

**KUSKOKWIM AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY, SISCHU
MOUNTAINS, ALASKA**

Emond, A.M., Fusso, L.A., and Geotech Ltd.

Geophysical Report 2024-1

2024
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS



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KUSKOKWIM AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY, SISCHU MOUNTAINS, ALASKA

Emond, A.M.¹, Fusso, L.A., and Geotech Ltd.

ABSTRACT

The Kuskokwim airborne magnetic and radiometric survey, Sischu Mountains block, geophysical survey covers parts of the Ruby, Kantishna River, Mt. McKinley, Medfra, and Ophir quadrangles north of McGrath, Alaska (fig. 1). Magnetic and radiometric data were collected with a helicopter between July 14, 2023, and October 15, 2023, by Geotech Ltd. The survey contains a single block covering 8,008 km². A total of 25,878 line-kilometers were collected. The magnetometer was installed inside the stinger attached to the helicopter nose. The airborne gamma ray spectrometer was mounted on the interior floor of the helicopter cabin. The block was flown with a line spacing of 400 m. The mean ground clearance is 192 m with a nominal survey speed of 142 km/hour.

PURPOSE

The data from the Sischu Mountains block of the Kuskokwim airborne magnetic and radiometric survey will be used to improve the understanding of the area's geology and mineral potential and promote resource exploration. This survey is part of planned continuous regional geophysical data coverage of the greater Kuskokwim Mountains region.

SURVEY OVERVIEW DESCRIPTION

This document provides an overview of the survey and includes text and figures of select primary and derivative products of this survey. A table of digital data packages available for download is provided to assist users in data selection. For reference, a catalog of the available maps is presented in reduced resolution. Please consult the metadata, project report, and digital data packages for more information and data at doi.org/10.14509/31094.

ACKNOWLEDGMENTS

This work was supported by the U.S. Geological Survey's Earth MRI program grants G22AC00475 and additional support was provided by State of Alaska Capital Improvement Project Funds. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

¹ Alaska Division of Geological & Geophysical Surveys, 3354 College Road, Fairbanks, Alaska 99709-3707

AVAILABLE DATA

Data Type	Provider	Description
ascii_data	contractor	ASCII format line data, other ASCII data.
databases_geosoft	contractor	Geosoft format database of final line data, other Geosoft format databases.
documents	contractor	Project report.
grids_geosoft	contractor	Oasis montaj Geosoft GRD format gridded data.
grids_tif	DGGS	Geographically registered data value rasters of gridded data, GeoTiff format.
kmz	contractor	Keyhole markup language (kml) kmz archive files of project data. Viewable in Google Earth and other compatible programs.
maps_pdf_format	contractor	Printable and geographically registered maps in pdf format. Compatible with mobile device navigation and desktop mapping applications.
maps_geosoft_format	contractor	Maps as Geosoft packed map files.
video_flightpath	contractor	Survey flight path downward facing video.
vector_data	contractor	Line path and survey boundary in Esri shapefile (SHP) format.

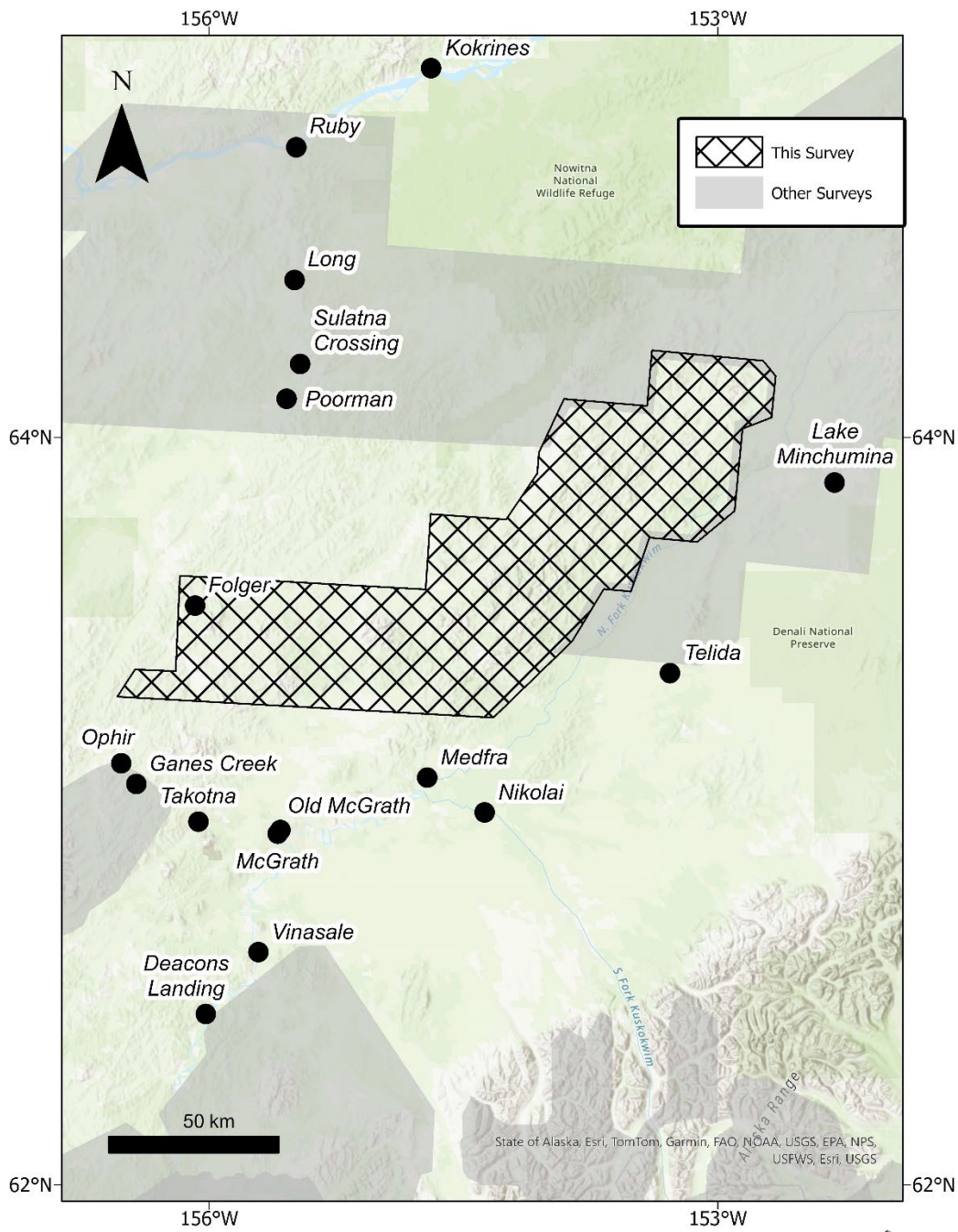


Figure 1. Top. The Kuskokwim airborne magnetic and radiometric survey, Sischu Mountains geophysical survey location map with towns. Other existing, in-progress, and planned DGGs surveys shown in gray. **Right.** Survey location shown in Interior Alaska with relevant 1:250,000-scale quadrangles.

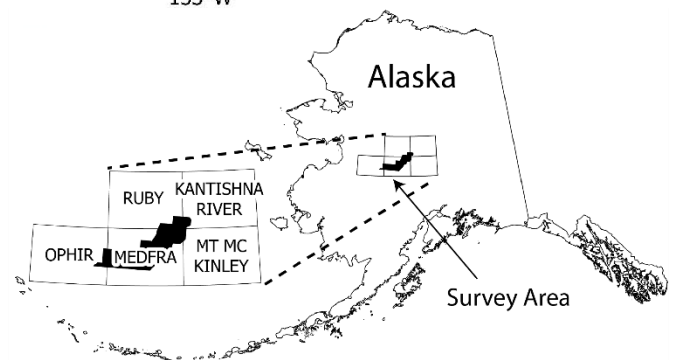


Table 1. The contractor-provided maps are made available as Geosoft Packed Map (*.map) and Portable Document Format (*.pdf) formats at a resolution of 400 dpi. All use WGS84 datum and UTM zone 4N projection. Copies of the following maps are included at the end of this booklet. The low-resolution, page-size maps included in this booklet are intended to be used as a search tool and are not the final product. Large-scale, full-resolution versions of each map are available to download on this publication's citation page: doi.org/10.14509/31094. All maps have a U.S. Geological Survey topographic basemap.

