KUSKOKWIM AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY, NORTHERN KAIYUH MOUNTAINS, ALASKA

Logan A. Fusso, Eric I. Petersen, Abraham M. Emond, and EON Geosciences Inc.

Geophysical Report 2025-3

2025
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DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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KUSKOKWIM AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY, NORTHERN KAIYUH MOUNTAINS, ALASKA

Logan A. Fusso[1], Eric I. Petersen[1], Abraham M. Emond[2], and EON Geosciences Inc.[3]

ABSTRACT

The Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska, is within the Nulato Quadrangle west of Fairbanks, Alaska. Magnetic and radiometric data were collected with a helicopter between June 4 and 17, 2024, by EON Geosciences Inc. The survey contains a single block covering 1,975 km^2, which includes an infill block with tighter line spacing located in the northcentral portion of the block. A total of 6,459 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 and the northcentral infill block was flown with 200 m spacing. Tie-lines for magnetic leveling were flown at 1,600 m spacing. The data and metadata are available from the Alaska Division of Geological & Geophysical Surveys website: https://doi.org/10.14509/31493.

PURPOSE

The data from the Kaiyuh airborne magnetic and radiometric survey will be used for improving the understanding of the region's geology and mineral potential and to promote resource exploration. This survey is part of the continuous regional magnetic data coverage of Alaska.

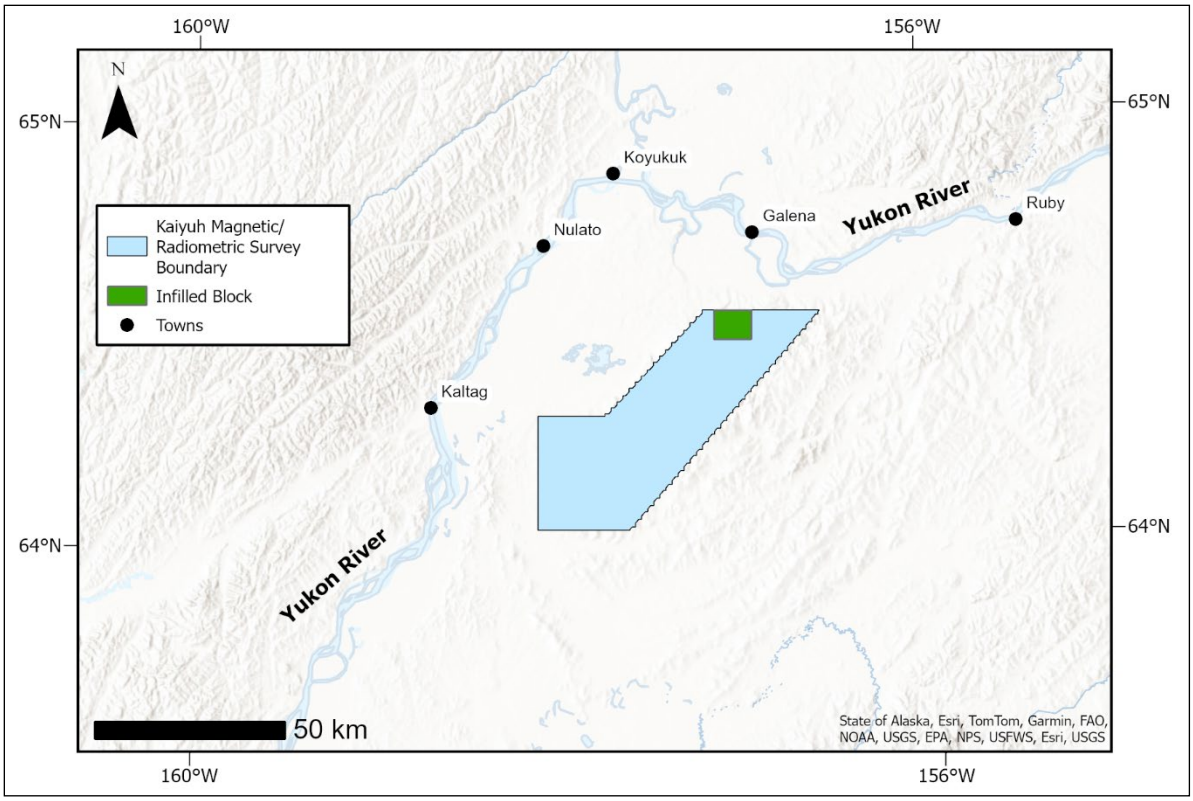
SURVEY OVERVIEW DESCRIPTION

This document provides an overview of the survey and includes text and figures of select primary and derivative products from this survey. A table is provided showing digital data packages available for download 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.

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

[2] Aqua Geo Frameworks, 10848 Ridge Road, Fort Laramie, Wyoming 82212; *formerly DGGS*

[3] 4018 Boulevard Cote Vertu Ouest, Saint-Laurent, Quebec H4R 1V4, Canada



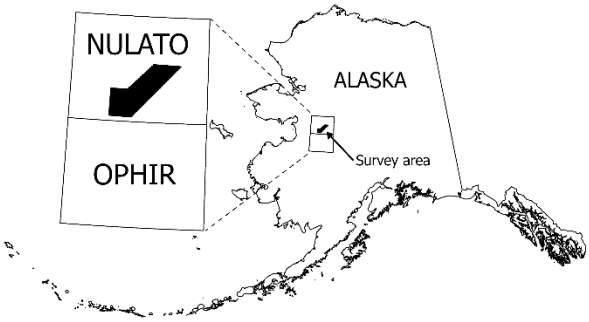


Figure 1. Top. The Kaiyuh airborne magnetic and radiometric survey, Alaska, location map with nearby towns. **Right.** The Kaiyuh airborne magnetic and radiometric survey, Alaska, location shown in Interior Alaska with relevant 1:250,000-scale quadrangles.

