

WHITE MOUNTAINS AIRBORNE MAGNETIC AND RADIOMETRIC GEOPHYSICAL SURVEY

Emond, A.M., and MPX Geophysics LTD

Geophysical Report 2021-3

2021
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS



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WHITE MOUNTAINS AIRBORNE MAGNETIC AND RADIOMETRIC GEOPHYSICAL SURVEY

Emond, A.M.,¹ and MPX Geophysics LTD

ABSTRACT

The White Mountains airborne magnetic and radiometric geophysical survey covers parts of the Livengood, Circle, and Fairbanks quadrangles 25 kilometers north of Fairbanks, Alaska (fig. 1). Magnetic and radiometric data were collected with a fixed-wing aircraft June 30 to August 22, 2021 by MPX Geophysics LTD. A total of 36,933 line kilometers were collected covering 13,423 square kilometers. The magnetometer was mounted to a rear-facing fixed boom (“tail stinger”). The radiometric crystals were located in the cabin of the aircraft. The White Mountains survey was flown with a line spacing of 400 meters (m) and a mean ground clearance of 270 m.

PURPOSE

The data from the White Mountains airborne magnetic and radiometric geophysical survey will be used for improving the understanding of the geology and mineral potential, promoting resource exploration, and be a part of the continuous regional magnetic data coverage of the Yukon Tanana Uplands.

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.

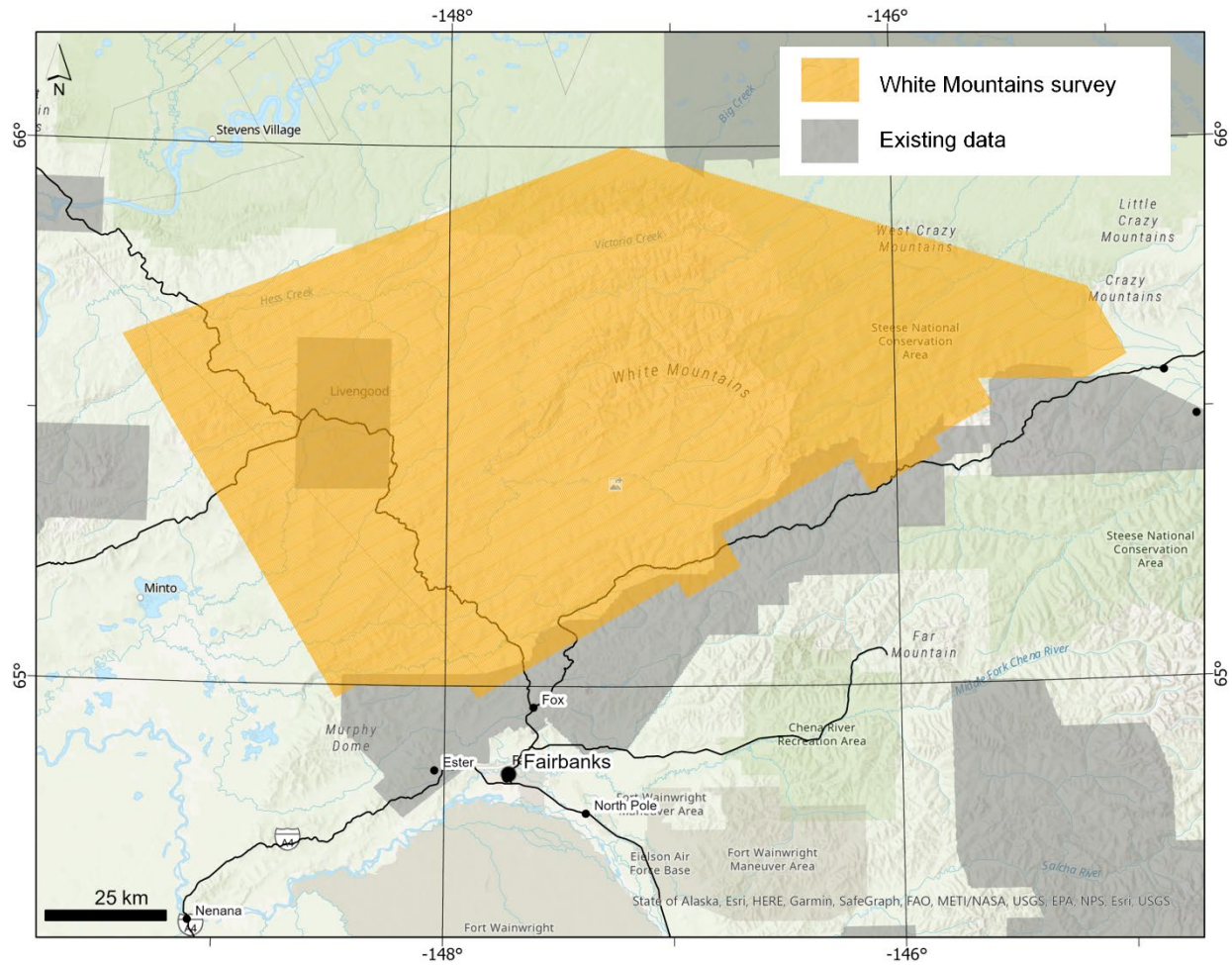
ACKNOWLEDGMENTS

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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_ermapper	contractor	Geographically registered gridded data, ER Mapper ERS format
grids_geosoft	contractor	Geosoft-format gridded data
images_registered	contractor	RGB GeoTiff format images of gridded data
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
maps_jpg_format	contractor	Printable maps jpg format
photos_flightpath	contractor	Survey flight path downward facing photos with GPS location in exif data
vector_data	contractor	Line path and survey boundary in ESRI shapefile (SHP) format



Top. White Mountains survey location map with major roads, towns, and 1:250,000-scale USGS quadrangle boundaries. Prior DGGs surveys shown in gray. **Right.** White Mountains airborne geophysical survey location shown in interior Alaska with relevant 1:250,000-scale quadrangles.



Table 1. 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: <https://doi.org/10.14509/30756>. All maps have a USGS topographic map basemap.

