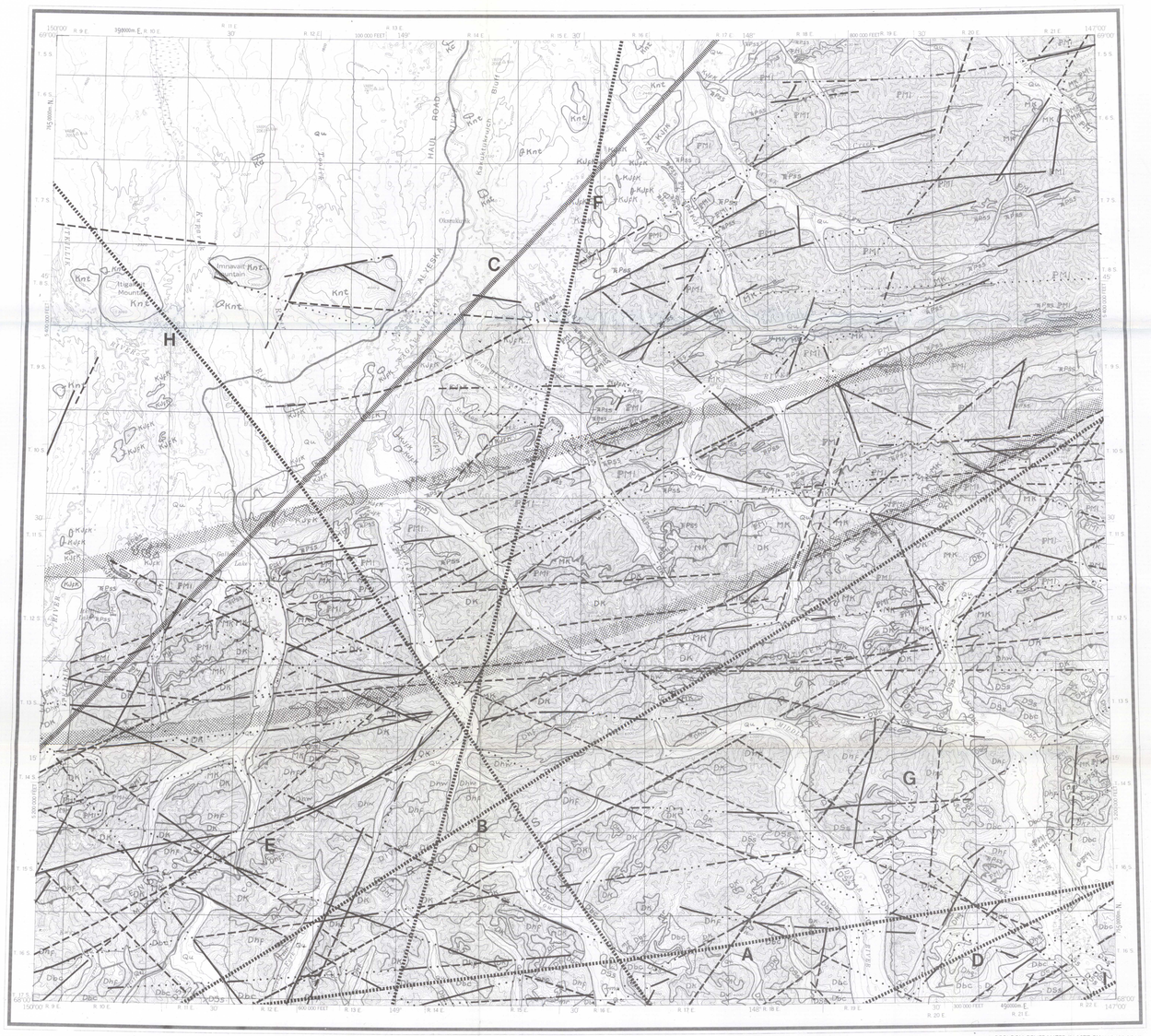
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE PHILIP SMITH MOUNTAINS QUADRANGLE, ALASKA
MISCELLANEOUS FIELD STUDIES MAP MF — 879F
SHEET 1 OF 2
LE COMPTE—LANDSAT IMAGERY

