DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

FOLIO OF THE CHIGNIK AND SUTWIK ISLAND QUADRANGLES, ALASKA

MISCELLANEOUS FIELD STUDIES
MAP MF – 1053 – O
SHEET 1 OF 2

LE COMPTE AND STEELE – INTERPRETATION OF LANDSAT IMAGERY

IMAGERY EITHER NOT ACQUIRED OR OF POOR QUALITY FOR THIS REGION

Base from U. S. Geological Survey, 1963

Geology from Detterman and others (1979)

EXPLANATION OF IMAGERY INTERPRETATION

Lineament

Boundary of study area for this report

TABLE OF IMAGERY USED IN ANALYSES

Photo-optically enhanced scenes used are 2534-20511 and 2534-20513, taken July 9, 1976. Imagery is available from EROS Data Center, Sioux Falls, SD 57198 (specify PAD number when ordering). Example of imagery is shown in Figure 2.

IMAGE TYPE	COMPUTER-ENHANCED	BANDS AND COLORS USED	PROJECTION	PAD NUMBER	SCENE ID NUMBER	SCALE	TRANSPARENCY SCALE	PRINT SCALE
False-color (POE) -- south	No	4 Blue 5 Green 7 Red	Space Cylindrical	E-1198-99CT	2534-20511	1:1,006,500	1:250,000	
False-color (POE) -- north	No	4 Blue 5 Green 7 Red	Space Cylindrical	E-1199-99CT	2534-20513	1:1,000,000	1:250,000	

POE = photo-optically enhanced

THIS MAP IS ONE OF A SERIES ALL BEARING THE NUMBER MF – 1053.
BACKGROUND INFORMATION RELATING TO THIS MAP IS PUBLISHED AS U. S. GEOLOGICAL SURVEY CIRCULAR 802 AVAILABLE FREE FROM BRANCH OF DISTRIBUTION, U. S. GEOLOGICAL SURVEY, 1300 SOUTH EADS STREET, ARLINGTON, VA. 22202

SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETERS

CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL

APPROXIMATE MEAN DECLINATION AT CENTER OF MAP, 1980

TRUE NORTH
MAGNETIC NORTH

LINEAMENT MAP

MAPS SHOWING INTERPRETATION OF LANDSAT IMAGERY OF THE CHIGNIK AND SUTWIK ISLAND QUADRANGLES, ALASKA

BY

JAMES R. LE COMPTE AND W. CLINTON STEELE

1981

CORRELATION OF MAP UNITS

SURFICIAL DEPOSITS AND SEDIMENTARY ROCKS	VOLCANIC ROCKS	INTRUSIVE ROCKS		
Qs	Qed Qcs Qv		Holocene and Pleistocene	QUATERNARY
Tmb Unconformity	Tv	Tt	Pliocene and Miocene	TERTIARY
	Tm		Miocene or * Oligocene	
Tt Unconformity			Eocene and Paleocene	
		Tgd	Paleocene	
Khc Unconformity			Upper Cretaceous	CRETACEOUS
KJhs			Lower Cretaceous to Middle Jurassic	CRETACEOUS AND JURASSIC

DESCRIPTION OF MAP UNITS

SURFICIAL DEPOSITS AND SEDIMENTARY ROCKS

Qs SURFICIAL DEPOSITS--Unconsolidated alluvium, colluvium, glacial, marine, swamp and eolian deposits; mainly sand, silt, gravel and pumice

Tmb MILKY RIVER FORMATION OF GALLOWAY (1974) AND BEAR LAKE FORMATION--Milky River Formation (Pliocene); mainly volcanogenic sandstone and conglomerate, non-marine. Bear Lake Formation (Miocene); sandstone, conglomerate, siltstone, shale, and coal; shallow marine to non-marine

Tt TOLSTOI FORMATION OF BURK (1965) (Paleocene and Eocene)--Sandstone, conglomerate, siltstone, dark shale, coal; high percent volcanic debris; mainly non-marine

Khc HOODOO AND CHIGNIK FORMATIONS--Hoodoo Formation (Upper Cretaceous); dark shale and siltstone; deep water deposit. Chignik Formation (Upper Cretaceous); sandstone, shale, conglomerate, siltstone, and coal; shallow water to non-marine

KJhs HERENDEEN LIMESTONE AND STANIUKOVICH, KNIKER, AND SHELIKOF FORMATIONS--Herendeen Limestone (Lower Cretaceous); thin-bedded calcarenite composed of foraminifera, echinoid and shell debris; calcareous sandstone. Staniukovich Formation (Upper Jurassic and Lower Cretaceous); thin-bedded feldspathic and laumontitic sandstone. Naknek Formation (Upper Jurassic); dark siltstone and shale in upper part, light arkosic sandstone and conglomerate in lower part. Shelikof Formation (Middle Jurassic); dark siltstone and shale

VOLCANIC ROCKS

Qed ASH AND DEBRIS FLOW DEPOSITS--Volcanic ash, pumice, tuff, and breccia; includes air-fall, ash flow, and avalanche deposits; unsorted to well-sorted; poorly- to well-stratified; includes some lava flows