Flown flight path map

Magnetics

Total field magnetic data (_magtf) - nT

Magnetic data, residual magnetic intensity, international geomagnetic reference field (IGRF) removed, leveled, lagged, diurnally corrected and despiked (_mag_residual) - nT

Magnetic data, analytic signal of residual magnetic intensity data, all gradients Calculated (_mag_analytic) - nT/m

Magnetic data, calculated first vertical derivative (_cv1vdmag) - nT/m

Magnetic tilt-angle derivative (_mag_tilt) - radians

Calculated 2nd vertical gradient

Radiometrics

Radiometric data, equivalent concentration of Potassium (_rad_pct_k) - %K

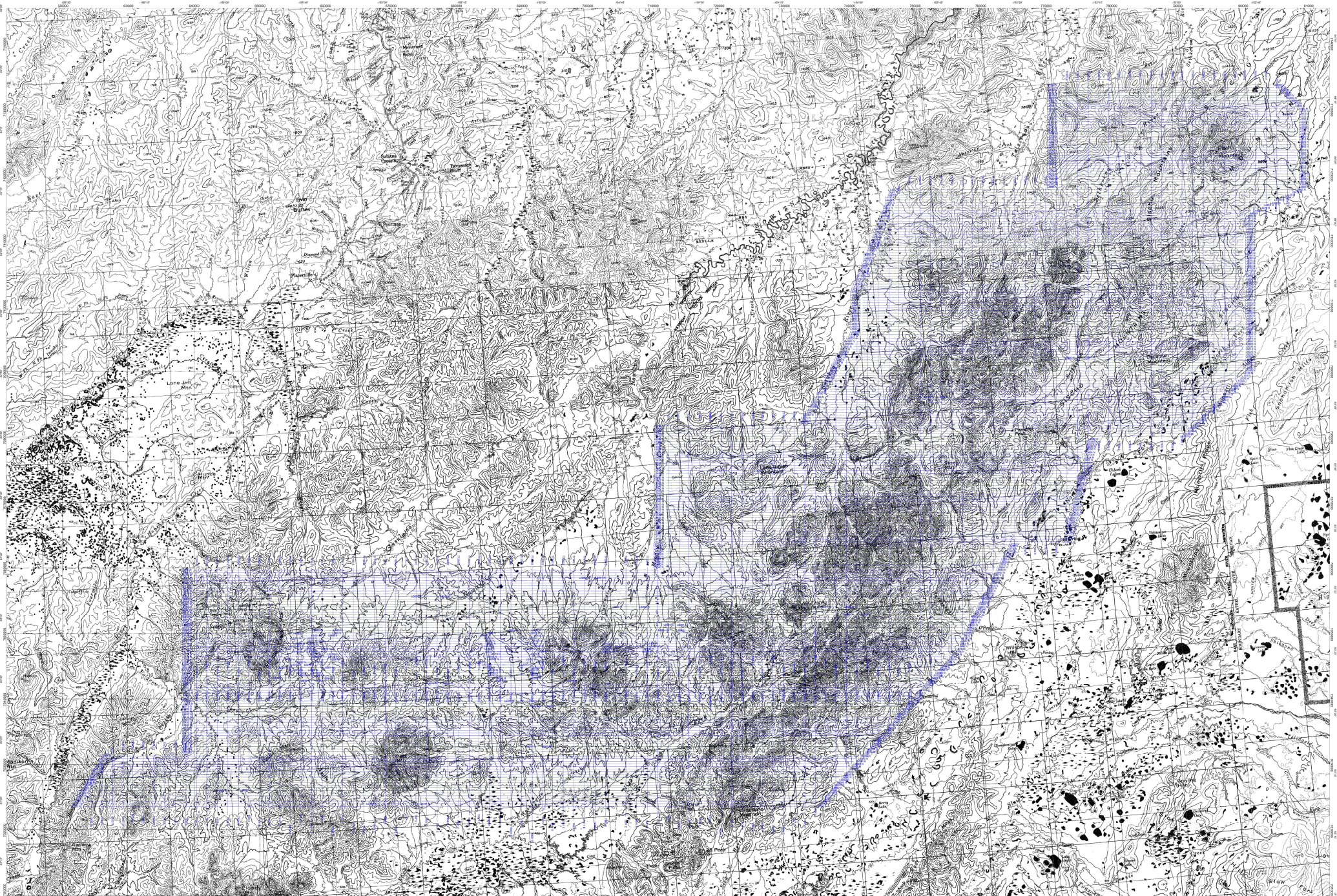
Radiometric data, equivalent concentration of Thorium (_rad_equiv_th) - eqTh ppm

Radiometric data, equivalent concentration of Uranium (_rad_equiv_u) - eqU ppm

Radiometric data, ratio of Thorium and Potassium (_rad_ratio_th_k) - eqTh ppm/%K

Radiometric data, total air absorbed dose rate or natural air absorbed dose rate (_rad_tadr) - nGy/h,

Radiometric data, ternary grid (_rad_ternary) - RGB



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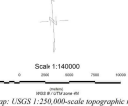


This work was supported by the U.S. Geological Survey's Earth MRI program
 Emerald, J.M., Fenton, J.L., and Greenoff, Ltd., 2024, Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains, Alaska Division of Geological & Geophysical Surveys Geophysical Report 2024-1, <https://doi.org/10.14309/31094>

SURVEY SPECIFICATIONS:
 Survey Date: June 19th to October 16th, 2023
 Survey Base: McGrath, Alaska
 Aircraft: Aeromaster A-ster 300 BS (C-GEOS) & (C-182N)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

Airborne Systems:

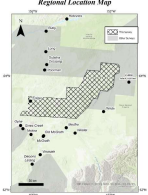
INSTRUMENTS:
 023 HSS-5 Gamma-Ray Spectrometer (Hz)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High Sensitivity Constant Measurement
 Magnetometer Resolution: 0.02 nT at 40Hz



MAP PROJECTION:
 Datum: NAD83
 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Axis: 6378137.000
 Inverse Flattening: 298.25722

Flown Flight Path
 <L:0000,0:00
 Flown Direction (°>): Line Type (L/T); Line Number , Version , Flight Number

Location of the Sitska Mountains survey area in Alaska and its relation to the USGS 1:250,000-scale quadrangles

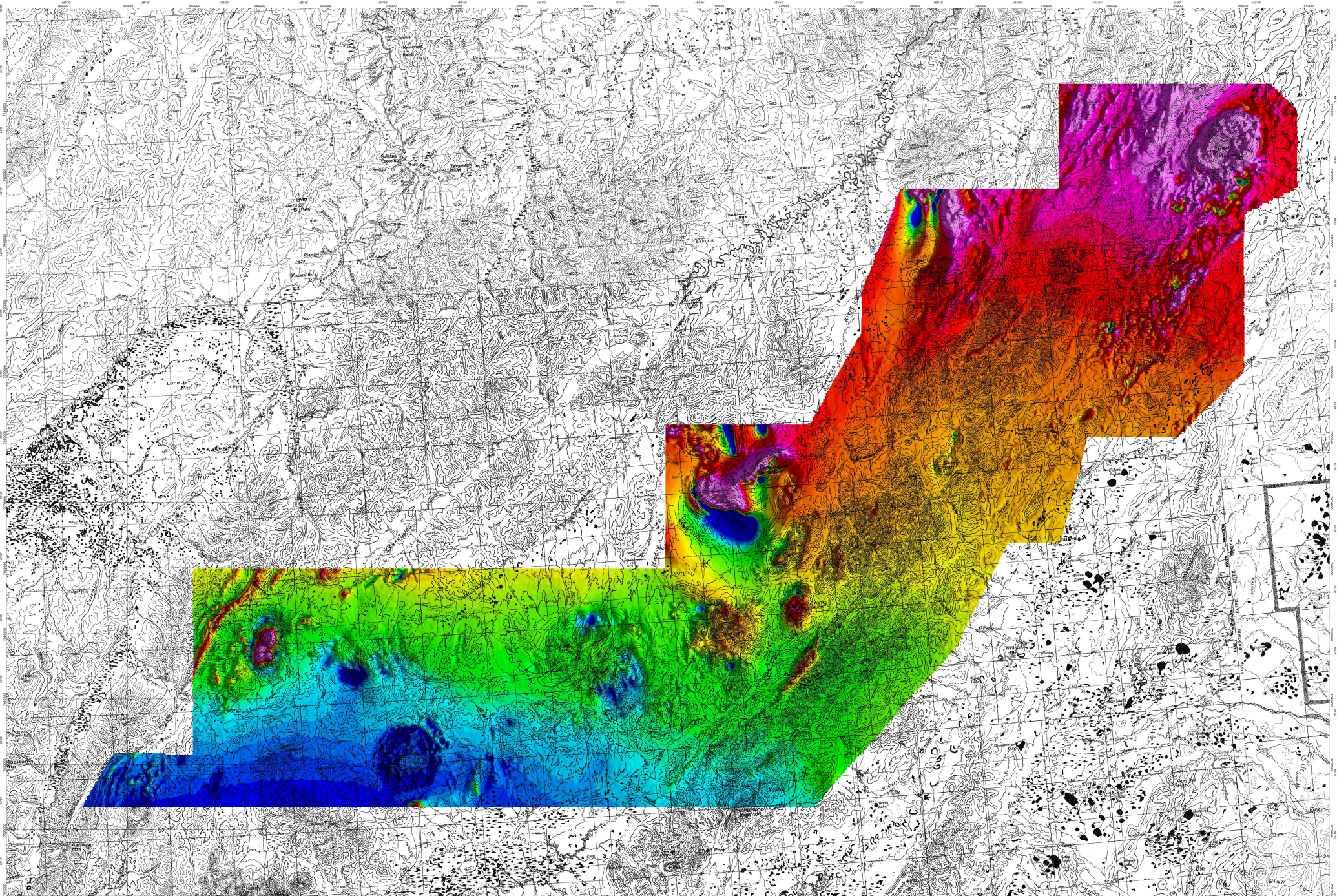


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Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains

Flown Flight Path Map

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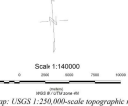


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Ernst, J.M., Faxon, J.L., and Grunth, J.D., 2024, Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains, Alaska Division of Geological & Geophysical Surveys Geophysical Report 2024-1, <https://doi.org/10.14309/31094>

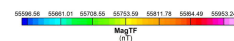
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 Survey Date: June 19th to October 16th, 2023
 Survey Base: McGrath, Alaska
 Aircraft: Aeromagnetic A-Star 350 BS (C-GE0Q) & (C-4R2N)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

Airborne Systems:

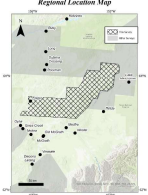
INSTRUMENTS:
 023 RSN-5 narrow-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High-Sensitivity Custom Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz



MAP PROJECTION:
 Datum: NAD83
 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Scale: 6178.17 m
 Inverse Flattening: 298.25722



Location of the Sitska Mountains survey area in Alaska and in relation to the USGS 1:250,000-scale quadrangles

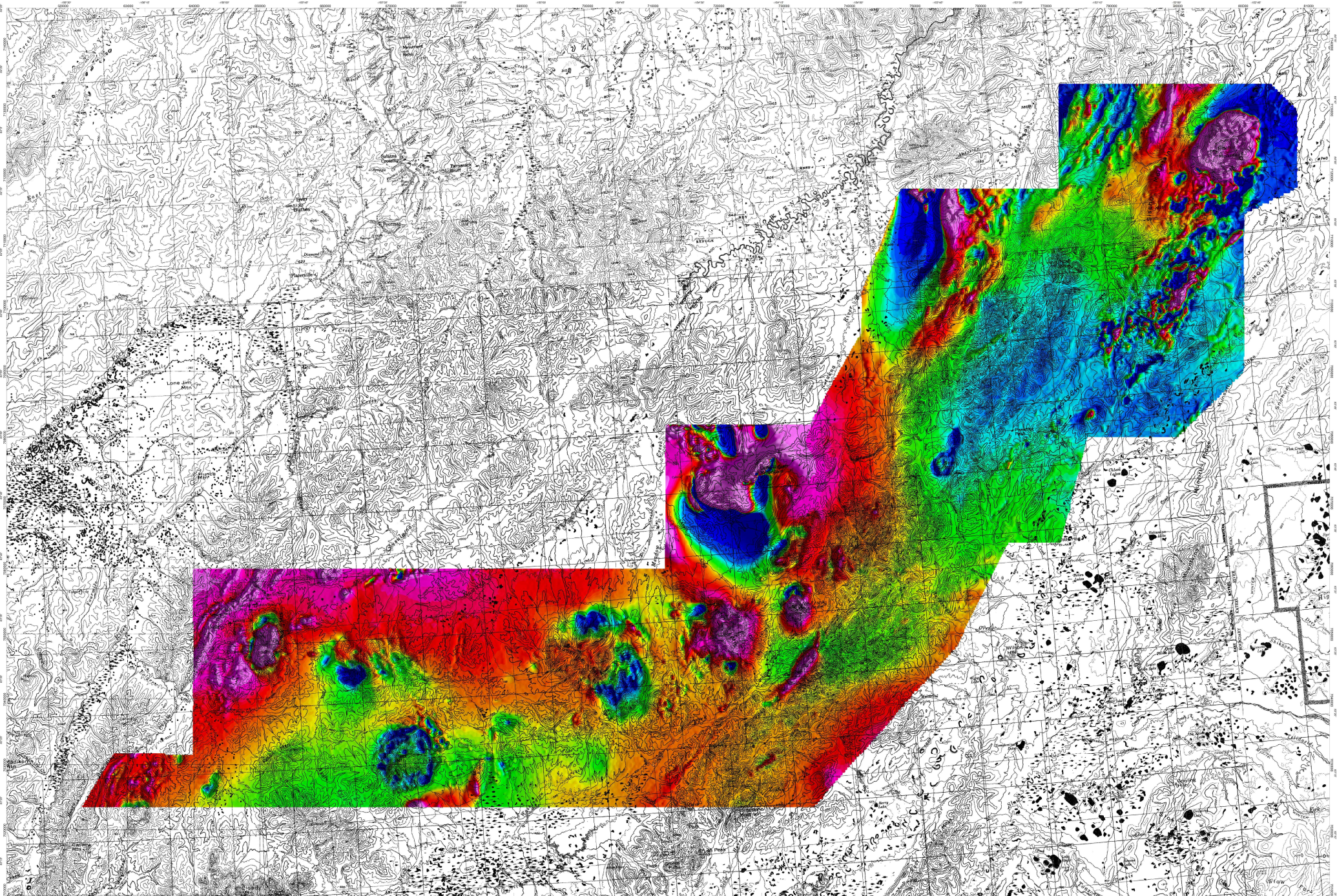


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Total Field Magnetic Data

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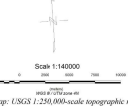


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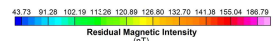
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 Survey Dates: June 19th to October 16th, 2023
 Survey Base: McGrath, Alaska
 Aircraft: Aeromagnetic A-ster 350 BS (C-GEOS) & (C-172NS)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

Airborne Systems:

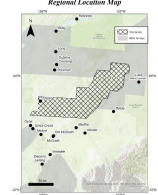
INSTRUMENTS:
 1x23 RSN-5 narrow-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High-Sensitivity Custom Management
 Magnetometer Resolution: 0.02 nT at 40Hz



MAP PROJECTION:
 Datum: WGS84
 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Scale: 673817.00
 Inverse Flattening: 298.25722



Location of the Sitska Mountains survey area in Alaska and its relation to the USGS 1:250,000-scale quadrangle

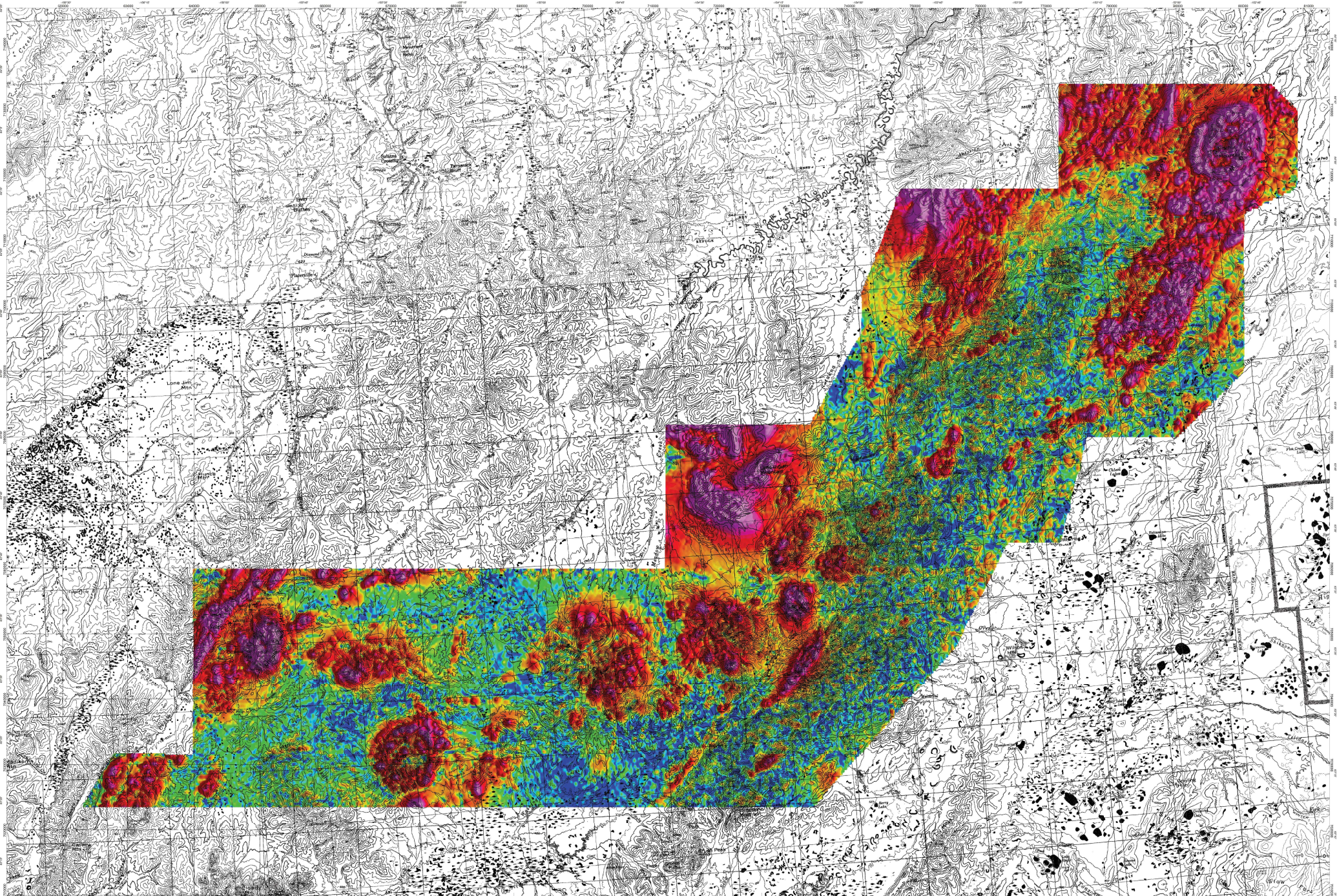


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Residual Magnetic Intensity Map