Flown flight path

Magnetic Data

Residual Magnetic Intensity in nT

Calculated analytic signal of the residual magnetic field in nT/m

Computed 1st vertical derivative of the residual magnetic field in nT/m

Radiometric Data

Total Air Absorbed Dose Rate in nGy/h

Equivalent concentration of Potassium (K) as percent K

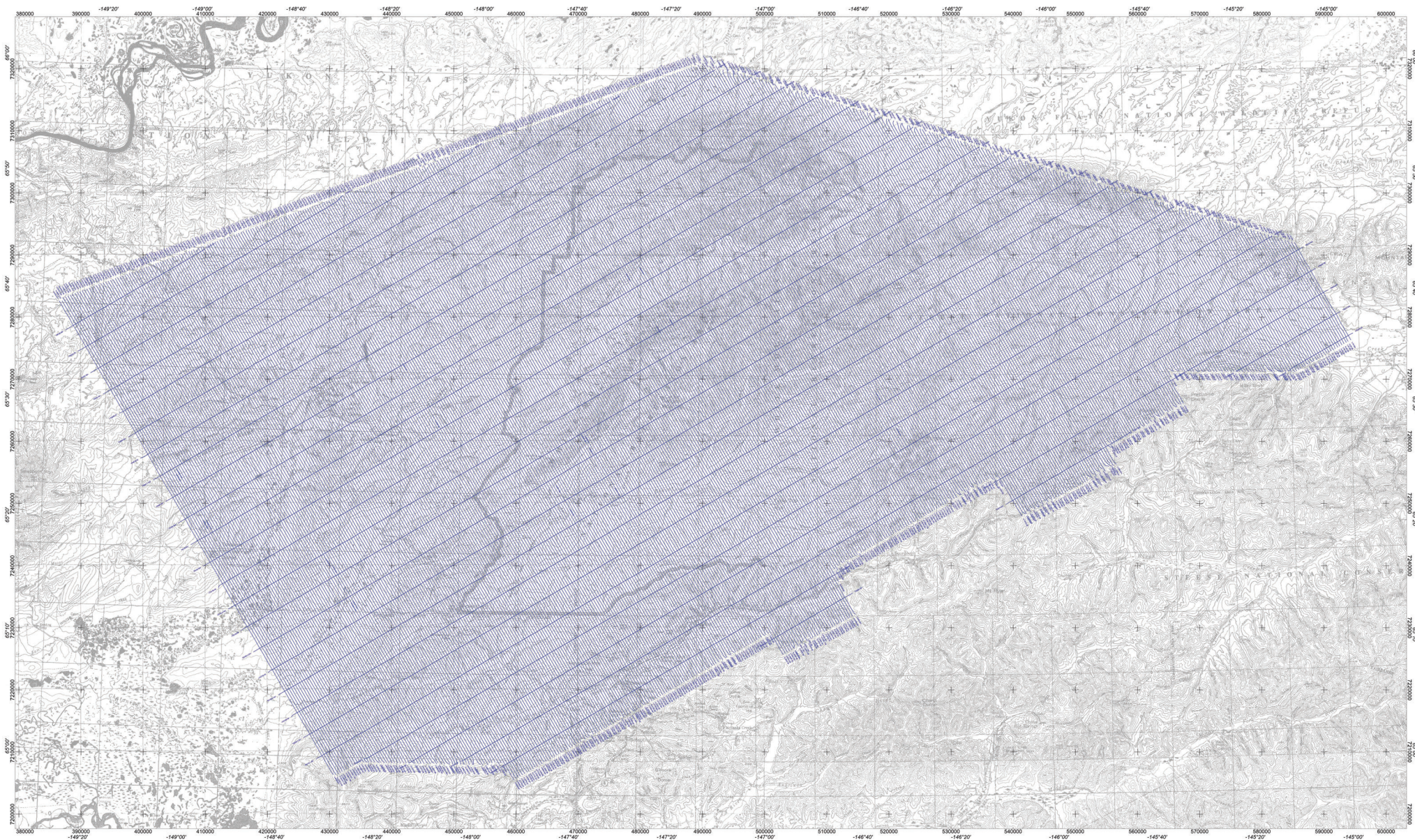
Equivalent concentration of Thorium (Th) in ppm

Equivalent concentration of Uranium (U) in ppm

Uranium Thorium Ratio

Potassium Thorium Ratio

Ternary Grid: percent K - equivalent U - equivalent Th



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Traverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

MAGNETOMETER: Scintrex CS-3
Configuration: Tail-dragger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT

NAVIGATION: Novatel LI/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
RS33-5 multi-channel NaI sensors with 31.6
L"downwards looking" and 8.4 L"upwards
looking"
Sampling Rate: 1 reading/second

ALTIMETERS:
Senn 276 Pressure Transducer

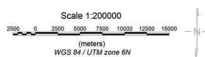
Sampling Rate: 10 readings/second
Radar: Remko King KRA-10A
Sampling Rate: 20 readings/second

BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.022 nT

Flown Flight Path
—<L0000.0:00>

Flown Direction (<>); Line Type (LT); Line Number . Version : Flight Number

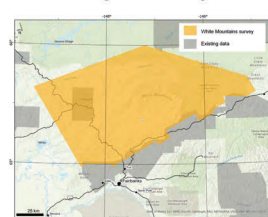
Base map: USGS 1:250,000-scale topographic map



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



Regional Location Map



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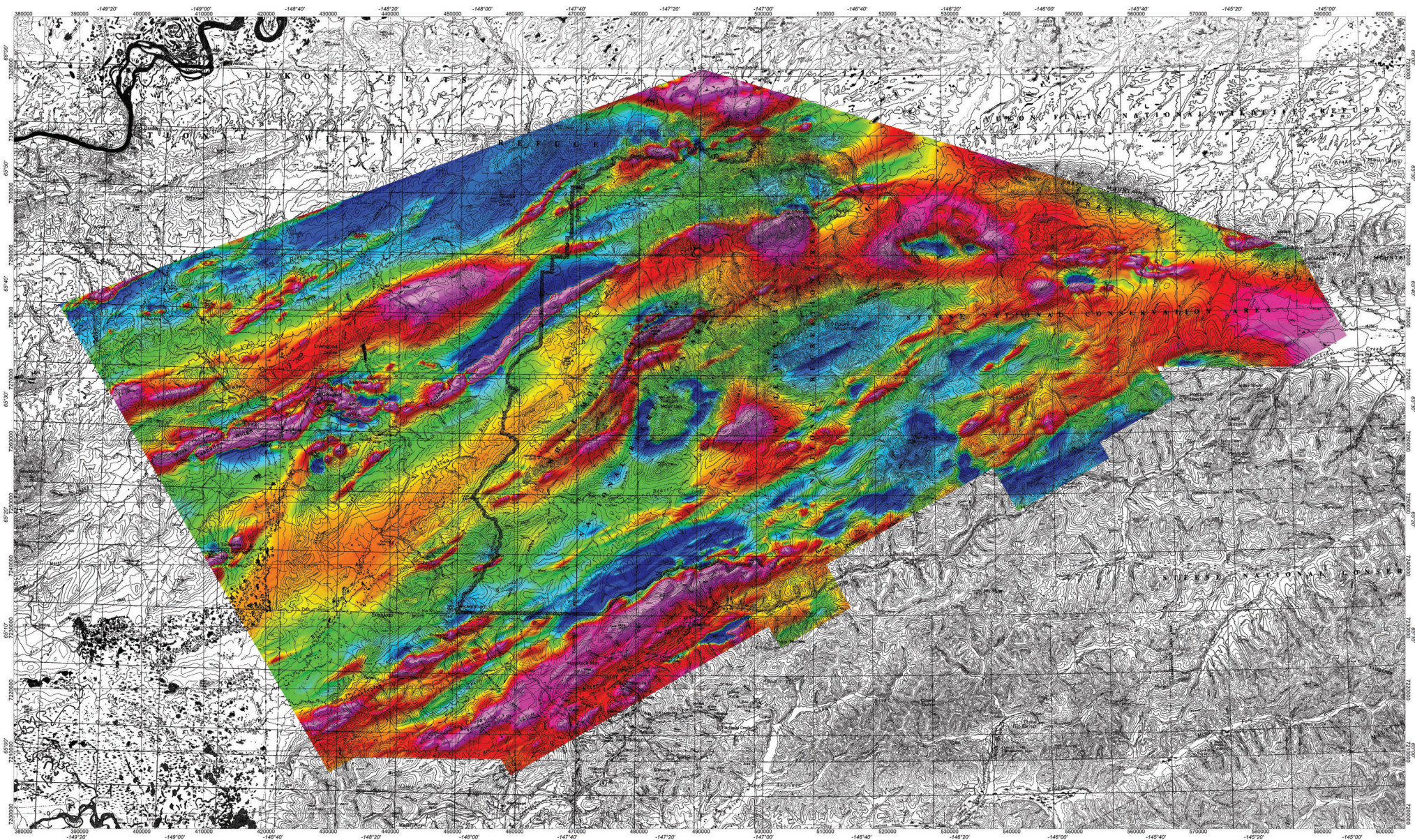
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White Mountains airborne magnetic and
radiometric geophysical survey

Flown Flight Path Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Transverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

