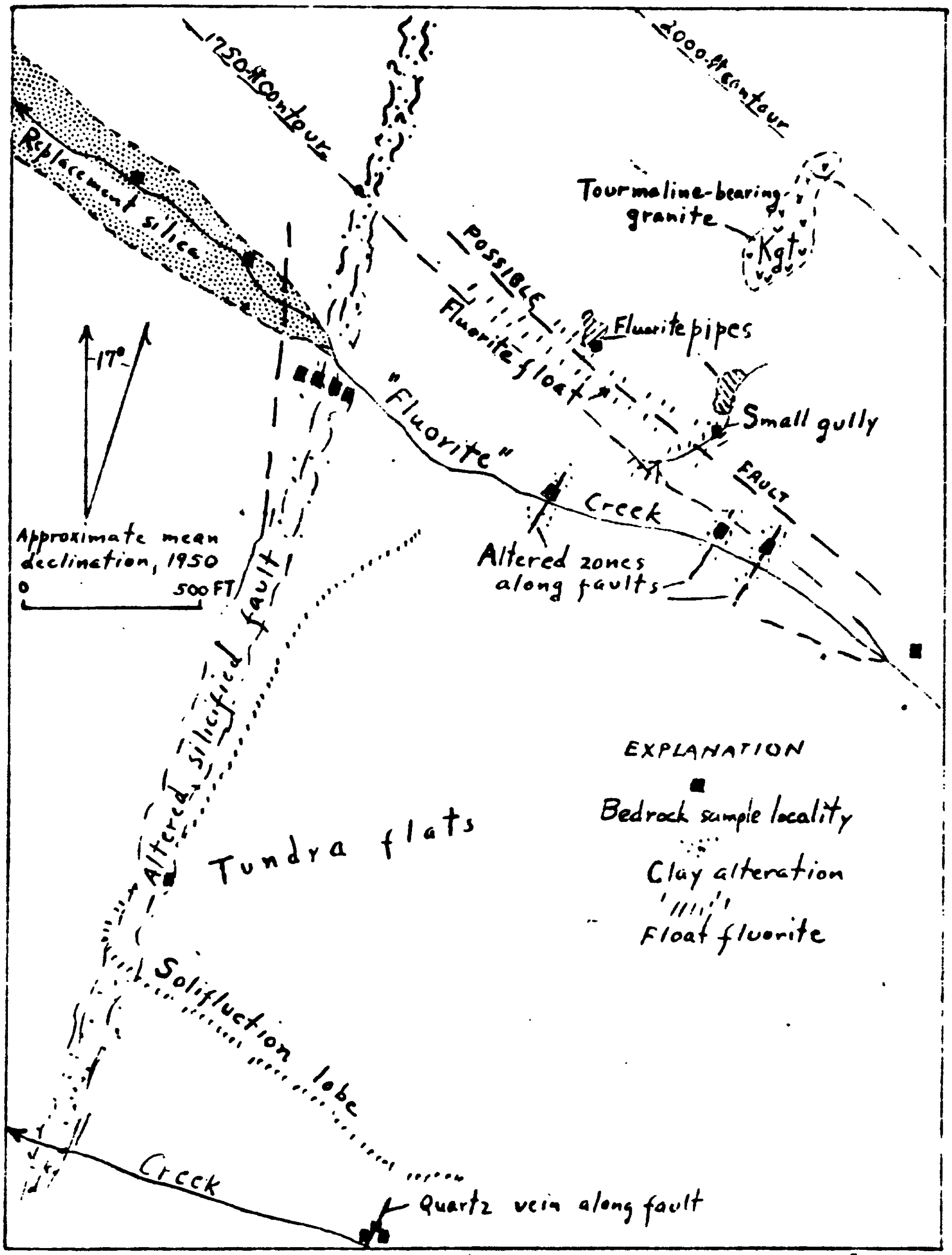


Figure 2. Geologic sketch map of area around fluorite pipes, Tisuk River drainage, Nome D-2 quadrangle, Alaska. Geology by C. L. Sainsbury and Reuben Kachadoorian, 1967.

fluorite. Within the central core, numerous iron-stained veinlets some 1/4-1/2 inch in thickness ramify through the fluorite. The fluorite content of the pipe is estimated to be between 40 and 60 percent CaF_2.