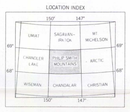


GEOLOGY GENERALIZED IN 1977 BY W.P. BROSGE, H.N.REISER, J.T.DUTRO, JR., AND R.L.DETTERMAN

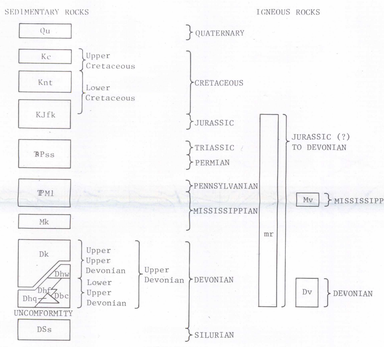
BASE FROM U.S. GEOLOGICAL SURVEY, 1956

SCALE 1:250000

CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL



CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

SEDIMENTARY ROCKS

Qu SURFICIAL DEPOSITS, UNDIVIDED (QUATERNARY)

Kc COLVILLE GROUP (UPPER CRETACEOUS)--Tuff; tuffaceous clastic rocks

Knt NANUSHUK GROUP (UPPER AND LOWER CRETACEOUS) AND TOROK FORMATION (LOWER CRETACEOUS)--Nonmarine and marine; sandstone, shale, siltstone and conglomerate

KJfk FORTRESS MOUNTAIN, OKPIKRUAK AND KONGAKUT FORMATIONS (LOWER CRETACEOUS) AND KINGAK SHALE (JURASSIC)-- Graywacke, dark-gray, partly manganiferous shale and siltstone, conglomerate

PPss SHUBLIK FORMATION (TRIASSIC) AND SADLEROCHIT GROUP (TRIASSIC AND PERMIAN)-- Phosphatic shale and limestone, partly calcareous siltstone and shale, sandstone, barite concretions

PMl LISBURNE GROUP (PENNSYLVANIAN AND MISSISSIPPIAN)--Limestone and dolomite

Mk KAYAK SHALE (MISSISSIPPIAN)--Black shale, limestone, sandstone

Dk KANAYUT CONGLOMERATE (UPPER DEVONIAN)--Nonmarine quartzite, ferruginous conglomerate, red shale. Basal marine sandstone

HUNT FORK SHALE (UPPER DEVONIAN)

Dhw Wacke member--Manganiferous shale and siltstone, ferruginous subgraywacke

Dhf Shale--Dark-gray shale and slate; quartzite, limestone. Thin mafic flow and sills

Dhq Quartzite member

Dbc CALCAREOUS SANDSTONE MEMBER OF HUNT FORK SHALE AND UNNAMED BROWN CALCAREOUS CLASTIC ROCKS (UPPER DEVONIAN)--Includes some reef limestone and red and green shale

DSs SKAJIT LIMESTONE (DEVONIAN AND SILURIAN)--Limestone, dolomite, marble. Few small mafic dikes

IGNEOUS ROCKS

Mv VOLCANIC ROCKS (MISSISSIPPIAN)--Diorite sill

Dv VOLCANIC ROCKS (DEVONIAN)--Pillow basalt flows

mr MAFIC ROCKS--Gabbro, diorite, and greenstone

GEOLOGIC SYMBOLS

GEOLOGIC CONTACT--Approximately located

FAULT--Dashed where approximately located

THRUST FAULT--Sawteeth on upper plate. Dotted where concealed

TABLE OF IMAGERY USED IN ANALYSES

Images used for computer enhancement were 1773-21014 and 1773-21020, both taken 9/04/74. Computer compatible tapes were processed by Pat S. Chavez, Jr., Teresa E. Grow, and Lynda Sowers, U.S. Geological Survey, Flagstaff, Ariz. Imagery is available from EROS Data Center, Sioux Falls, South Dakota 57198 (specify PAO number when ordering). For descriptions of these types of enhancement see Albert and Steele (1976a, 1976b). Example of imagery is shown in Figure 1.