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, calibration reports
grids_geosoft	contractor	Oasis montaj Geosoft GRD format gridded data

Data Type	Provider	Description
grids_tif	contractor	Geographically registered data value rasters of gridded data, GeoTiff format
kmz	DGGS	keyhole markup language (kml) kmz archive files of project data. Viewable in Google Earth and other compatible programs
maps_pdf_format	DGGS	Printable and geographically registered maps in pdf format. Compatible with mobile device navigation and desktop mapping applications
vector_data	contractor	Line path and survey boundary in Esri shapefile (shp) format

Table 1. Copies of the following maps are included at the end of this booklet in portable document format (PDF). All maps use WGS84 datum and UTM zone 4N projection. 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/10.14509/31493.

Map Title	File Name
Flight path	Kaiyuh_flightpath.pdf
Magnetics	
Computed Analytic Signal of the Residual Magnetic Field	Kaiyuh_mag_analyticsignal.pdf
Calculated 1st Vertical Derivative	Kaiyuh_mag_c1vd.pdf
Calculated 2nd Vertical Derivative	Kaiyuh_mag_c2vd.pdf
Residual Magnetic Intensity	Kaiyuh_mag_residual.pdf
Tilt Derivative	Kaiyuh_mag_tiltderivative.pdf
Radiometrics	
Natural Air Absorbed Dose Rate	Kaiyuh_rad_naadr.pdf
Potassium	Kaiyuh_rad_pct_k.pdf
Thorium	Kaiyuh_rad_equiv_th.pdf
Uranium	Kaiyuh_rad_equiv_u.pdf
Ratio Uranium/Thorium	Kaiyuh_rad_ratio_u_th.pdf

Map Title	File Name
Ratio Thorium/Potassium	Kaiyuh_rad_ratio_u_k.pdf
Ratio Uranium/Potassium	Kaiyuh_rad_ratio_u_k.pdf
Radiometric Ternary Map	Kaiyuh_rad_ternary.pdf

ACKNOWLEDGMENTS

This work was supported by the U.S. Geological Survey's Earth MRI program grants G22AC00475 and G23AC00408 with additional funding by Doyon, Limited.

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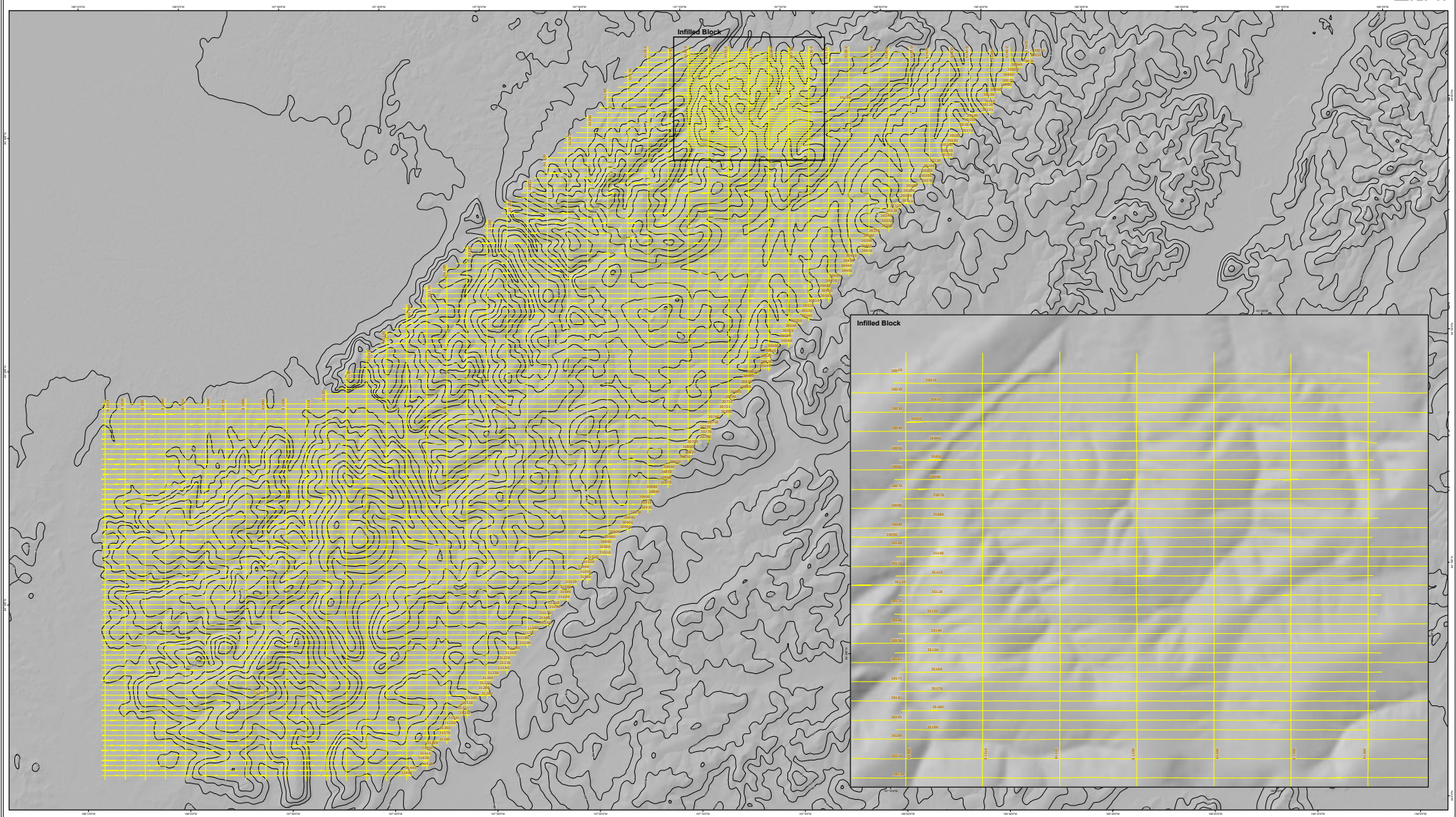

Flight path
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by
Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

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Location of map area

SCALE 1:170,000

coordinate/datum/projection

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[2] Aqua Geo Frameworks, 10645 Ridge Road, Fruit Laramie, Wyoming 82073, formerly DGGS, formerly DOGGS
[3] EON Geosciences Inc., 6618 Sour Tuba Hills, St.Laurent, QC, Canada H9R 1V6

Flight Paths, Survey Line Number Labelled

Alaska Contours — Small-scale contours for Alaska. Contour intervals vary from 50 feet to 100 feet.