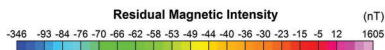
MAGNETOMETER: Scintrex CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT
NAVIGATION: Novat L1/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
832.5 multi-channel NaI sensors with 31.6
L'downwards looking" and 8.4 L "upwards
looking"
Sampling Rate: 1 reading/second

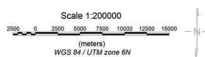
ALTIMETERS:
Senn 276 Pressure Transducer

Sampling Rate: 10 readings/second
Radar: Remtek King KRA-10A
Sampling Rate: 20 readings/second

BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.022 nT



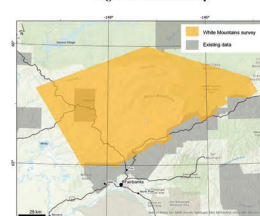
Base map: USGS 1:250,000-scale topographic map



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



Regional Location Map



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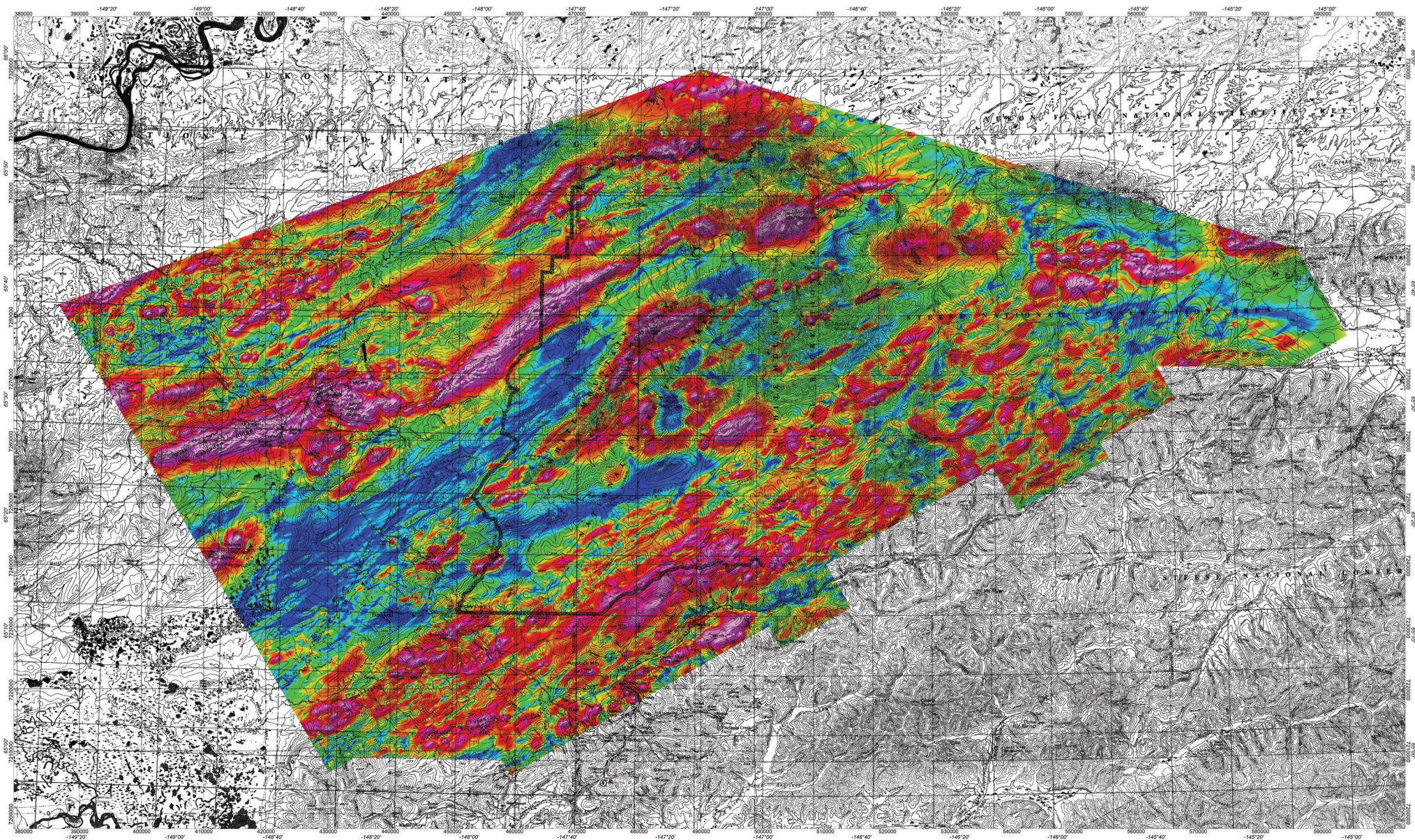


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White Mountains airborne magnetic and
radiometric geophysical survey

Residual Magnetic Intensity Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Transverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

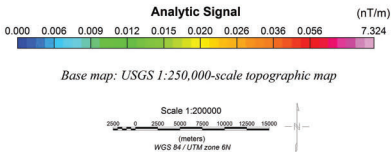
AIRBORNE SYSTEMS:

MAGNETOMETER: Scintrex CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT
NAVIGATION: Novatel LI/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
RS33-5 multi-channel NaI sensors with 31.6
L'downwards looking" and 8.4 L "upwards
looking".
Sampling Rate: 1 reading/second

ALTIMETERS:
Senn 270 Pressure Transducer

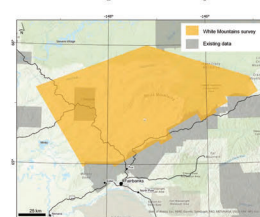
Sampling Rate: 10 readings/second
Radar: Hensoldt King K1A-10A
Sampling Rate: 20 readings/second
BASE STATION MAGNETOMETER:
GEM GSM-191W
Sampling Rate: 1 reading/second
Sensitivity: 0.002 nT



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



Regional Location Map



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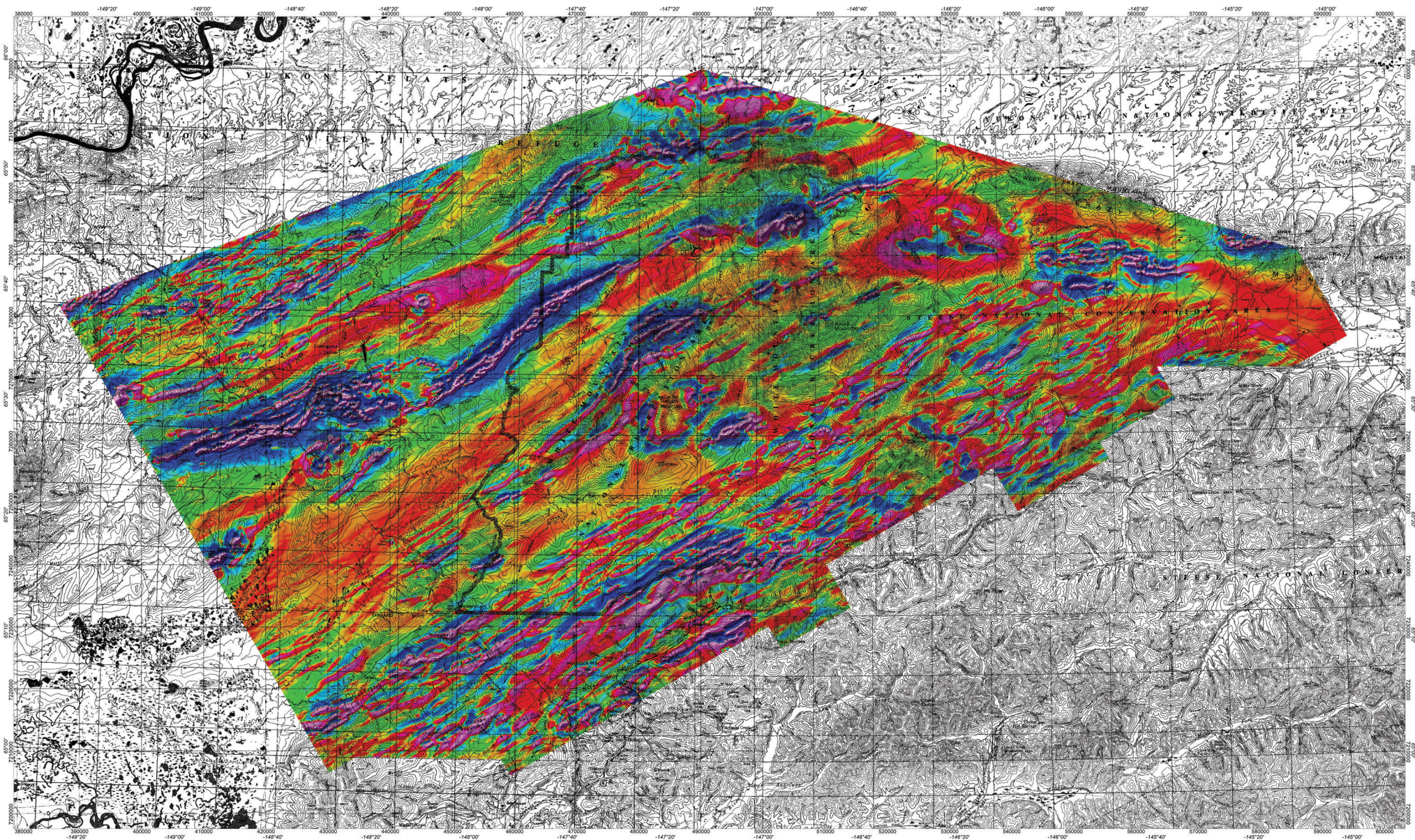