Qcs CINDER AND SPATTER CONES, AND DOMES--Cinders, scoria, and associated pyroclastic rock

Qv VOLCANIC ROCKS--Andesite and dacite flows, tuff, volcanic breccia, and lahars

Tv VOLCANIC ROCKS--Rhyolite, andesite, dacite, and basalt flows; tuff, volcanic rubble flows, and lahars; includes hypabyssal plugs and domes

Tm MESHIK FORMATION (Miocene or Oligocene?)--Basalt flows, volcanic rubble flows, and lahars; minor volcanogenic sedimentary rock

INTRUSIVE ROCKS

Tt INTRUSIVE ROCKS--Quartz diorite, diorite, and gabbro; medium- to coarse-grained; mainly small plutons

Tgd GRANODIORITE--Samdel Islands pluton; medium- to coarse-grained; hornblende- and biotite-bearing

* Potassium-argon and fossil data gathered after the publication of the geologic map (Detterman, Miller, Yount, and Wilson, 1979) used as the base for this map indicate that the age of the Meshik Formation is Miocene and Oligocene (Detterman and others, 1981).

GEOLOGIC MAP SYMBOLS

- Contact--Dotted where concealed
- Fault--Dashed where approximately located, dotted where concealed; queried where probable. U, upthrown side; D, downthrown side. Arrows indicate relative lateral movement
- Thrust or high-angle reverse fault--Dotted where concealed; sawteeth on upper plate
- Folds--Showing trace of axial plane; dashed where approximately located; dotted where concealed. Arrow indicates direction of plunge
- Anticline
- Syncline
- Volcanic crater
- Volcanic vent or cinder cone
- Hornfels
- Alteration
- Dikes and sills
- Exploratory drill hole
- Hot spring
- Native Corporation boundary

DISCUSSION

These maps are part of a folio of maps on the Chignik and Sutwik Island quadrangles. Landsat images of the quadrangles were analyzed for lineaments and circular and arcuate features as a possible aid in the mineral resource assessment of the area.

This study is a modified version of the Landsat lineament investigations conducted in other areas in Alaska (Albert, 1975; Albert and Steele, 1976a, b; Albert and others, 1978; Steele and Albert, 1978): the report is abridged and the methodology involved is similar to that used by Raines (1978). Details concerning the types of imagery used are given in "Table of Imagery Used in Analyses".

Although many lineaments are observed on the Landsat imagery of the quadrangles, no marked spatial relation between these features and mineralized localities or known areas with significant mineral potential (Cox and others, 1983) is apparent. However, well-defined lineaments can be spatially correlated, at least in part, with some locally prominent structural features (lineament map, sheet 1): a well-defined lineament (TF) coincides with a segment of an unnamed thrust fault located east of Pinnacle Mountain in the northeast part of the Port Heiden/Sutwik Island quadrangle, and several lineaments (features CA) mark the central region of the "Chignik anticline" (Detterman and others, 1980) located west of Kaljulik and Chignik Bays in the northeast part of the Chignik and in the northwest part of the Sutwik Island quadrangles.

The spatial relation between certain characteristically defined circular features and numerous areas marked by "zoned clusters" of geochemically-anomalous drainage basins (Cox and others, 1983) may be significant, however, with respect to the mineral resource potential of the quadrangles. Cox and others (1983) have reported 16 areas (herein termed, "anomaly-areas") marked by these zoned clusters from the quadrangles. Each anomaly-area is genetically associated primarily with Tertiary intrusive rocks (Detterman and others, 1979; Cox and others, 1983), and each has significantly anomalous values of arsenic, bismuth, copper, gold, lead, molybdenum, silver, tin, tungsten, and zinc. Cox and others (1983) have interpreted these anomaly-areas as representing the temperature-controlled deposition of ore minerals from outward-diffusing elements (in hydrothermal solution) emanating from volatile-rich plutons.

Generally well-defined, characteristic-appearing circular features (circular and arcuate features map, sheet 2, features 1-5) spatially coincide with the "centers of mineralization" (drainage basins with anomalous Cu-Mo values) of five of the anomaly-areas (Cox and others, 1983). These circular features are characterized by topographic depressions either bounded by arcuate, scarplike features or surrounded by less steep, snow-and-ice covered, arcuate positive areas; the circular features range from approximately 2 to 6 km in diameter.

Four other circular features, similar to the five described above, are observed from the imagery (circular and arcuate features map, sheet 2, features 6-9). Features 6, 7, and 8 coincide with parts of separate anomaly-areas, but do not overlie their respective central zones (Cox and others, 1983); circular feature 9 is not coincident with an anomaly-area, but is adjacent to two relatively small drainage basins anomalous in arsenic, gold, lead, and silver (Cox and others, 1983).

The areas underlying circular features 6, 7, 8, and 9 may be worthy of further geologic and geochemical investigations. Circular features 6, 7, and 8 may mark potential sites for additional or extended central zones within anomaly-areas with which they coincide. Feature 9, which is associated with Tertiary intrusive rocks (Detterman and others, 1979), may be a potential site for an as yet unrecognized central zone within an unrecognized anomaly-area.

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