Note: All survey line numbers are shown. Infill line numbers for the Infilled Block are shown only within the inset map. Line numbers are displayed to the north of labeled lines (to the west for N-S oriented lines). Labels are situated at the east end of E-W oriented lines; note that in some cases multiple lines may be oriented along the same line of latitude, one picking up where the previous line ended.

This work was supported by the United States Geological Survey's Earth Mapping Resources Initiative (Earth MRI), grants G22AC00475 and G23AC00408. Additional survey lines were funded over the Infilled Block by Doyon Limited, increasing the data density in that area (shown in detail by inset).

Basemap streams and waterbodies from:
National Hydrography Dataset, U.S. Geological Survey, Reston, Virginia, 2002–2016
Basemap hillshade and contours from:
U.S. Geological Survey, EROS Data Center, 2013, Digital elevation - Interferometric Synthetic Aperture Radar (IFSAR) - Alaska
Projection:
Universal Transverse Mercator Zone 4N
Datum:
WGS 1984
Cartography by:
E.I. Petersen and A.E. Macpherson (2025)

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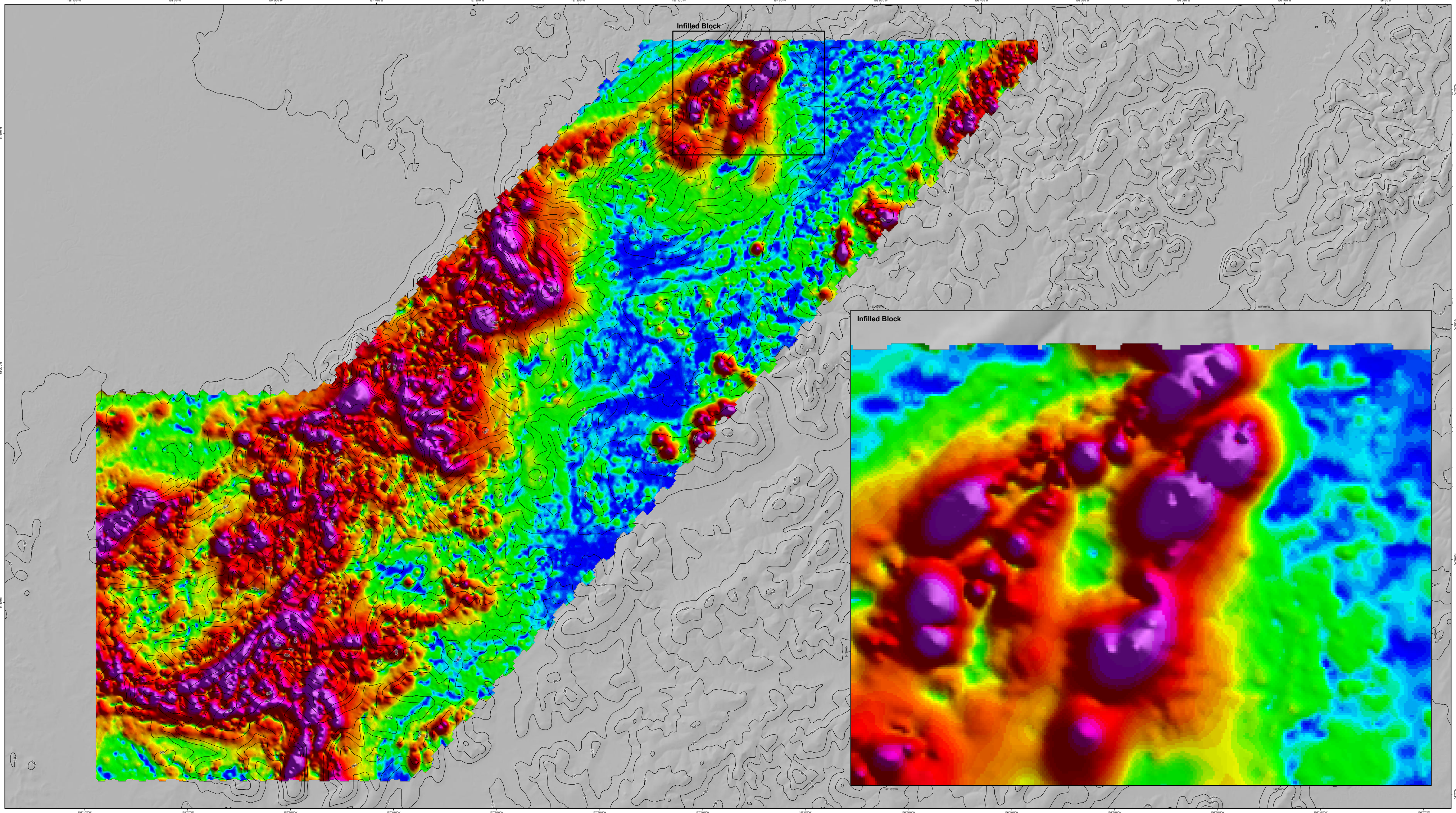

Analytic Signal
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

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SCALE 1:115,000

CONTOUR INTERVAL 100 METERS

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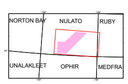