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White Mountains airborne magnetic and radiometric geophysical survey

Magnetic Analytic Signal Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Traverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

MAGNETOMETER: Sintered CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT
NAVIGATION: Novat L1/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
RS33-5 multi-channel NaI sensors with 31.6
L"downwards looking" and 8.4 L"upwards
looking".
Sampling Rate: 1 reading/second

ALTIMETERS:
Senn 276 Pressure Transducer

Sampling Rate: 10 readings/second
Radar: Hensley King KRA-10A
Sampling Rate: 20 readings/second

BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.002 nT

Calculated 1st Vertical Derivative (nT/m)
-1.863 -0.034 -0.019 -0.012 -0.008 -0.004 -0.001 0.003 0.010 6.117

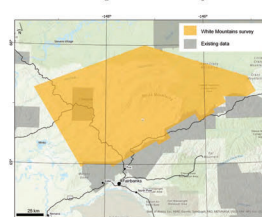
Base map: USGS 1:250,000-scale topographic map

Scale 1:200000
0 2000 4000 6000 8000 10000 12000 14000
(meters)
WGS 84 / UTM zone 6N

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



Regional Location Map



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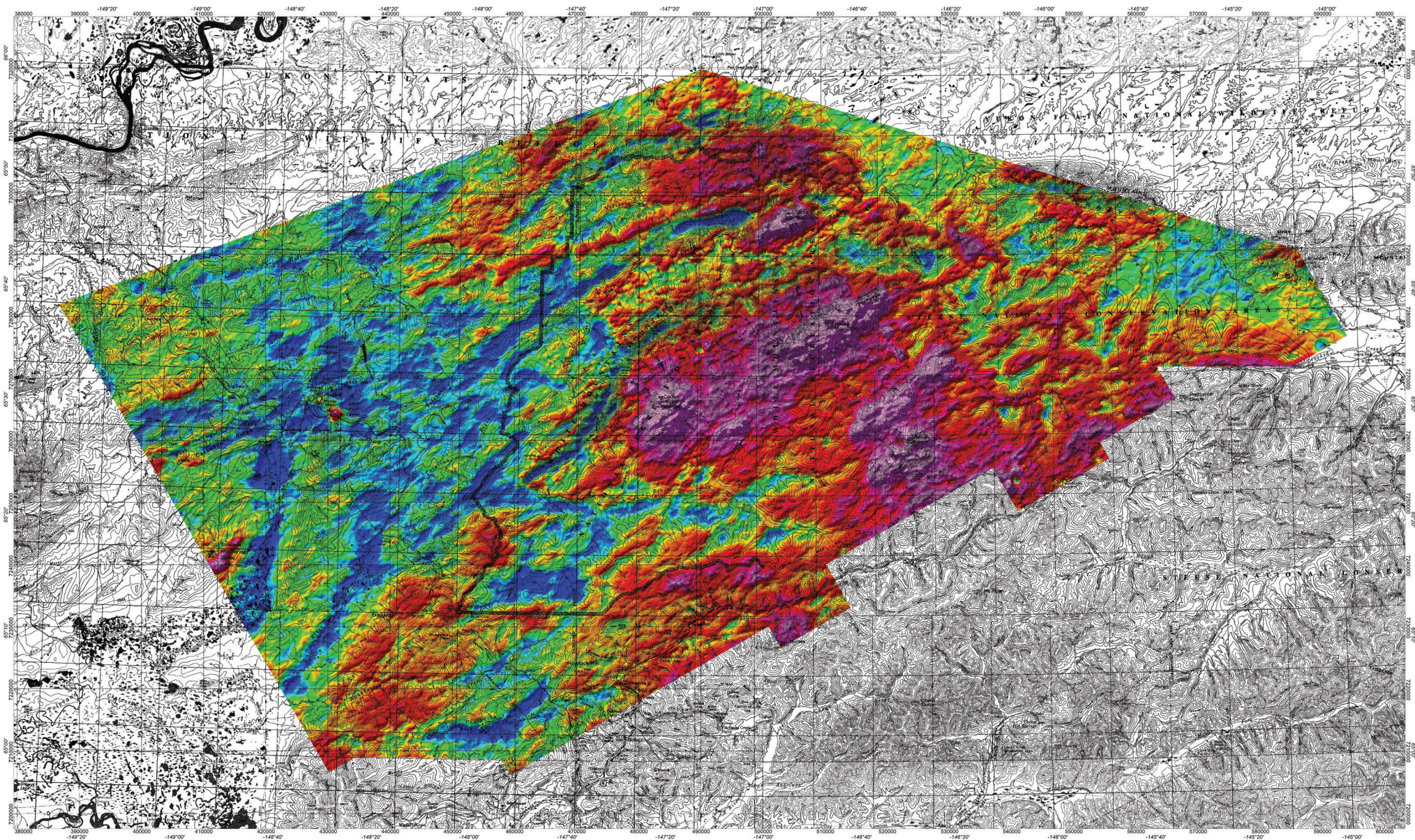


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White Mountains airborne magnetic and
radiometric geophysical survey

Calculated Magnetic 1st Vertical Derivative Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Traverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

MAGNETOMETER: Sintered CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT

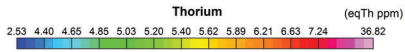
NAVIGATION: Novatel LI/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
8325-5 multi-channel NaI sensors with 31.6
L "downwards looking" and 8.4 L "upwards
looking".
Sampling Rate: 1 reading/second

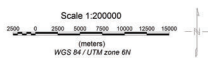
ALTIMETERS:
Senn 276 Pressure Transducer

Sampling Rate: 10 readings/second
Radar: Hensoldt King KXA-10A
Sampling Rate: 20 readings/second

BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.022 nT



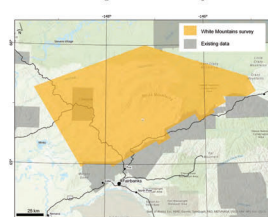
Base map: USGS 1:250,000-scale topographic map