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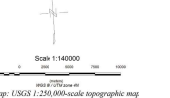
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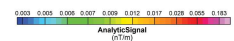
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SURVEY SPECIFICATIONS:
 Survey Date: June 19th to October 16th, 2023
 Survey Base: McGrath, Alaska
 Aircraft: Aeroportals A-ster 350 BS (C-GE00) & (C-4R2N)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
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 Tie Line Direction: N 0° E / N 180° E

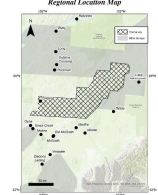
Airborne Systems:
INSTRUMENTS:
 023 RRS-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High Sensitivity Custom Management
 Magnetometer Resolution: 0.02 nT at 40Hz



MAP PROJECTION:
 Datum: NAD83
 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Scale: 617817.000
 Inverse Flattening: 298.15722



Location of the Sitska Mountains survey area in Alaska and in relation to the USGS 1:250,000-scale quadrangles

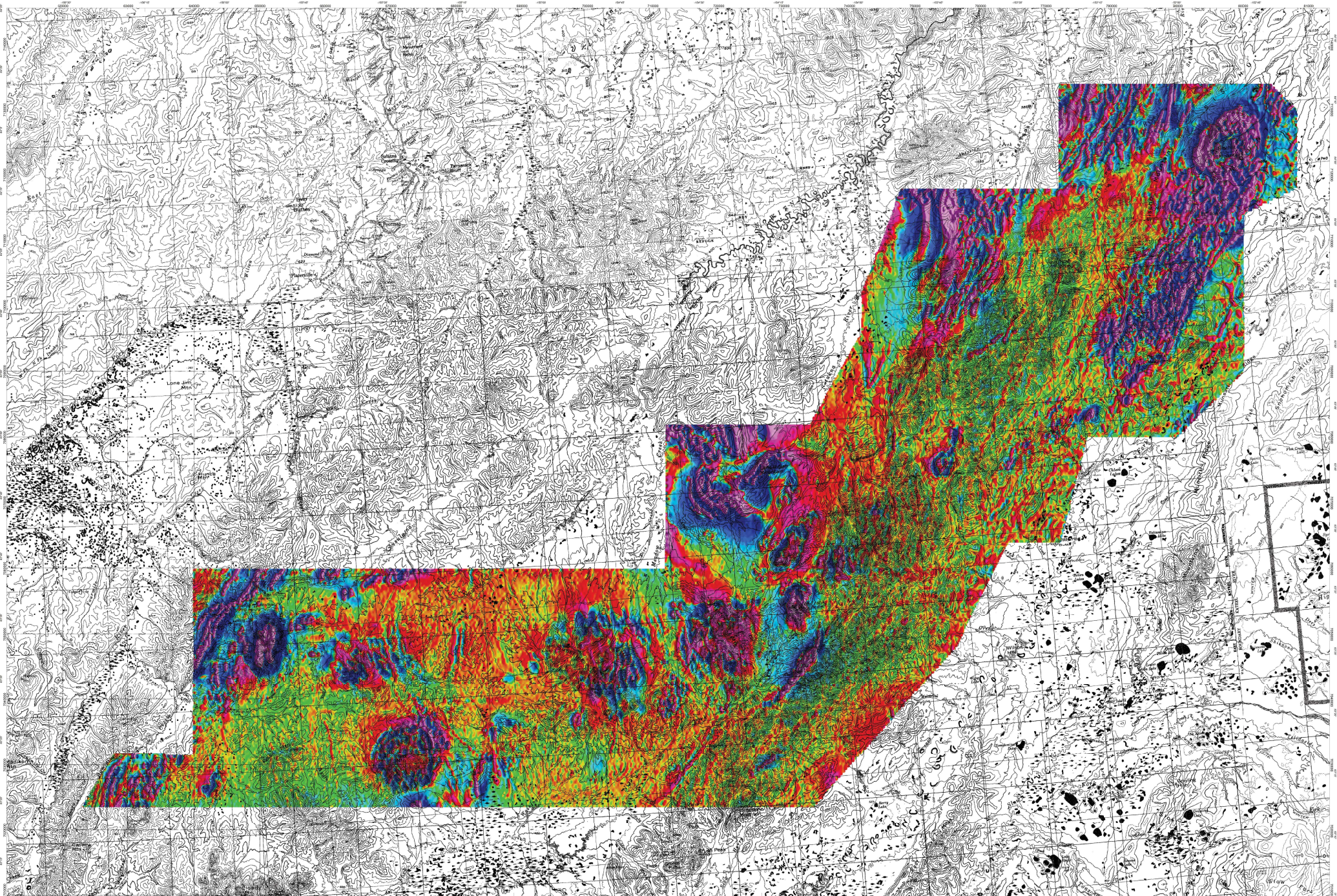


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Analytic Signal Map

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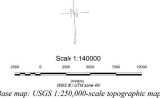
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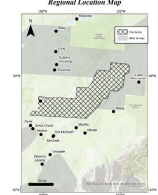
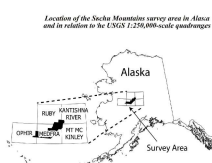
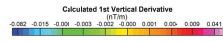
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SURVEY SPECIFICATIONS:
 Survey Date: June 1988 to October 1988, 2023
 Survey Base: McGrath, Alaska
 Aircraft: Aeromagnetic A-100 BS (C-GE00) & (C-1R20)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

Airborne Systems:
INSTRUMENTS:
 023 RSN-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High Sensitivity Constant Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz



MAP PROJECTION:
 Datum: NAD83
 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Scale: 678,117.400
 Inverse Flattening: 298.25722

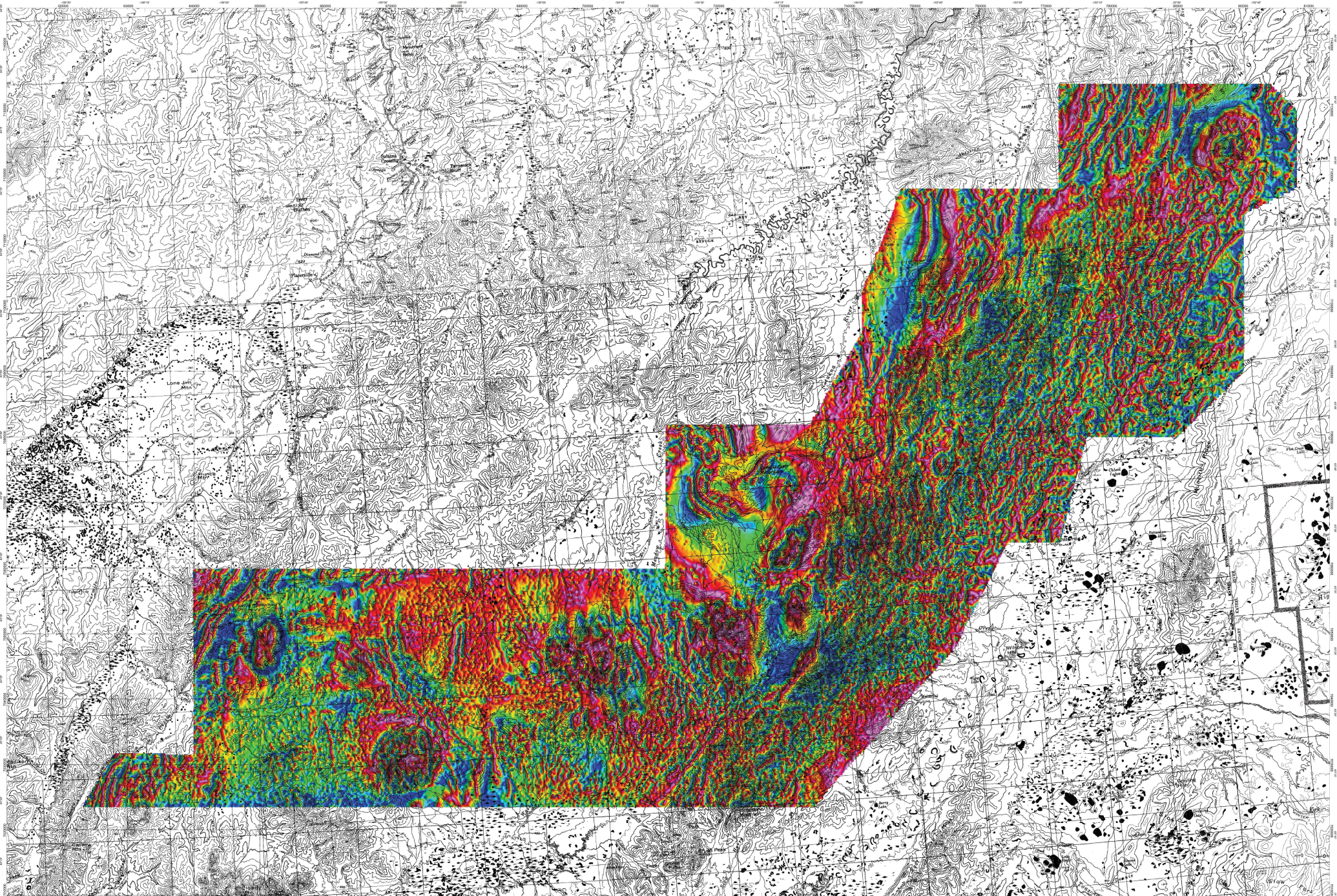


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Calculated 1st Vertical Derivative Map