Location of map area

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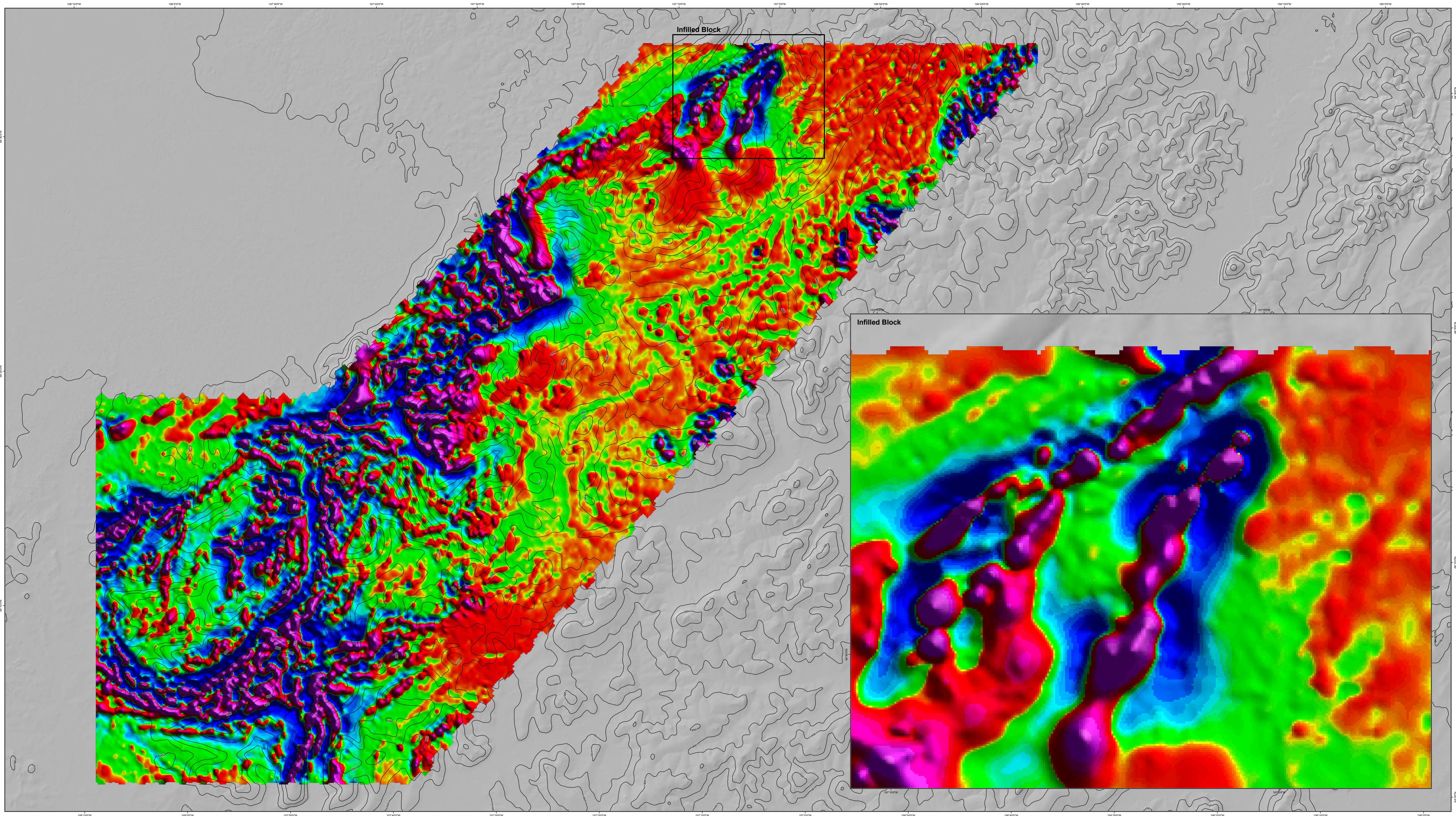

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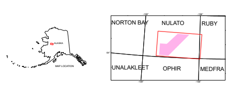

Location of map area

Calculated 1st Vertical Derivative
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

2025

SCALE 1:115,000

CONTOUR INTERVAL 100 METERS

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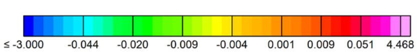

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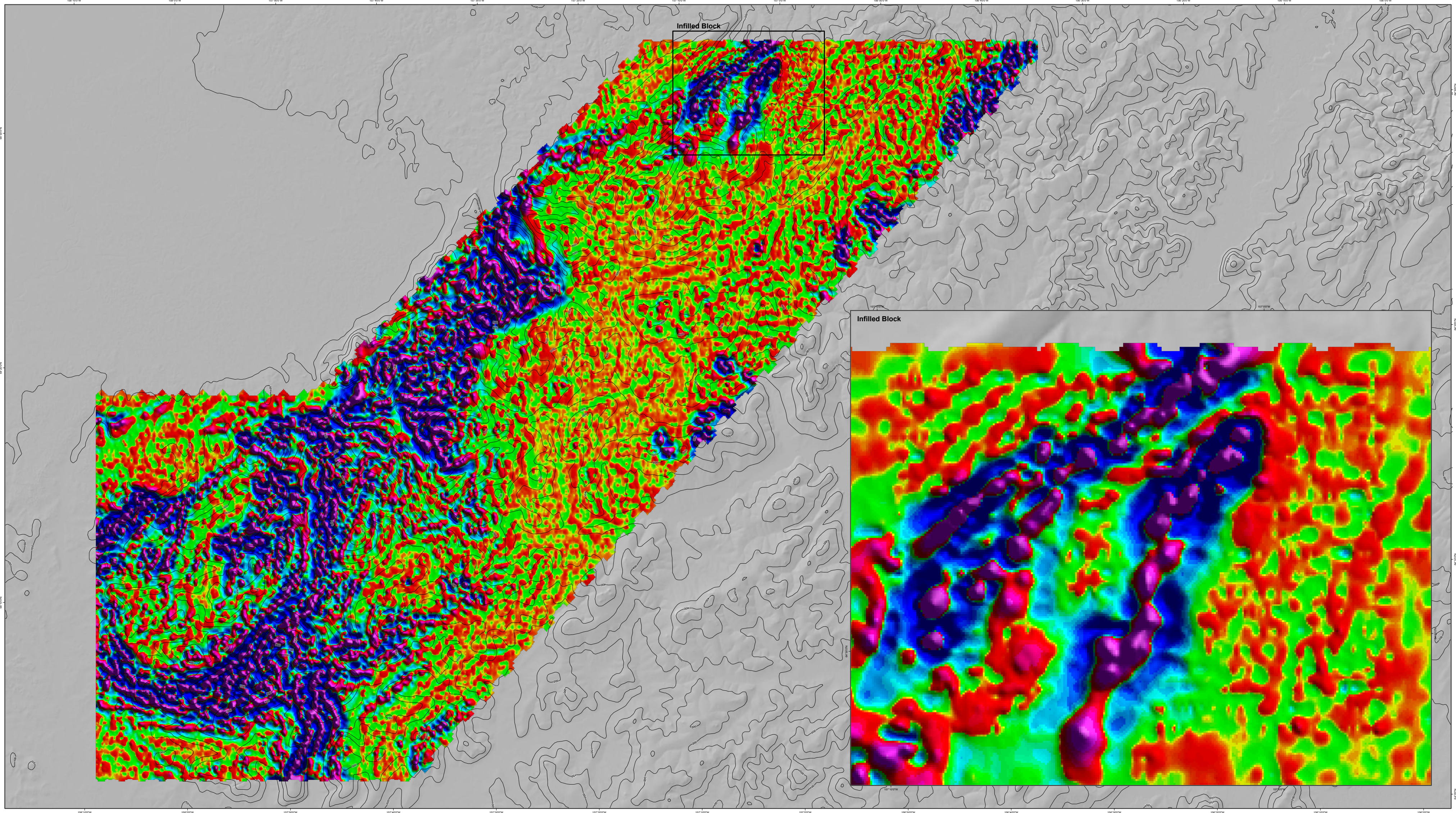