IMAGE TYPE	COMPUTER-ENHANCED	BANDS AND COLORS USED	PROJECTION	PAO NUMBER	TRANSPARENCY SCALE	PRINT SCALE
U.S.D.A. Alaska mosaic	No	7 B&W	Albers' Equal-Area	this item not available from EROS Data Center		1:1,000,000
False-color with linear stretch	Yes	4 Blue 5 Green 7 Red	Orthographic	E-668-76CT	1:1,072,500	1:250,000
False-color with sinusoidal stretch (#1)	Yes	5 Green 6 Red 7 Blue	Orthographic	E-669-76CT	1:1,072,500	1:250,000
False-color with sinusoidal stretch (#2)	Yes	4 Blue 6 Green 7 Red	Orthographic	E-670-76CT	1:1,072,500	1:250,000
Simulated natural color	Yes	4 Green 5 Red Syn Blue	Orthographic	E-671-76CT	1:1,072,500	1:250,000
Horizontal first derivative	Yes	6 B&W	Orthographic	E-109-55BP	1:1,562,500	1:250,000
R.G.H. Raynold Alaska mosaic	No	7 B&W	Albers' Equal-Area	this item not available from EROS Data Center		1:1,000,000

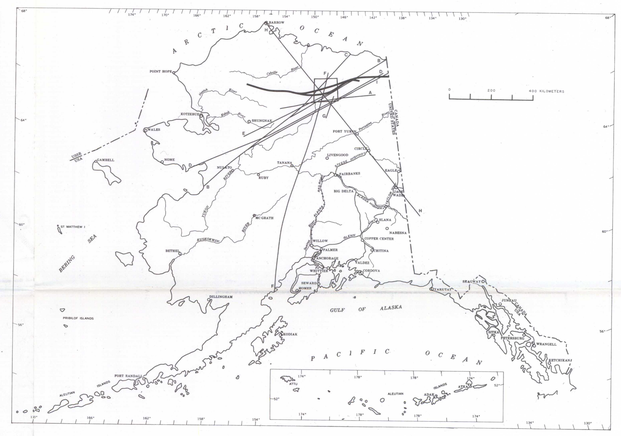


Figure 3. Index map of Alaska showing location of Philip Smith Mountains quadrangle and approximate location of those major lineaments that seem geologically significant on a regional basis and that are recognized in the quadrangle. Lettered lineaments refer to corresponding features denoted on the lineament map (sheet 1). Data sources for major lineaments are noted in the explanation of imagery interpretation for the lineament map (sheet 1).

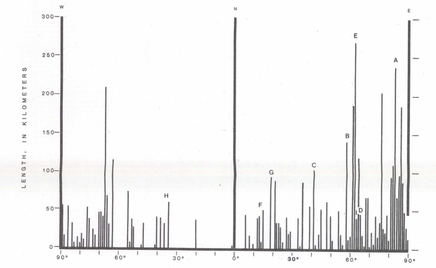


Figure 4. Histogram of trends and cumulative lengths of lineaments shown on lineament map (sheet 1) of the Philip Smith Mountains quadrangle. Letters refer to major lineaments (see fig. 3) and denote their approximate azimuths. Cumulative length for each major lineament may not represent its actual (total) length because (1) most major lineaments are composed of numerous multi-azimuthal segments and (2) other lineaments (or lineament segments) may have the same azimuth.