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



Regional Location Map



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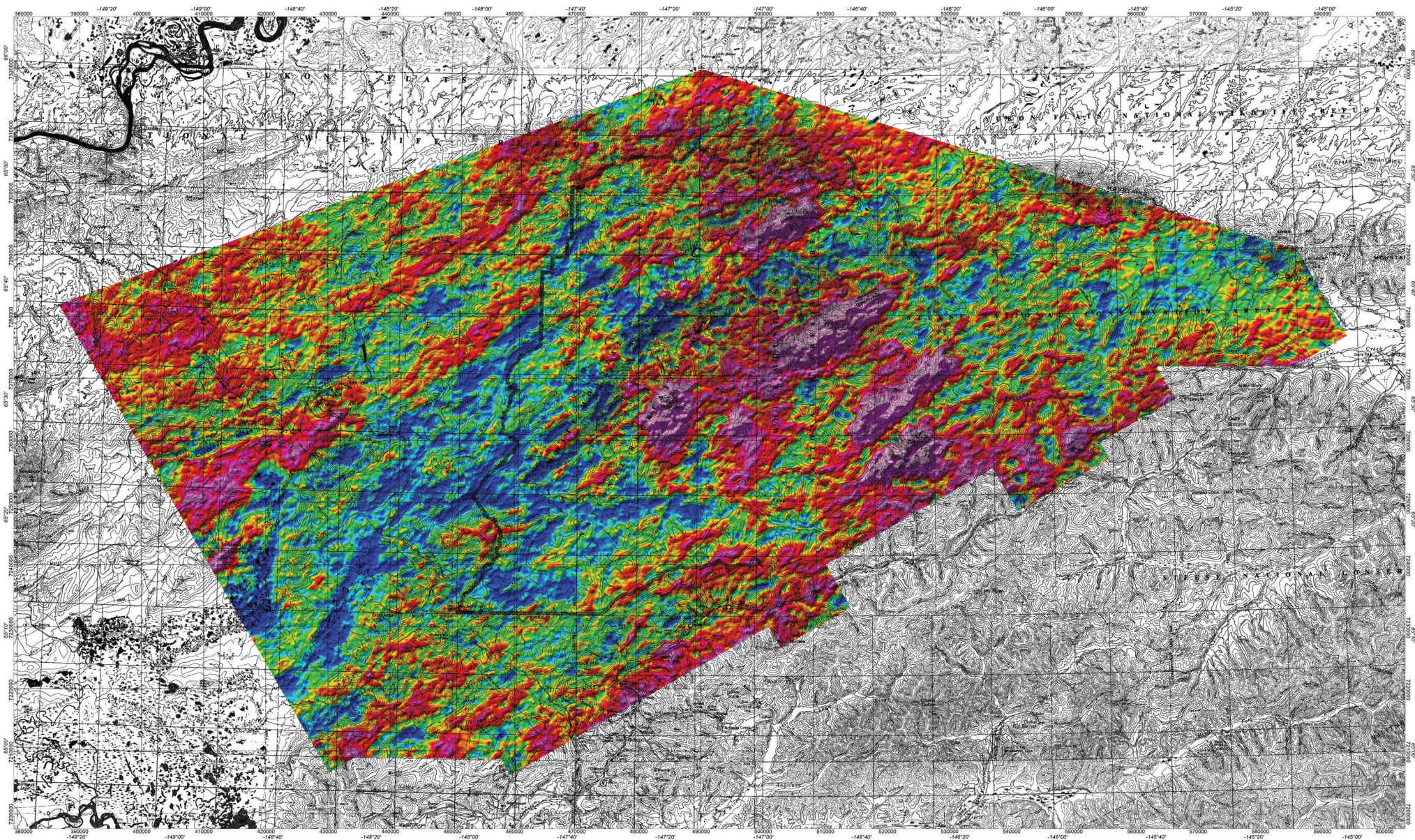


ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

White Mountains airborne magnetic and
radiometric geophysical survey

Thorium Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Traverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

MAGNETOMETER: Scintrex CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT
NAVIGATION: Novatel LI/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
8325-5 multi-channel NaI sensors with 31.6
L"downwards looking" and 8.4 L"upwards
looking".
Sampling Rate: 1 reading/second

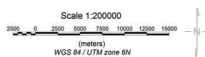
ALTIMETERS:
Senn 276 Pressure Transducer

Sampling Rate: 10 readings/second
Radar: Hensley King KRA-10A
Sampling Rate: 20 readings/second

BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.002 nT



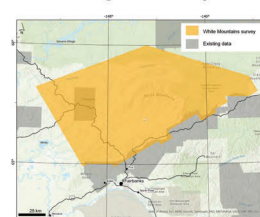
Base map: USGS 1:250,000-scale topographic map



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



Regional Location Map



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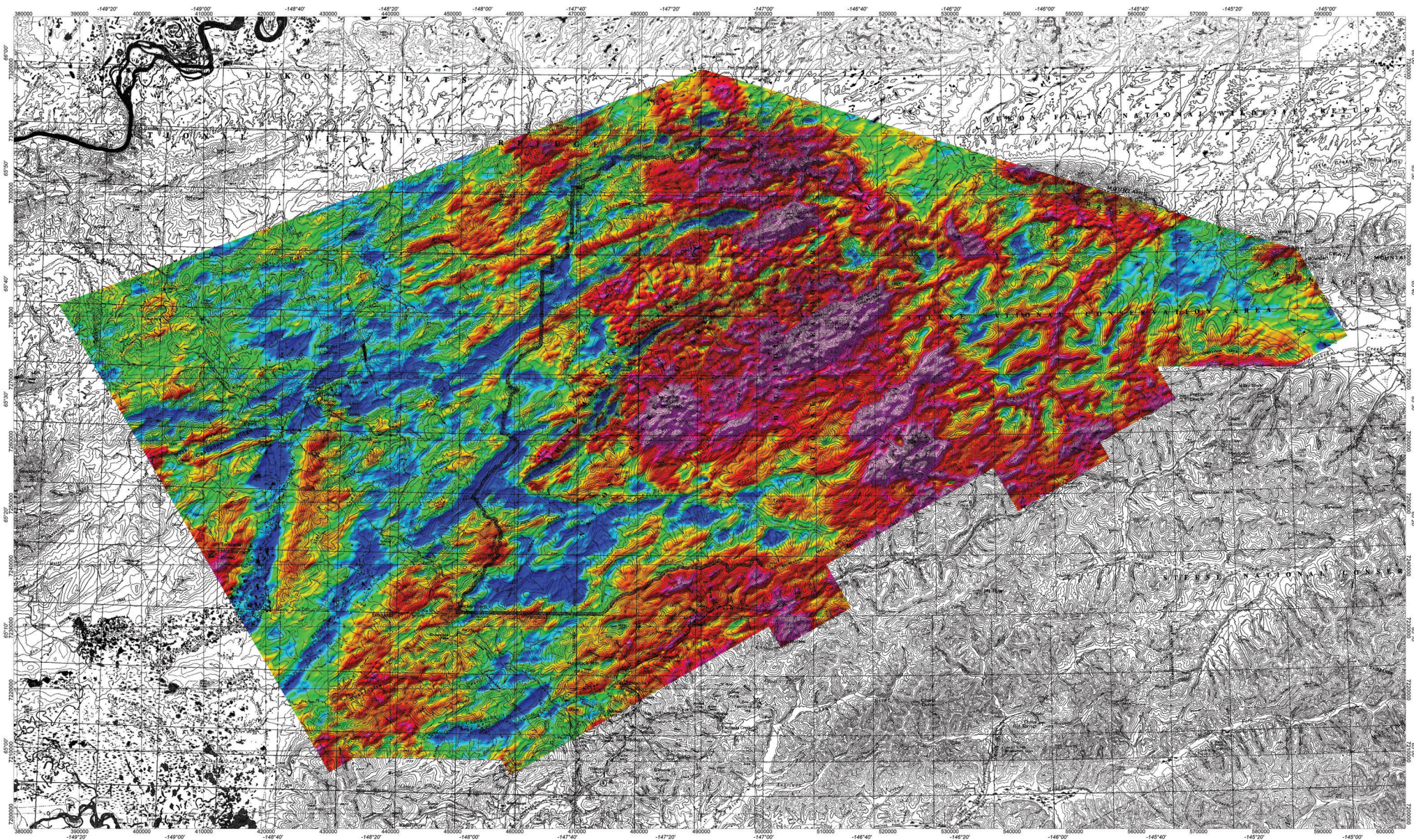


ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

White Mountains airborne magnetic and radiometric geophysical survey

Uranium Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Traverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

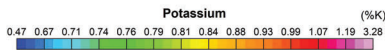
MAGNETOMETER: Scintrex CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT
NAVIGATION: Novatel LI/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
8325-5 multi-channel NaI sensors with 31.6
L"downwards looking" and 8.4 L"upwards
looking".
Sampling Rate: 1 reading/second

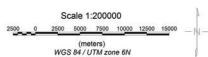
ALTIMETERS:
Senn 276 Pressure Transducer

Sampling Rate: 10 readings/second
Radar: Remtek King KRA-10A
Sampling Rate: 20 readings/second

BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.002 nT



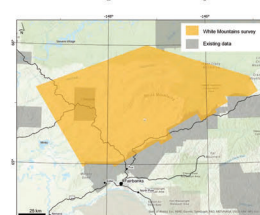
Base map: USGS 1:250,000-scale topographic map



Location of the White Mountains survey
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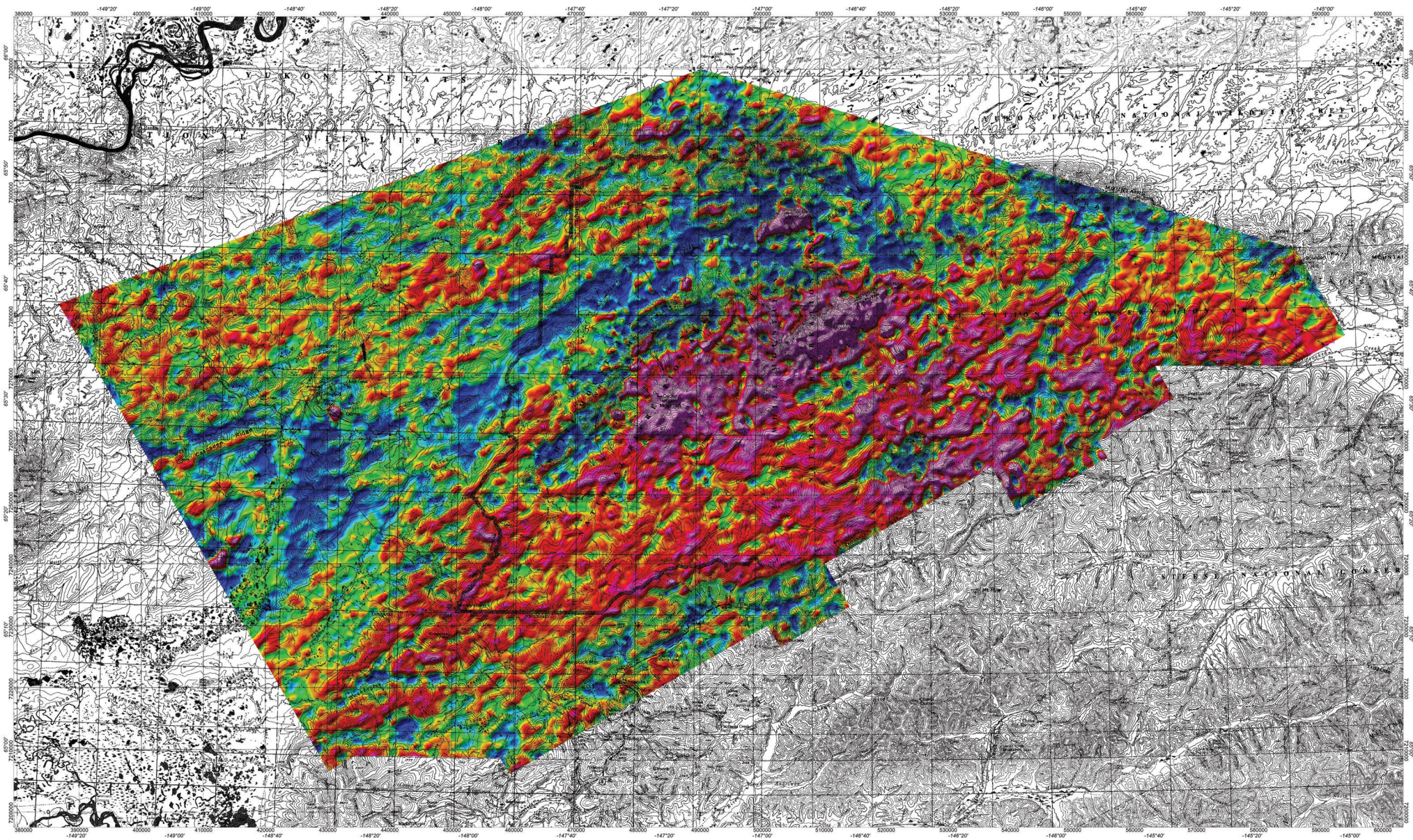


ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

White Mountains airborne magnetic and
radiometric geophysical survey

Potassium Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Traverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

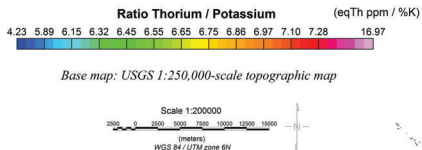
AIRBORNE SYSTEMS:

MAGNETOMETER: Scintrex CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT
NAVIGATION: Novatel LI/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
8325-5 multi-channel NaI sensors with 31.6
L"downwards looking" and 8.4 L"upwards
looking".
Sampling Rate: 1 reading/second

ALTIMETERS:
Senn 276 Pressure Transducer

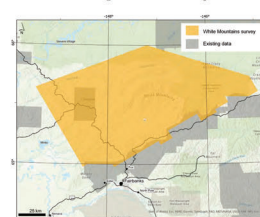
Sampling Rate: 10 readings/second
Radar: Hensoldt King KRA-10A
Sampling Rate: 20 readings/second
BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.022 nT