Calculated 2nd Vertical Derivative
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by
Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

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SCALE 1:115,000

CONTOUR INTERVAL 100 METERS

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[3] EON Geosciences Inc., 4018 boul. Côte-Vertu, St-Laurent, QC, Canada H4R 1V4

≤ -0.03652 | -0.00013 | -0.00004 | -0.00001 | 0.00001 | 0.00005 | ≥ 0.04002

Calculated 2nd Vertical Derivative (nT/m^2)

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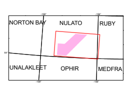

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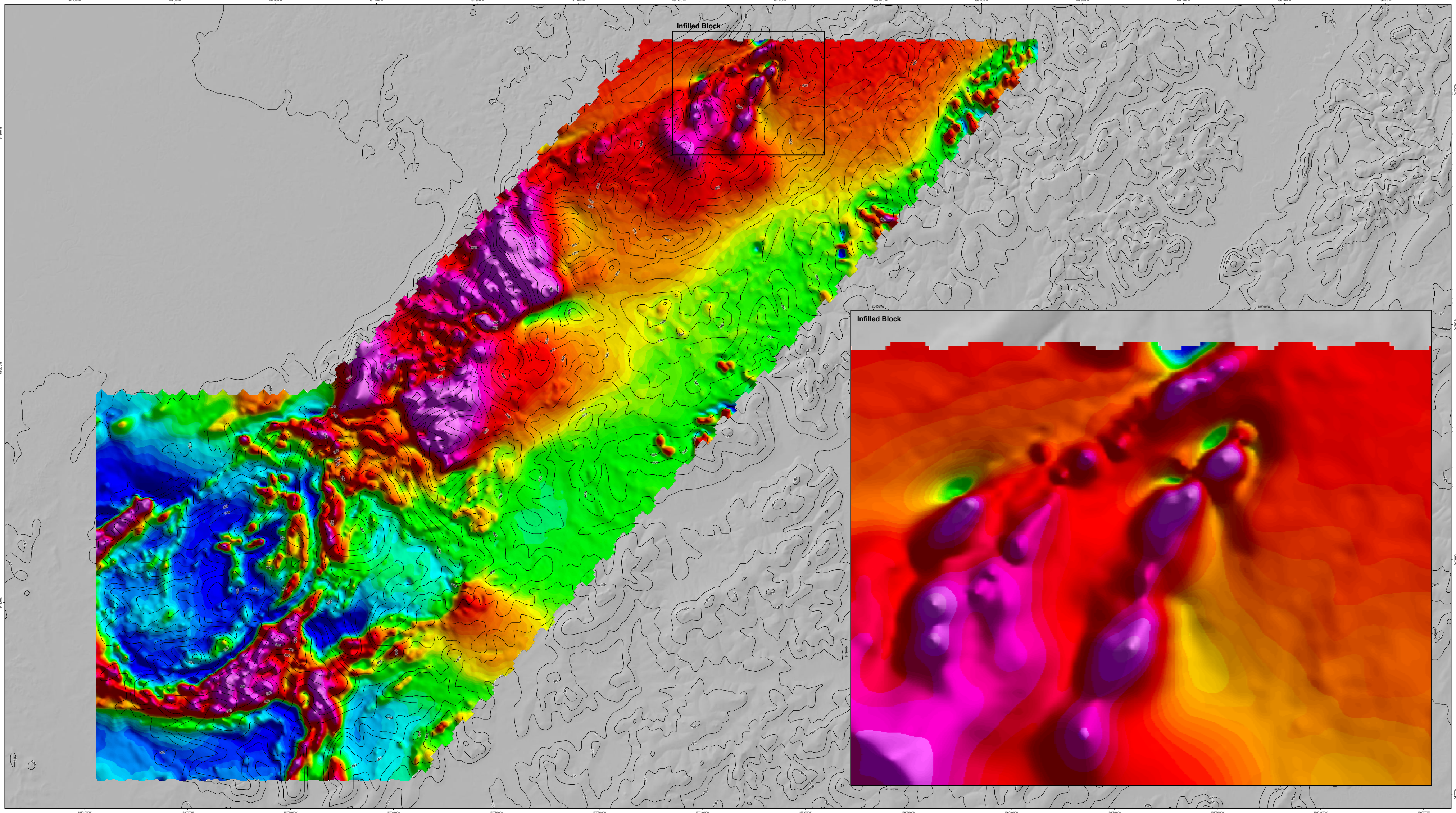

Residual Magnetic Intensity
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

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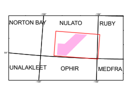
[3] Aqua Geo Frameworks, 10848 Ridge Road, Fort Laramie, Wyoming 82212; formerly DGGS



Location of map area

Residual Magnetic Intensity (nT)