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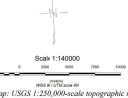


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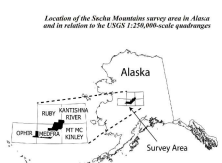
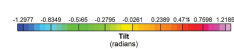
SURVEY SPECIFICATIONS:
 Survey Date: June 19th to October 16th, 2023
 Survey Base: McGrath, Alaska
 Aircraft: Aeromaster A-ster 350 BS (C-GE00) & (C-TR20)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

Airborne Systems:

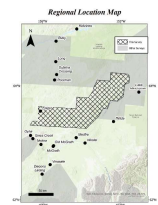
INSTRUMENTS:
 Oxi 855-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High-Sensitivity Custom Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz



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 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Scale: 678,117.00
 Inverse Flattening: 298.25722



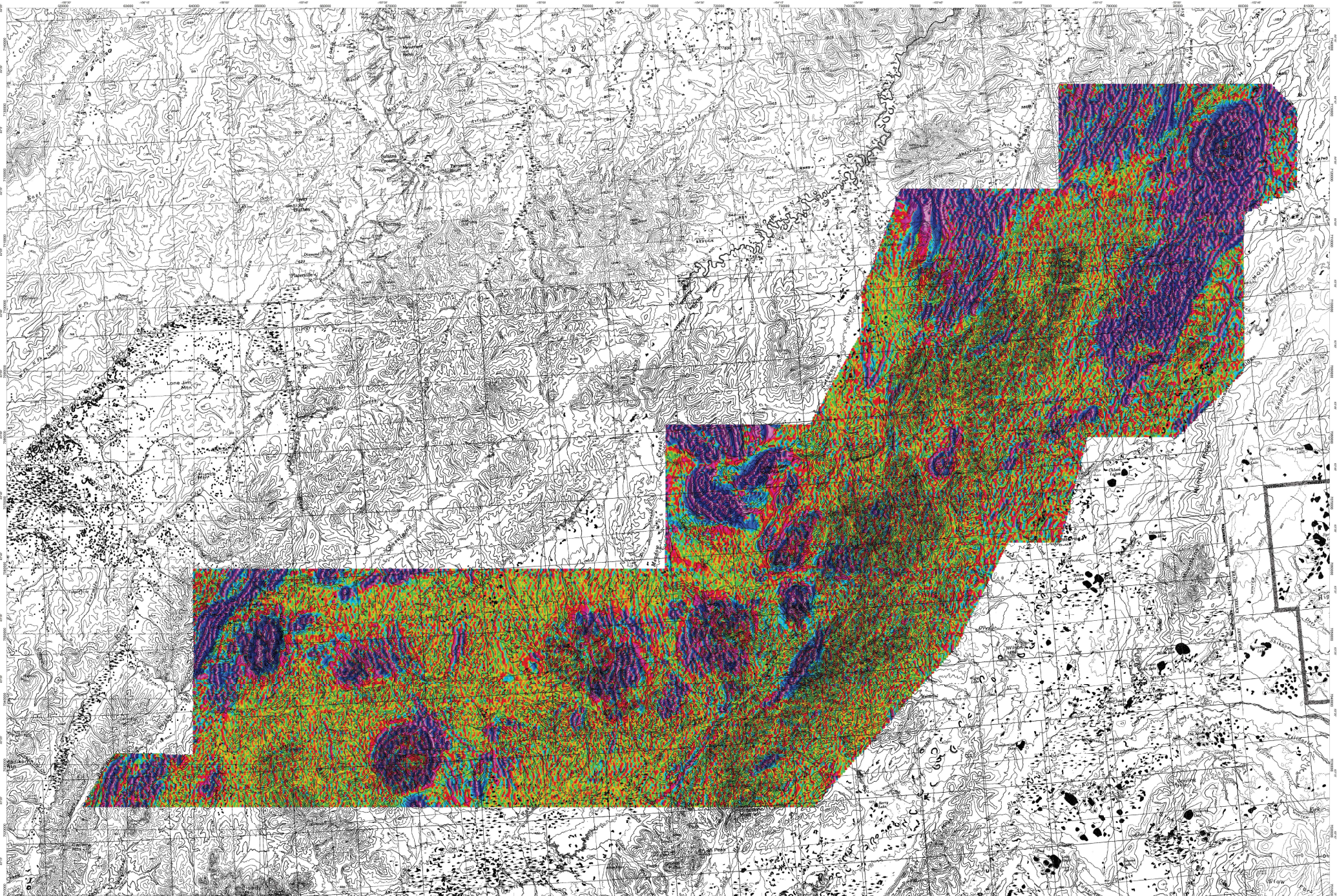
Location of the Sitska Mountains survey area in Alaska and its relation to the USGS 1:250,000-scale quadrangles



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Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains

Magnetic Tilt-Angle Derivative



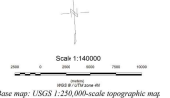
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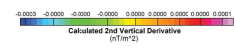
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 Survey Base: McGrath, Alaska
 Aircraft: Aeromagnetic A-ster 350 BS (C-GE00) & (C-472N)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

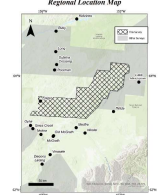
Airborne Systems:
INSTRUMENTS:
 (A2) RSN-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High-Sensitivity Constant Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz



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 Major Scale: 6378137.000
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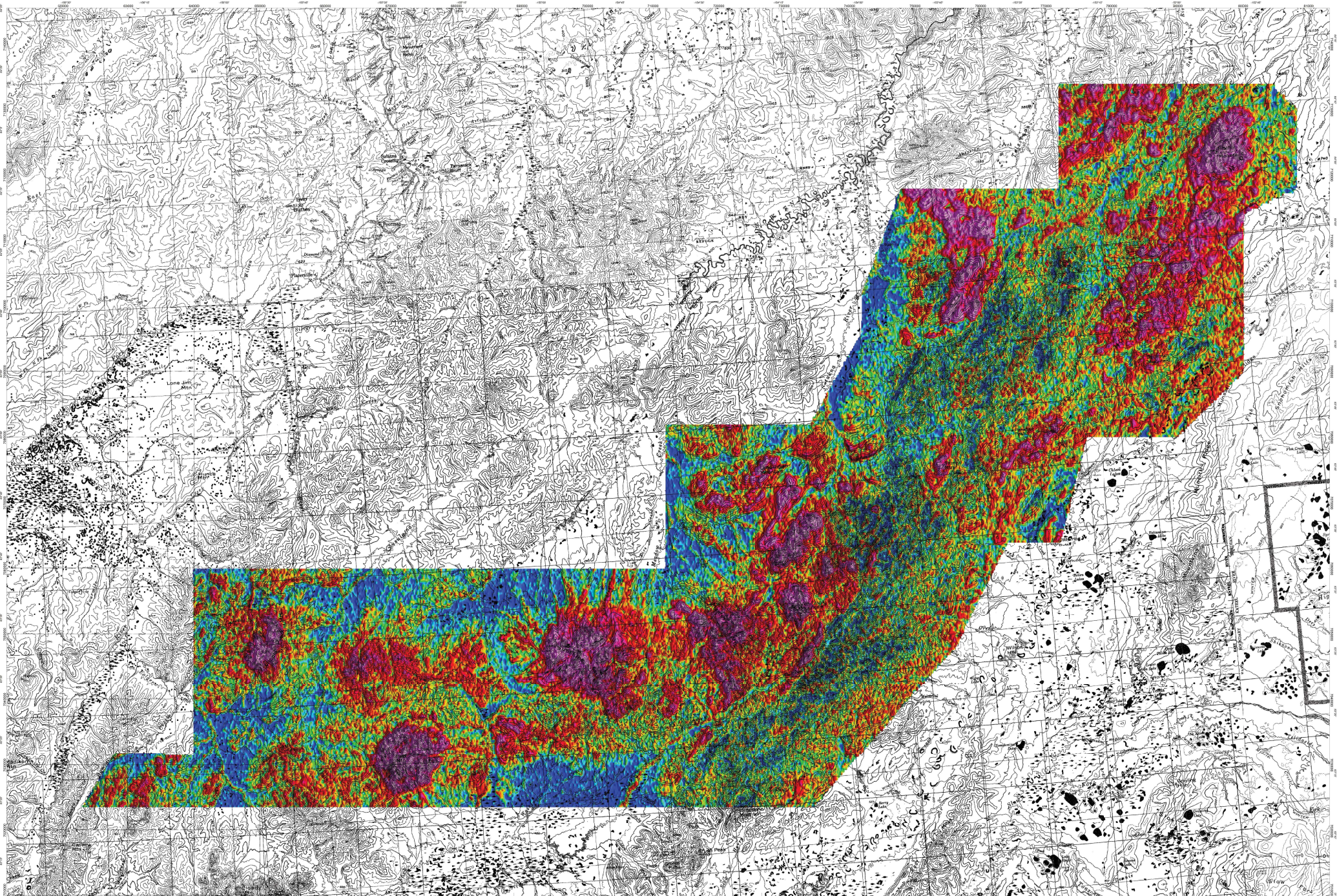
Location of the Sitsku Mountains survey area in Alaska and in relation to the USGS 1:250,000-scale quadrangles