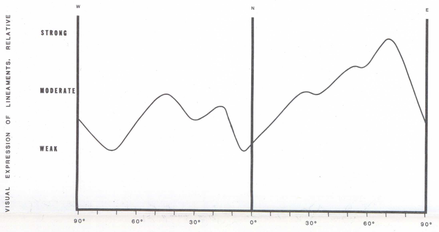


Figure 5. Graph of trends of lineaments less than 10 km long as determined by use of a diffraction grating on Landsat imagery (see table of imagery used in analyses (sheet 1): horizontal first-derivative) of Philip Smith Mountains quadrangle. Terms used (strong, moderate, weak) indicate relative visual expression (of lineaments) which is subjective.

EXPLANATION OF IMAGERY INTERPRETATION

Well defined lineament

Moderately defined lineament

Poorly defined lineament

Broad, diffuse lineament

Lineament from Albert and others (1978)

Lineament from Lathram and Raynolds (1977)

See figure 3 for extensions of lettered features outside the Philip Smith Mountains quadrangle

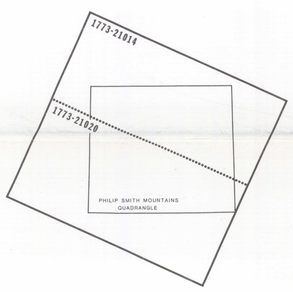


Figure 1. Map showing location of Landsat imagery used in analyses of Philip Smith Mountains quadrangle. Dotted line indicates boundary between mosaicked images.

LINEAMENT MAP

DISCUSSION

This study is an abridged version of similar interpretative investigations previously conducted in other areas of Alaska (Albert and Steele, 1976a, b).

Landsat images were analyzed for lineaments, circular and arcuate features, and for possible extensions of, modifications to, or verification of known faults (Brosgé and others, 1978) to aid in the mineral resource assessment of the Philip Smith Mountains quadrangle, Alaska. Most analyses were made on (1) a black-and-white mosaic of Alaska, constructed by the Department of Agriculture, Soil Conservation Service, and (2) computer-enhanced black-and-white and color Landsat imagery derived from computer compatible tapes (CCT's) processed by the U.S. Geological Survey in Flagstaff, Ariz. Additional analysis was made on a 1:1,000,000-scale, black-and-white, band 7, low sun angle, Landsat mosaic of most of mainland Alaska constructed by R. G. H. Raynolds (unpub. data, 1975). General descriptions of the computer enhancement and interpretative techniques used can be found in Albert and Steele (1976a, b).

The term "broad, diffuse lineament" used herein refers to an east-trending zone approximately 700 km long located in the northern Brooks Range. In the western part of the range, the zone coincides with the north-facing range front, approximating the location of major thrusts in the area (King, 1969; Beikman and Lathram, 1976). In the north-central part of the range, which includes the Philip Smith Mountains quadrangle, the zone bifurcates to form northern and southern segments, coinciding with the approximate location of several major thrusts (King, 1969; Beikman and Lathram, 1976; Brosgé and others, 1978). In the eastern part of the northern Brooks Range, these two segments rejoin to form a single zone that may coincide with the northermmost limit of major thrusting in that region (Beikman and Lathram, 1976; Lathram, E. H., oral commun., 1978).

The significance of figures 1, 2, 3, 6, and 7 is apparent in their brief summary captions. The reader is referred to Albert and Steele (1976a, b) for a more detailed discussion of the derivation of the illustrations shown in figures 4 and 5.

REFERENCES CITED

Albert, N. R. D., Le Compte, J. R., and Steele, W. C., 1978, Map showing interpretation of Landsat imagery of the Chandalar quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-878J, 2 sheets, scale 1:250,000.

Albert, N. R. D., and Steele, W. C., 1976a, Interpretation of Landsat imagery of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-773M, 3 sheets, scale 1:250,000.

Albert, N. R. D., and Steele, W. C., 1976b, Interpretation of Landsat imagery of the Tanacross quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-767C, 3 sheets, scale 1:250,000.