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Basemap hillshade and contours from:
U.S. Geological Survey, EROS Data Center, 2013, Digital elevation - Interferometric Synthetic Aperture Radar (IFSAR) - Alaska
Projection:
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Datum:
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Cartography by:
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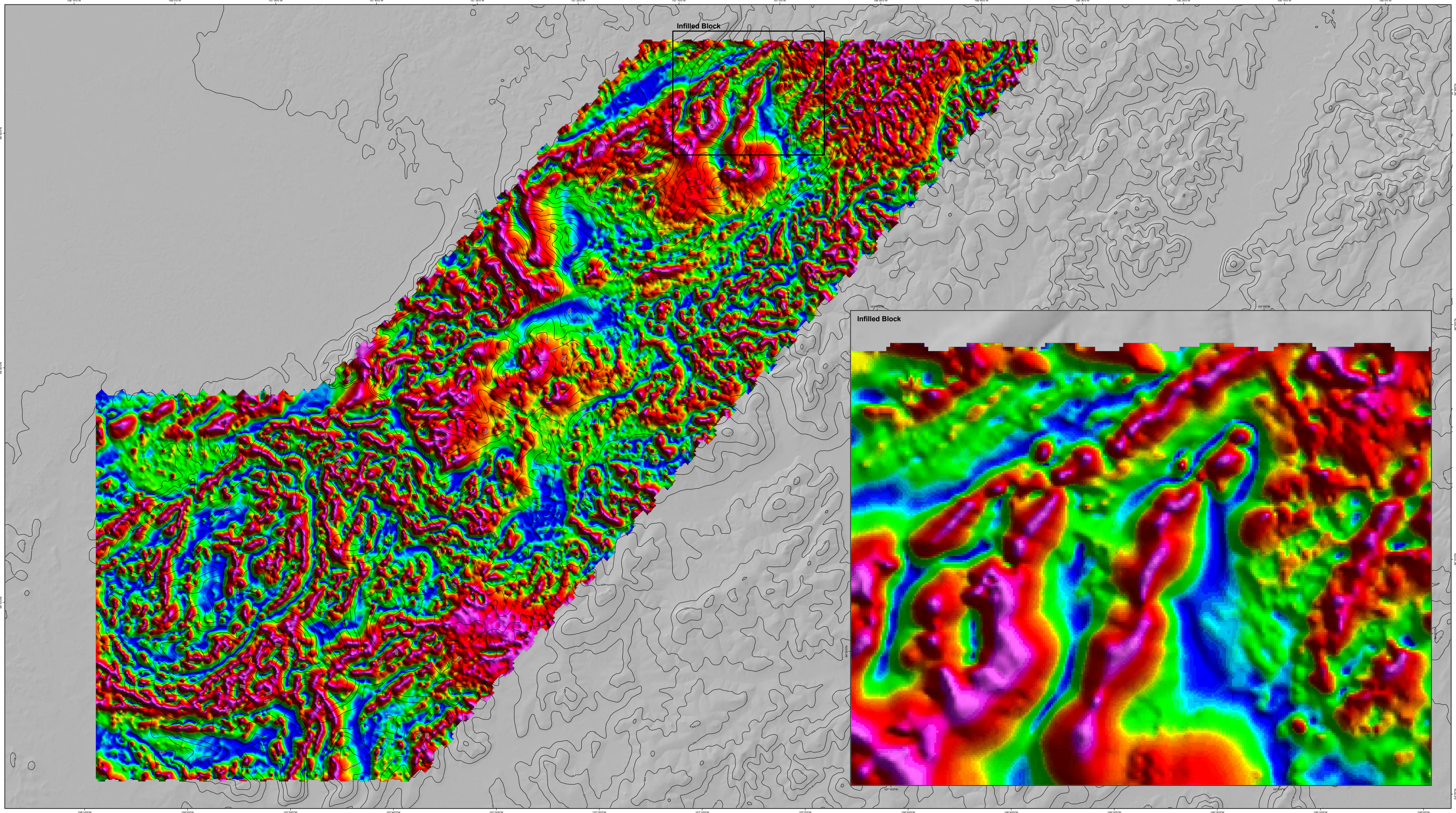

Tilt Derivative
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

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CONTOUR INTERVAL 100 METERS

Affiliations:
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[3] EON Geosciences Inc., 4018 boul. Côte-Vertu, St-Laurent, QC, Canada H4R 1V4

-1.57	-1.25	-1.06	-0.85	-0.62	-0.35	-0.04	0.32	0.73	≥ 1.57

Tilt Derivative (radians)

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Projection:
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Datum:
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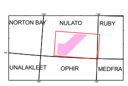