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Kuskokwim airborne magnetic and radiometric survey, Sitsku Mountains

Calculated 2nd Vertical Gradient



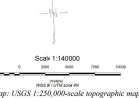
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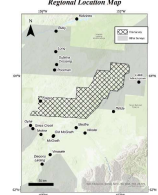
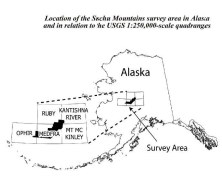
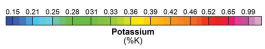
This work was supported by the U.S. Geological Survey's Earth MRI program
 Oswald, J.M., Faxon, J.A., and Greenish Ltd., 2024, Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains, Alaska Division of Geological & Geophysical Surveys Geophysical Report 2024-1, <https://doi.org/10.14309/31894>

SURVEY SPECIFICATIONS:
 Survey Date: June 198 to October 16th, 2023
 Survey Base: McGrath, Alaska
 Aircraft: Aeroqueste A-ster 350 BS (C-GE00) & (C-1R2N)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

Airborne Systems:
INSTRUMENTS:
 (A2) RSS-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High Sensitivity Custom Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz



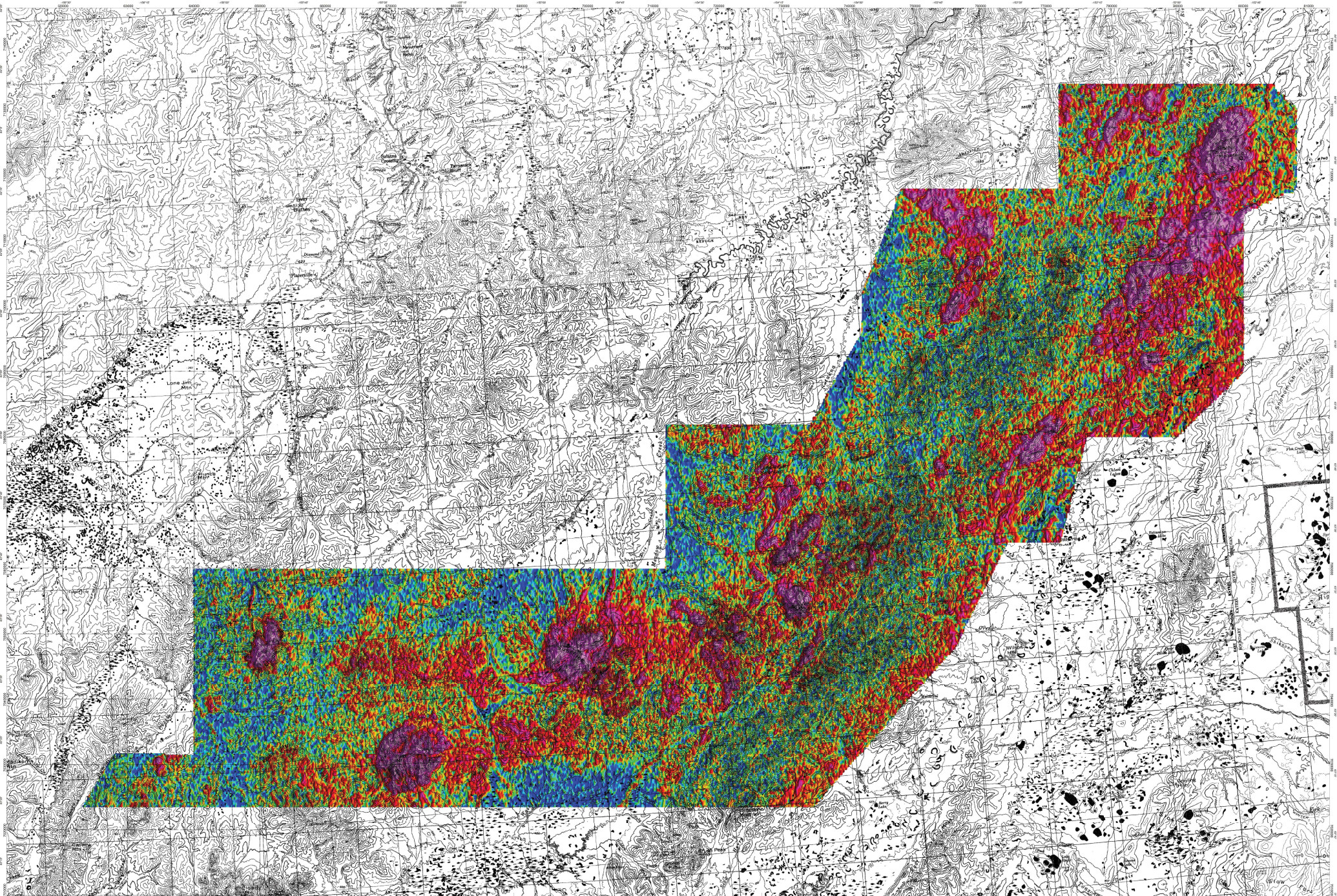
MAP PROJECTION:
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 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Scale: 678,117.401
 Inverse Flattening: 298.25722



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Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains

Potassium Map
 Geophysical Report 2024-1



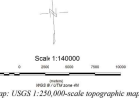
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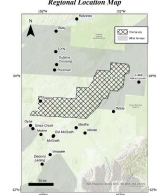
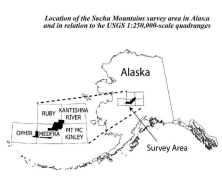
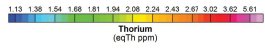
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 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

Airborne Systems:
INSTRUMENTS:
 (x2) RSS-5 Gamma-Ray Spectrometer (111z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High Sensitivity Constant Management
 Magnetometer Resolution: 0.02 nT at 40Hz