A second pipe of fluorite-cemented breccia crops out about 350 feet west of the first pipe. It is smaller, contains a higher percentage of siliceous breccia than the eastern pipe, and is more heavily pyritized. Between the two pipes, and extending downstream for several hundred feet, fluorite float is common. This float may have been strung out by a glacier that at one time occupied the valley, or it may represent float from a fluoritized zone in the calcareous unit.

Other fluorite prospects may exist in the valleys of "Fluorite" Creek and Canyon Creek, for small bodies of tourmaline-bearing granite occur on the ridge bounded by "Fluorite," Valpa, and Canyon Creeks (fig. 1), but if they do, they are not prominent. Fluorite in minor amounts occurs in tawny jasperoid along the large fault extending southerly for several miles from just west of the fluorite pipes, as well as in jasperoid in other altered faults exposed along "Fluorite" Creek and another creek to the south (fig. 2). Although the main fault has as much as 30-40 feet width of jasperoid along it, the fluorite content does not exceed a few percent.

Numerous samples of altered bedrock (see fig. 2) as well as fluorite and fluorite-cemented jasperoid float were taken and analyzed for gold by atomic absorption methods, and for numerous other elements by semiquantitative spectrographic analyses. Owing to incorrect treatment of the samples in the analytical laboratory, results are considered inconclusive. Of nine bulk samples collected originally, four contained gold up to 9 ppm; however, no gold was detected in any of 18 samples re-collected to check the original results.

Spectrographic analyses showed slightly anomalous amounts of As (200-700 ppm), Ag (0.5-1.7 ppm), and Hg (0.25-0.45 ppm) in samples of altered rocks along the faults; samples of pyrite-bearing jasperoid, cemented by fluorite, from the two pipes contained no detectable gold, and only small amounts of Ag (3 ppm) and Mo (70 ppm). No other metals were detected in anomalous amount.

Downstream from the main fault west of the pipes, a banded siliceous rock crops out in the banks of the creek. Numerous small flecks of black opaque mineral scattered through this rock are probably graphite, inasmuch as spectrographic analyses of two samples (fig. 2) show no detectable metals. The silicified rock is believed to represent carbonaceous limestone that has been replaced by silica, and may be close to a thrust fault, for numerous exposures of such rock elsewhere on the Seward Peninsula almost invariably are associated with thrust faults.

CONCLUSIONS

The fluorite pipes described herein are too small to sustain a mining operation for fluorite, and their content of other valuable metals is low. However, the area has widespread altered rocks and numerous faults and, therefore, may warrant a detailed evaluation to assess its total potential.

REFERENCES CITED

Moffit, Fred H., 1913, Geology of the Nome and Grand Central quadrangles, Alaska: U.S. Geol. Survey Bull. 533, 140 p.

Sainsbury, C. L., 1965, Geology and ore deposits of the central York Mountains, western Seward Peninsula, Alaska: U.S. Geol. Survey open-file report, 146 p. (to be superseded by U.S. Geol. Survey Bull. 1287, in press).

______1969, The A. J. Collier thrust belt of the Seward Peninsula, Alaska: Geol. Soc. America Bull., v. 80, p. 2595-2596.

Sainsbury, C. L., Kachadoorian, Reuben, Hudson, Travis, Smith, T. E., Richards, Thomas R., and Todd, W. E., 1969, Reconnaissance geologic maps and sample data, Teller A-1, A-2, A-3, B-1, B-2, B-3, C-1, and Bendeleben A-6, B-6, C-6, D-5, D-6 quadrangles, Seward Peninsula, Alaska: U.S. Geol. Survey open-file report, 64 p.

Smith, Philip S., 1910, Geology and mineral resources of the Solomon and Casadepaga quadrangles, Seward Peninsula, Alaska: U.S. Geol. Survey Bull. 433, 234 p.