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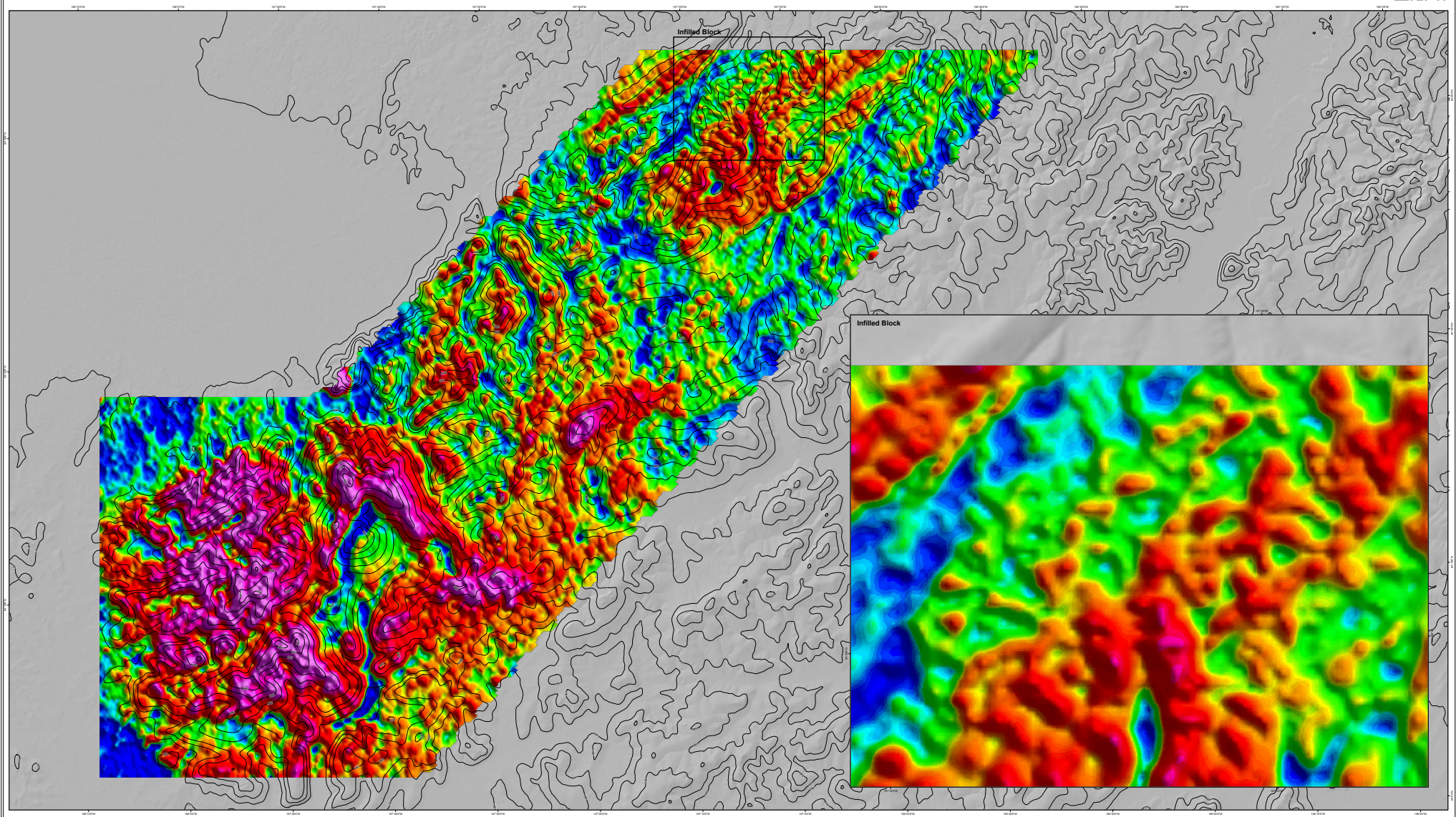

Natural Air Absorbed Dose Rate
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

Fusso, L.A.[1], Petersen E.I.[1], Elmard, A.M.[1], and EON Geosciences Inc.[2]

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Location of map area

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coordinate reference: NAD1983

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≤ -2 | 10 | 12 | 13 | 14 | 15 | 16 | 18 | 19 | 21 | 23 | 27 | ≥ 83

Natural Air Absorbed Dose Rate (nGy/h)

Basemap streams and waterbodies from:
National Hydrography Dataset, U.S. Geological Survey, Reston, Virginia, 2002–2016
Basemap hillshade and contours from:
U.S. Geological Survey, EROS Data Center, 2013, Digital elevation - Interferometric Synthetic Aperture Radar (IFSAR) - Alaska
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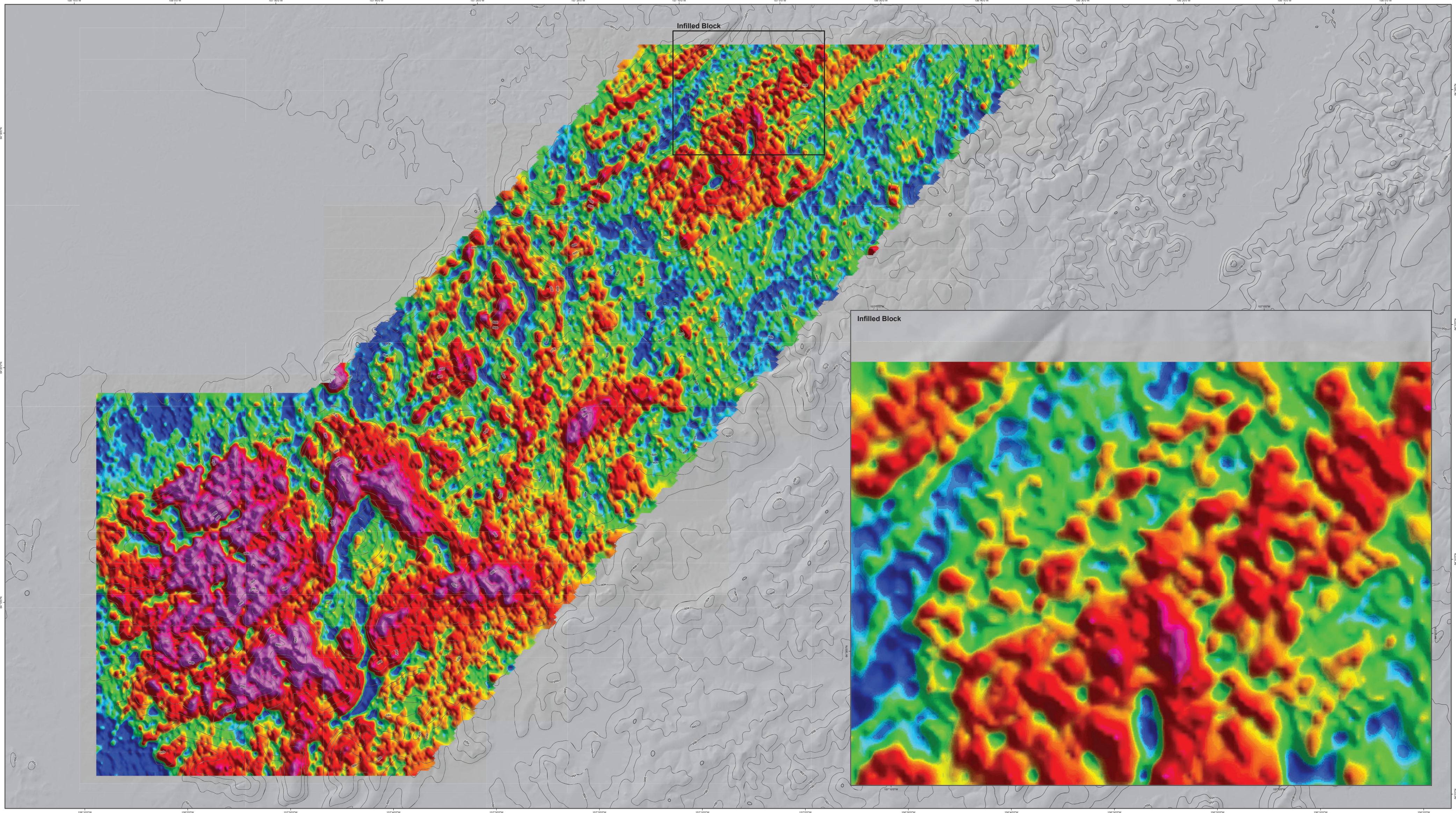