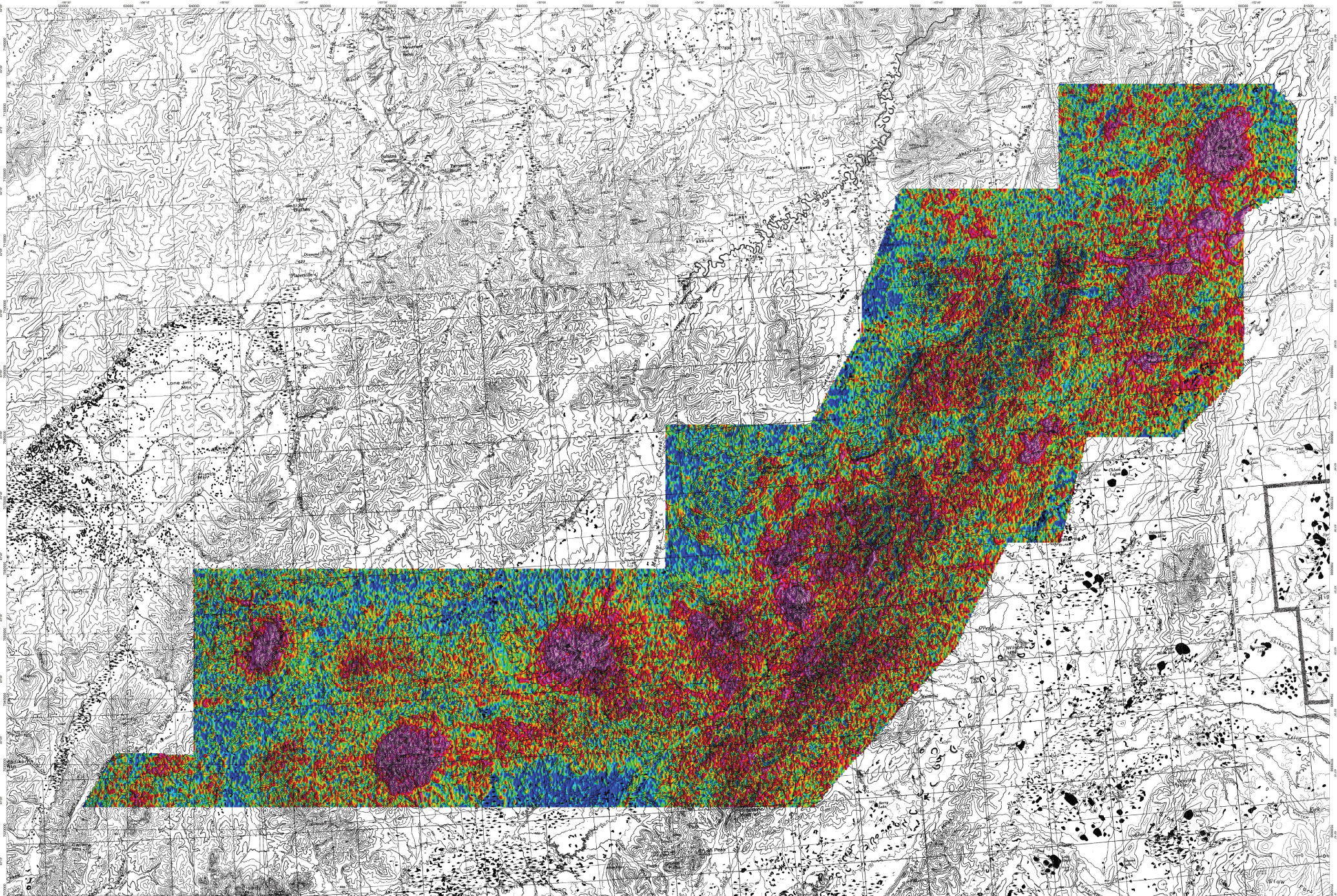
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 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Axis: 673817.000
 Inverse Flattening: 298.25722



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Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains

Thorium Map
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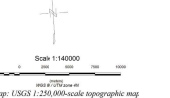
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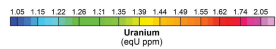
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SURVEY SPECIFICATIONS:
 Survey Date: June 1988 to October 1988, 2023
 Survey Base: McGrath, Alaska
 Aircraft: Aeromobiles A-er 350 BS (C-GE00) & (C-1R20)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
 Tie Line Spacing: 1600 Meters
 Tie Line Direction: N 0° E / N 180° E

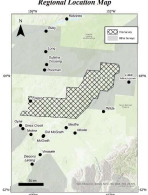
Airborne Systems:
INSTRUMENTS:
 023 HRS-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High Sensitivity Constant Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz



MAP PROJECTION:
 Datum: WGS84
 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Scale: 678,117.60
 Inverse Flattening: 298.25722



Location of the Sitchu Mountains survey area in Alaska and its relation to the USGS 1:250,000-scale quadrangles

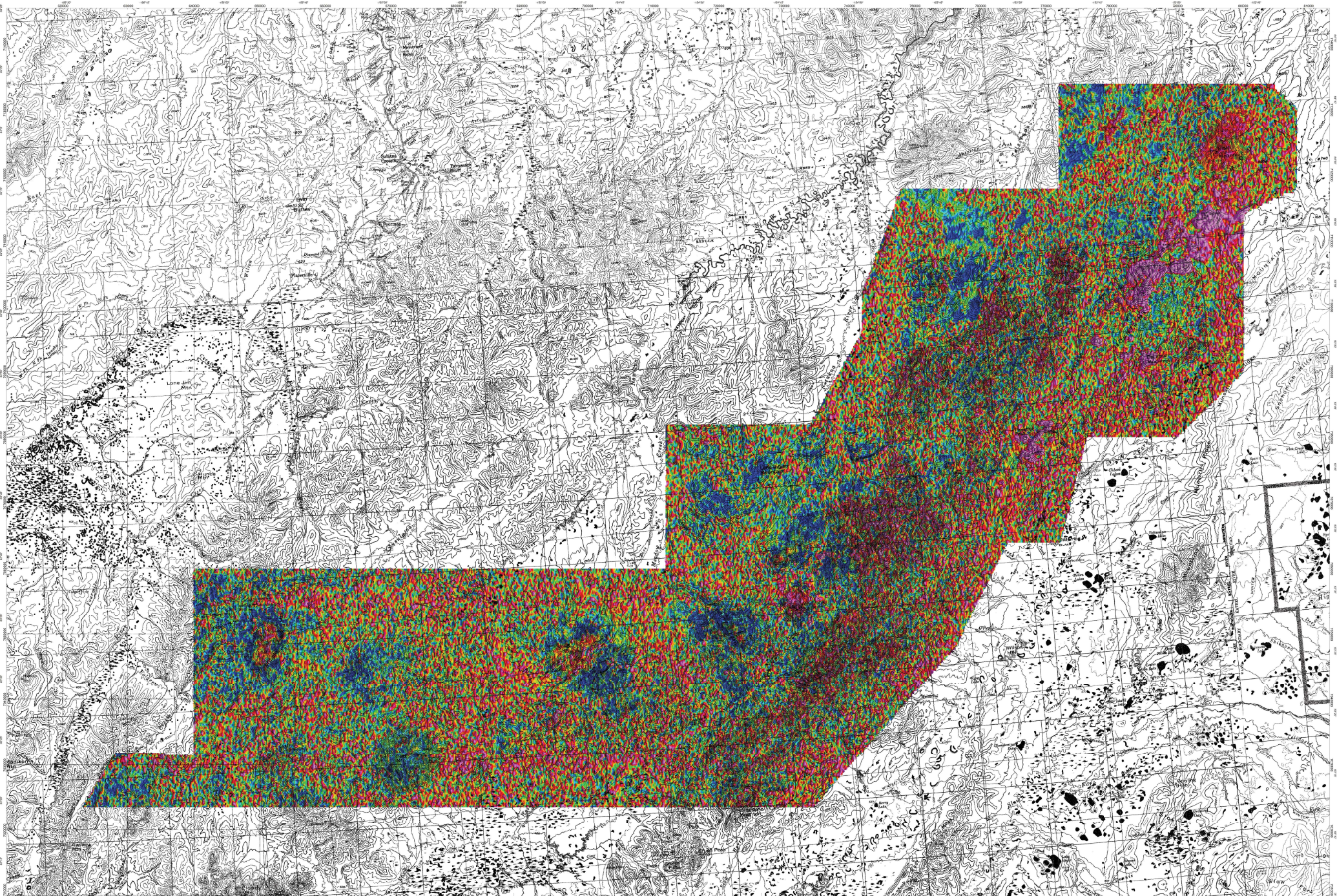


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Kuskokwim airborne magnetic and radiometric survey, Sitchu Mountains

Uranium Map

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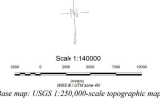


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 Aircraft: Aeroportals A-ster 350 BS (C-GEOQ) & (C-HR2N)
 Survey Line Spacing: 400 Meters
 Survey Line Direction: N 90° E / N 270° E
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 Tie Line Direction: N 0° E / N 180° E

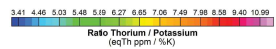


Base map: USGS 1:250,000-scale topographic map

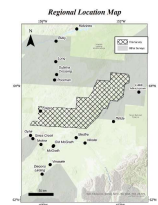
Airborne Systems:

INSTRUMENTS:
 023 RSN-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High-Sensitivity Constant Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz

MAP PROJECTION:
 Datum: WGS84
 Projection: Universal Transverse Mercator
 Central Meridian: 159°W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
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 Inverse Flattening: 298.25722



Location of the Sitchu Mountains survey area in Alaska and its relation to the USGS 1:250,000-scale quadrangles