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



Regional Location Map



ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

White Mountains airborne magnetic and
radiometric geophysical survey

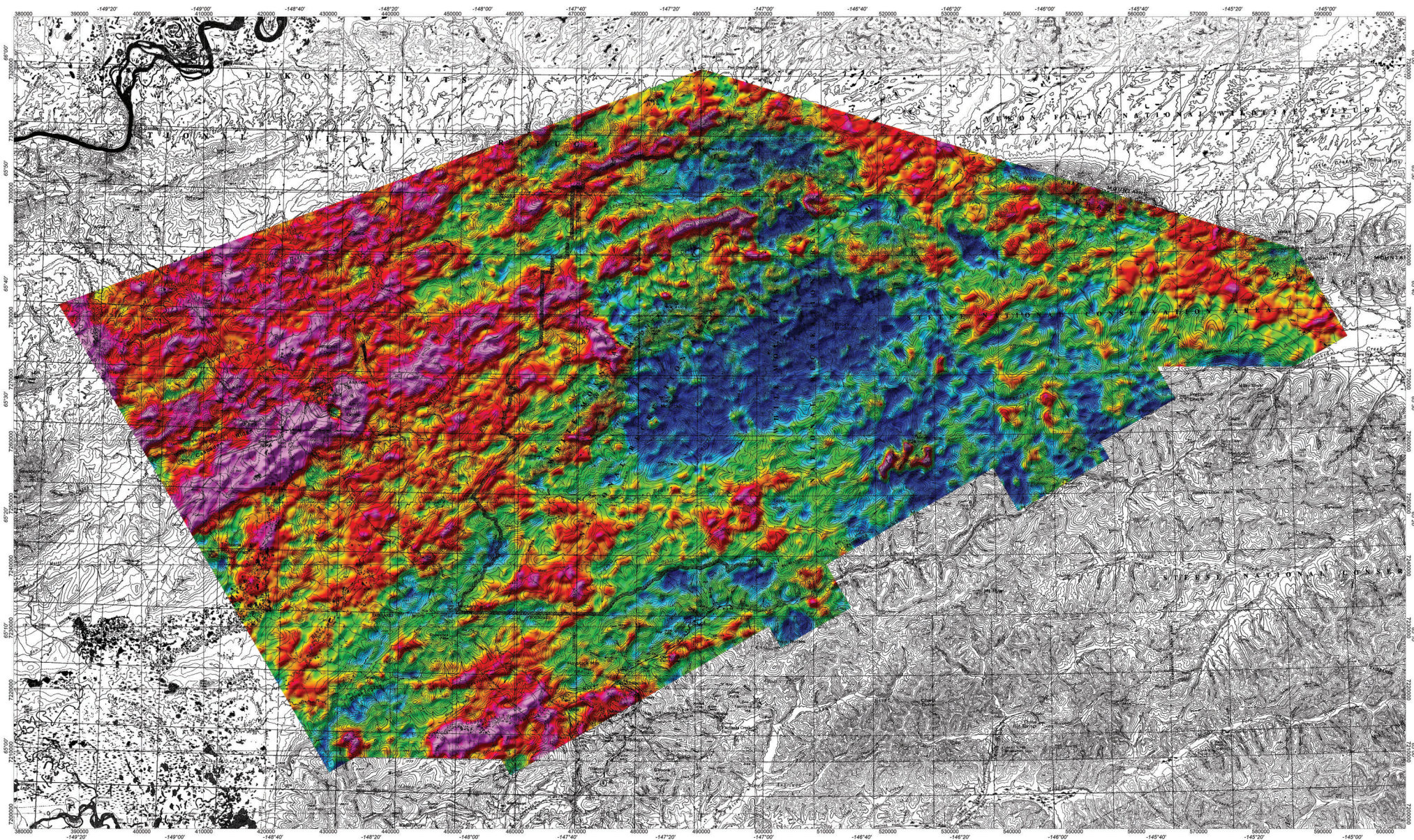
Ratio Thorium / Potassium Map

Geophysical Report 2021-3

ALASKA DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
Address: 3354 College Rd, Fairbanks, AK 99709, United States of America
Phone: +1 907-451-5000
Website: <https://dgs.alaska.gov/>

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Enond, A.M., and MPX Geophysics LTD, 2021, White Mountains airborne magnetic
and radiometric geophysical survey: Alaska Division of Geological & Geophysical
Surveys Geophysical Report 2021-3. <https://doi.org/10.14509/30736>



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Traverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

MAGNETOMETER: Scintrex CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT

NAVIGATION: Novatel LI/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
8325-5 multi-channel NaI sensors with 31.6
L'downwards looking and 8.4 L 'upwards
looking"
Sampling Rate: 1 reading/second

ALTIMETERS:
Senn 276 Pressure Transducer

Sampling Rate: 10 readings/second
Radar: Remtek King KRA-10A
Sampling Rate: 20 readings/second

BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.022 nT

Ratio Uranium / Thorium (eqU ppm / eqTh ppm)
0.17 0.39 0.42 0.45 0.47 0.49 0.51 0.53 0.55 0.56 0.58 0.61 0.64 1.09

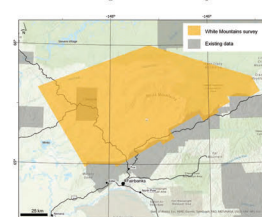
Base map: USGS 1:250,000-scale topographic map

Scale 1:200000
2000 0 2000 4000 6000 8000 10000 12000 14000
(meters)
WGS 84 / UTM zone 6N

Location of the White Mountains survey
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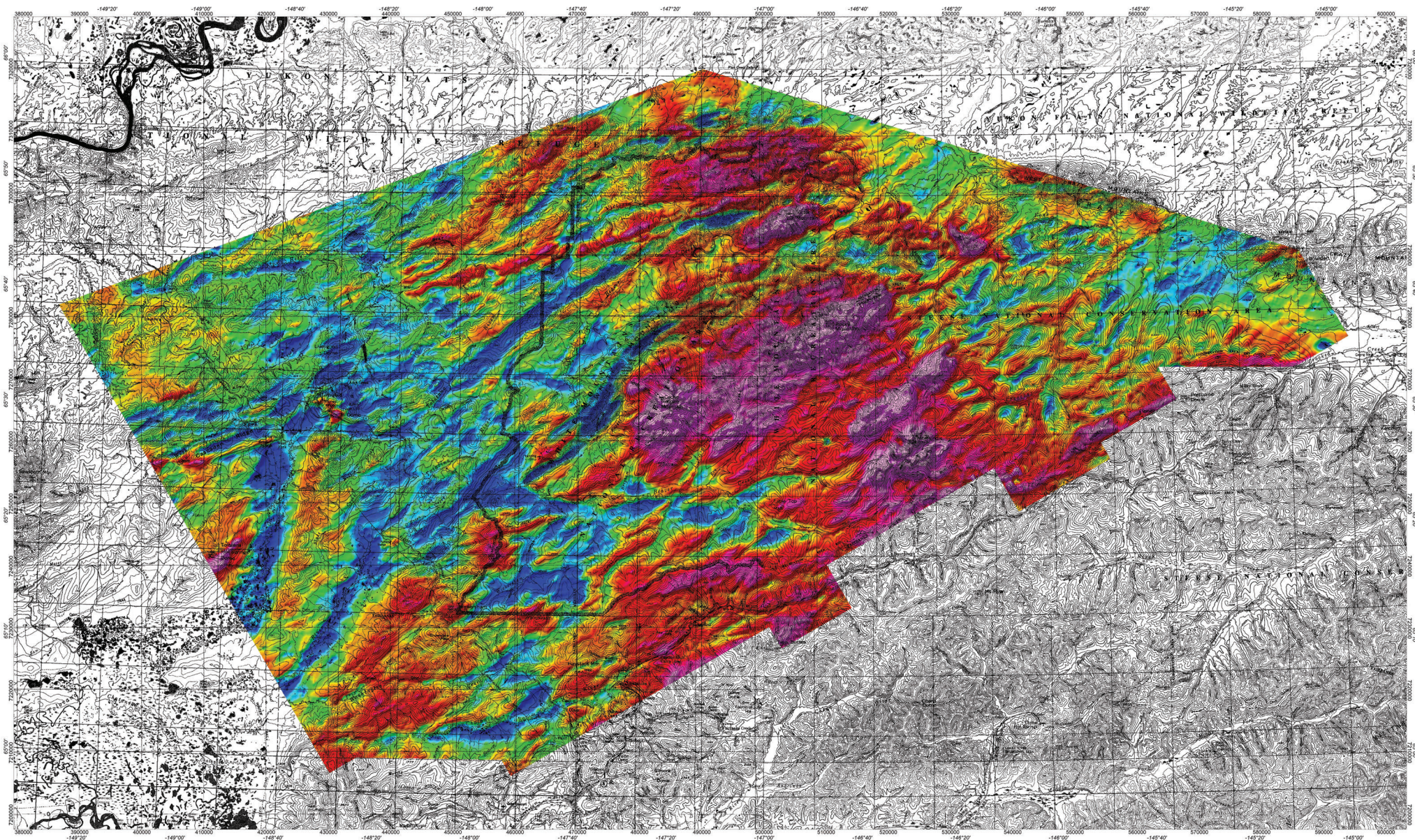