Beikman, H. M., and Lathram, E. H., 1976, Preliminary geologic map of northern Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-789, 2 sheets, scale 1:1,000,000.

Brosgé, W. P., Reiser, H. N., Dutro, J. T., Jr., and Detterman, R. L., 1978, Bedrock geologic map of the Philip Smith Mountains quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-879B, 2 sheets, scale 1:250,000.

King, P. B., 1969, Tectonic map of North America: U.S. Geological Survey, 2 sheets, scale 1:5,000,000.

Lathram, E.H., and Raynolds, R.G.H., 1977, Tectonic deductions from Alaskan space imagery, in Woll, P.W., and Fischer, W.A., eds., Proceedings of the first annual William T. Pecora Memorial Symposium, October 1975, Sioux Falls, South Dakota: U.S. Geological Survey Professional Paper 1015, p. 179-191.

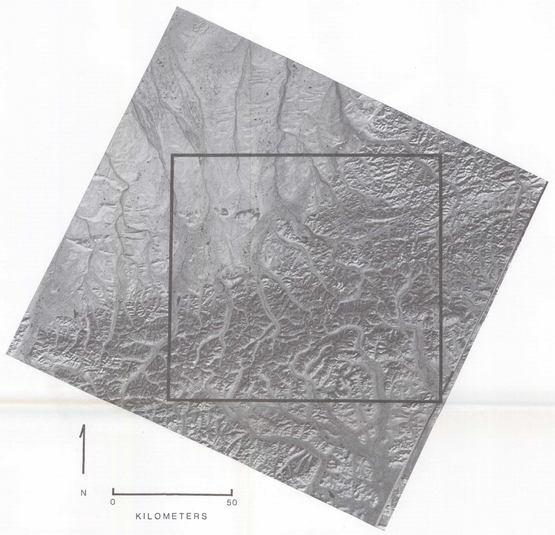


Figure 2. Example of imagery used in analyses of Philip Smith Mountains quadrangle. Image is composed of 2 computer-enhanced, black and white, band 7, Landsat scenes --- 1773-21014 and 1773-21020 (see fig. 1). Black outline shows approximate quadrangle boundaries.

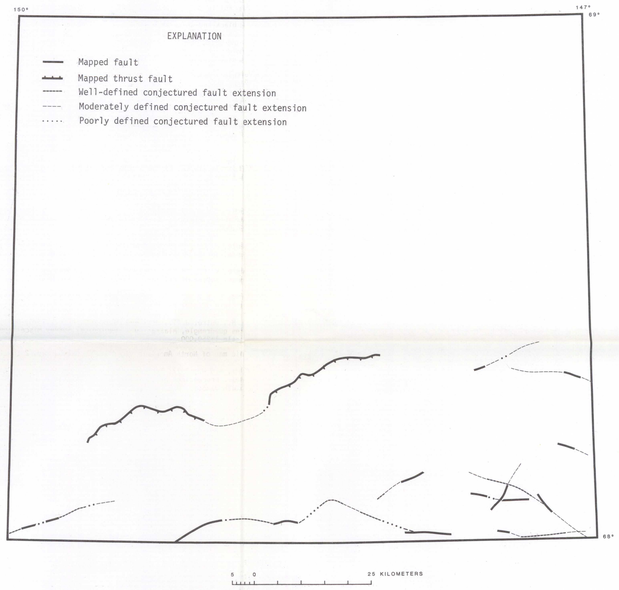


Figure 6. Map of conjectured fault extensions observed on Landsat imagery (see table of imagery used in analyses (sheet 1): false-color with linear stretch) of Philip Smith Mountains quadrangle with mapped faults (Brosgé and others, 1978).

MAP SHOWING INTERPRETATION OF LANDSAT IMAGERY OF THE PHILIP SMITH MOUNTAINS QUADRANGLE, ALASKA

BY

JAMES R. LE COMPTE

1979

Interior--Geological Survey, Reston, Va.--1979
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