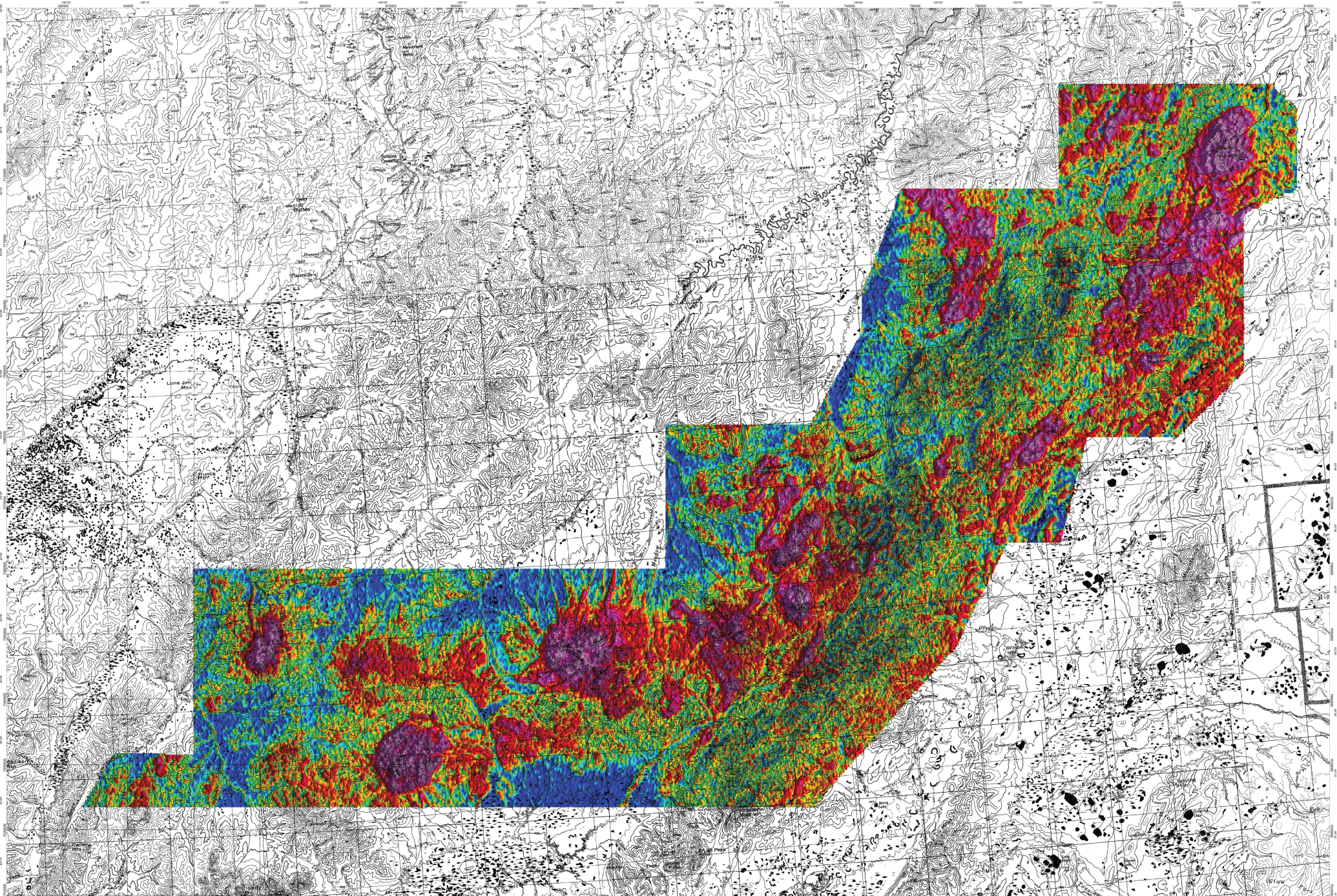


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Kuskokwim airborne magnetic and radiometric survey, Sitchu Mountains

Ratio Thorium / Potassium Map

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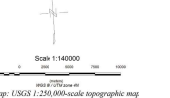
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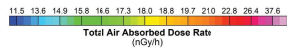
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 Oswald, J.M., Pano, J.A., and Greenish Ltd., 2024, *Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains, Alaska*. Division of Geological & Geophysical Surveys Geophysical Report 2024-1. <https://doi.org/10.14309/31894>

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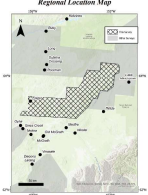
Airborne Systems:
INSTRUMENTS:
 023 RSS-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High Sensitivity Custom Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz



MAP PROJECTION:
 Datum: NAD83
 Projection: Universal Transverse Mercator
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 Central Scale Factor: 0.996
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 Inverse Flattening: 298.25722



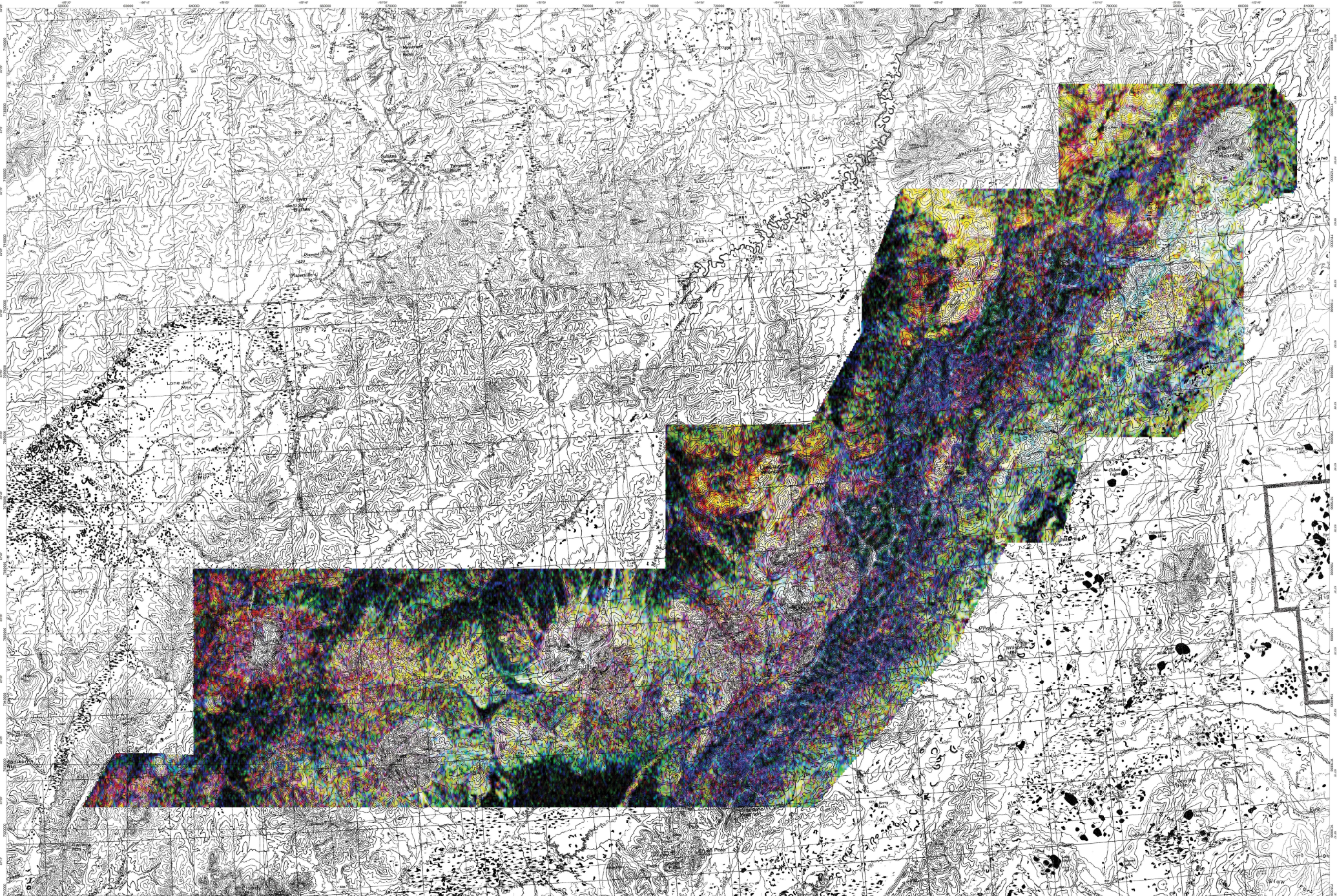
Location of the Sitska Mountains survey area in Alaska and its relation to the USGS 1:250,000-scale quadrangles



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Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains

Total Air Absorbed Dose Rate Map
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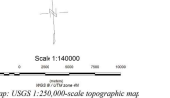
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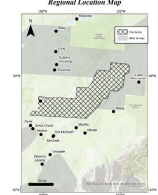
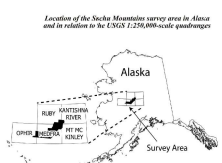
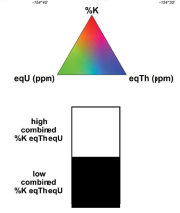
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 Emswiler, J.M., Frazee, J.A., and Greenough Ltd., 2024, Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains, Alaska Division of Geological & Geophysical Surveys Geophysical Report 2024-1, <https://doi.org/10.14309/31894>

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 Survey Line Direction: N 90° E / N 270° E
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 Tie Line Direction: N 0° E / N 180° E

Airborne Systems:
INSTRUMENTS:
 023 RSN-5 Gamma-Ray Spectrometer (11z)
 NaI Crystal Volume 16.8L, Down and 4.2L, Up
 Geometric High-Sensitivity Custom Magnetometer
 Magnetometer Resolution: 0.02 nT at 40Hz



MAP PROJECTION:
 Datum: WGS84
 Projection: Universal Transverse Mercator
 Central Meridian: 159° W (Zone 08)
 Central Scale Factor: 0.996
 False Easting/Northing: 500,000m/0m
 Major Scale: 6378137.00
 Inverse Flattening: 298.25722



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Kuskokwim airborne magnetic and radiometric survey, Sitska Mountains

Ternary Map
 Geophysical Report 2024-1