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White Mountains airborne magnetic and
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Ratio Uranium / Thorium Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
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Traverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

MAGNETOMETER: Scintrex CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT
NAVIGATION: Novat L1/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
8325-5 multi-channel NaI sensors with 31.6
L"downwards looking" and 8.4 L"upwards
looking".
Sampling Rate: 1 reading/second

ALTIMETERS:
Senn 276 Pressure Transducer

Sampling Rate: 10 readings/second
Radar: Remtek King K10A-10A
Sampling Rate: 20 readings/second

BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.022 nT

Total Air Absorbed Dose Rate (nGy/h)
4.3166 18.6 19.9 20.9 21.9 23.0 24.0 25.2 26.7 28.9 32.0 36.3 178.9

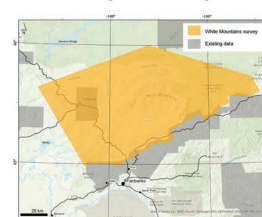
Base map: USGS 1:250,000-scale topographic map

Scale 1:200000
2000 0 2000 4000 6000 8000 10000 12000 14000
(meters)
WGS 84 / UTM zone 6N

Location of the White Mountains survey
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Regional Location Map



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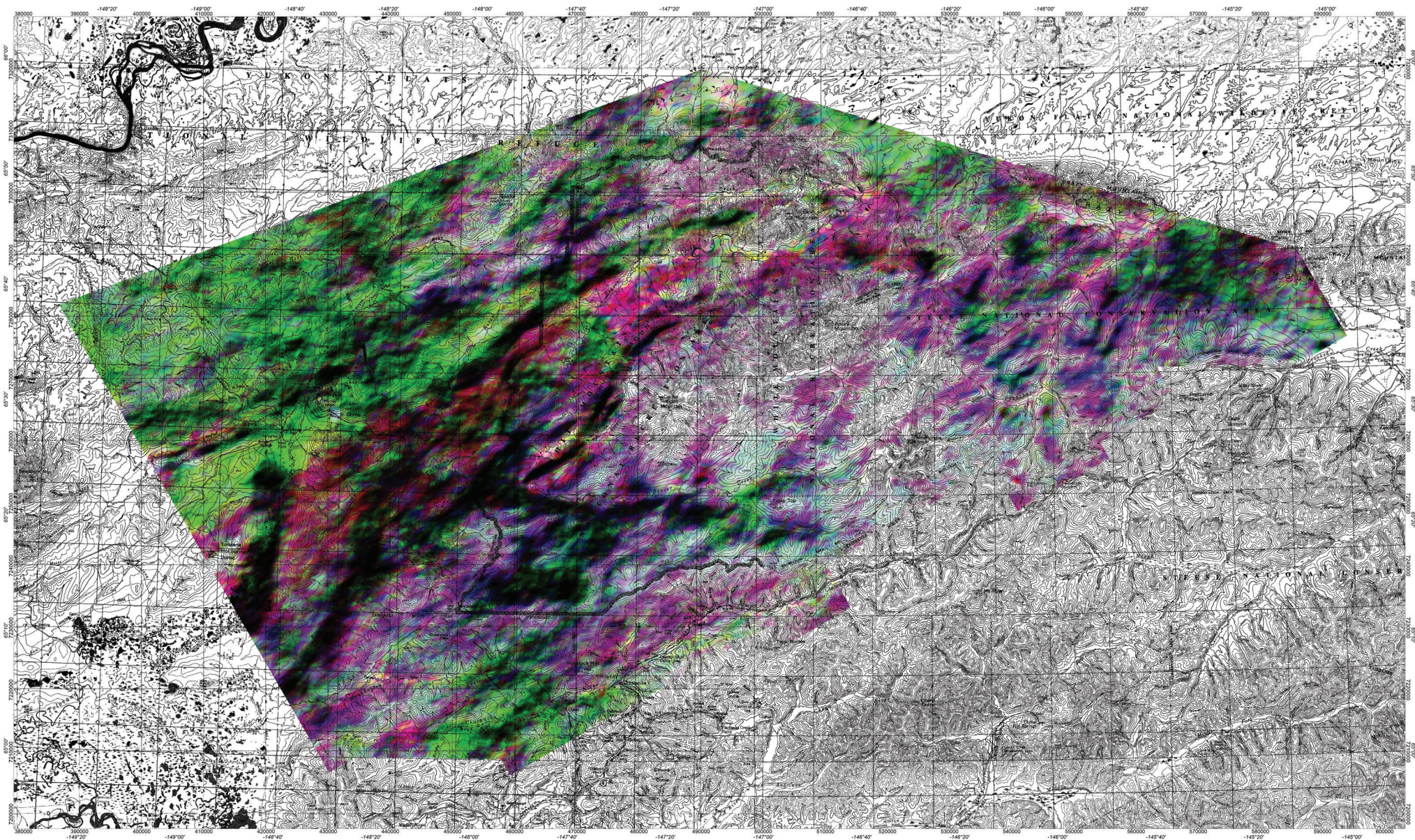


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White Mountains airborne magnetic and
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Total Air Absorbed Dose Rate Map

Geophysical Report 2021-3



LEGEND

Survey Date: June-August 2021
Fixed-Wing Aircraft Type: Piper Navajo PA31
Registration: C-GQVP

SURVEY PARAMETERS:
Mean Terrain Clearance: 270 m (aircraft and sensors)
Transverse Line Direction/Spacing: 150°(N30°W) / 400 m
Control Line Direction/Spacing: 60°(N60°E) / 4000 m

AIRBORNE SYSTEMS:

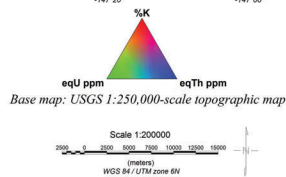
MAGNETOMETER: Scintrex CS-3
Configuration: Tail-slinger
Sampling Rate: 20 readings/second
Sensitivity: 0.01 nT
NAVIGATION: Novat L1/L2 GPS
Real-time differentially corrected
Sampling Rate: 10 readings/second

GAMMA-RAY SPECTROMETER:
8325-5 multi-channel NaI sensors with 31.6
L"downwards looking" and 8.4 L"upwards
looking".
Sampling Rate: 1 reading/second

ALTIMETERS:
Senn 276 Pressure Transducer

Sampling Rate: 10 readings/second
Radar: Bendix King KXA-10A
Sampling Rate: 20 readings/second

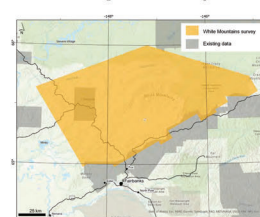
BASE STATION MAGNETOMETER:
GEM GSM-19TW
Sampling Rate: 1 reading/second
Sensitivity: 0.002 nT



**Location of the White Mountains survey
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1:250,000-scale quadrangles**



Regional Location Map



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White Mountains airborne magnetic and radiometric geophysical survey

Ternary Map

Geophysical Report 2021-3