Potassium
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

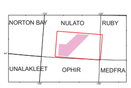
Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

2025

SCALE 1:115,000

CONTOUR INTERVAL 100 METERS

Affiliations:
[1] Alaska Division of Geological & Geophysical Surveys, 3354 College Rd, Fairbanks, AK 99709
[2] Aqua Geo Frameworks, 10848 Ridge Road, Fort Laramie, Wyoming 82212; formerly DGGS *formerly DGGS*
[3] EON Geosciences Inc., 4018 boul. Côte-Vertu, St-Laurent, QC, Canada H4R 1V4



≤ 0.00 | 0.24 | 0.29 | 0.33 | 0.37 | 0.42 | 0.47 | 0.53 | 0.64 | ≥ 2.30

Potassium (%K)

This work was supported by the United States Geological Survey's Earth Mapping Resources Initiative (Earth MRI), grants G22AC00475 and G23AC00408. Additional survey lines were funded over the Infilled Block by Doyon Limited, increasing the data density in that area (shown in detail by inset).

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Projection:
Universal Transverse Mercator Zone 4N
Datum:
WGS 1984
Cartography by:
E.I. Petersen and A.E. Macpherson (2025)

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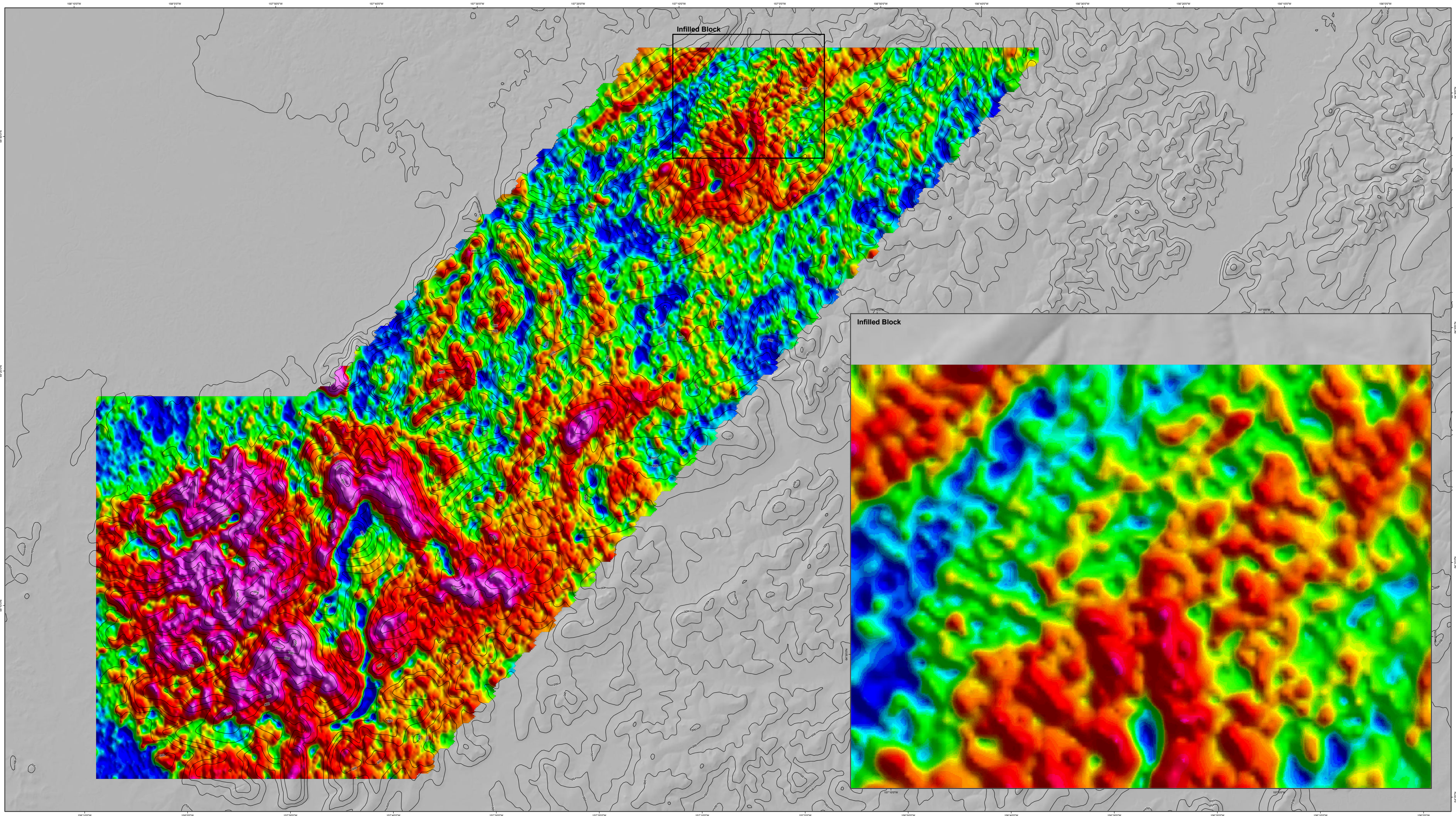

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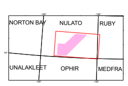

Location of map area

Thorium
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by
Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

2025

APPROXIMATE MEAN DECLINATION 2024

10 5 0 10 MILES

10 5 0 10 KILOMETERS

SCALE 1:115,000

CONTOUR INTERVAL 100 METERS

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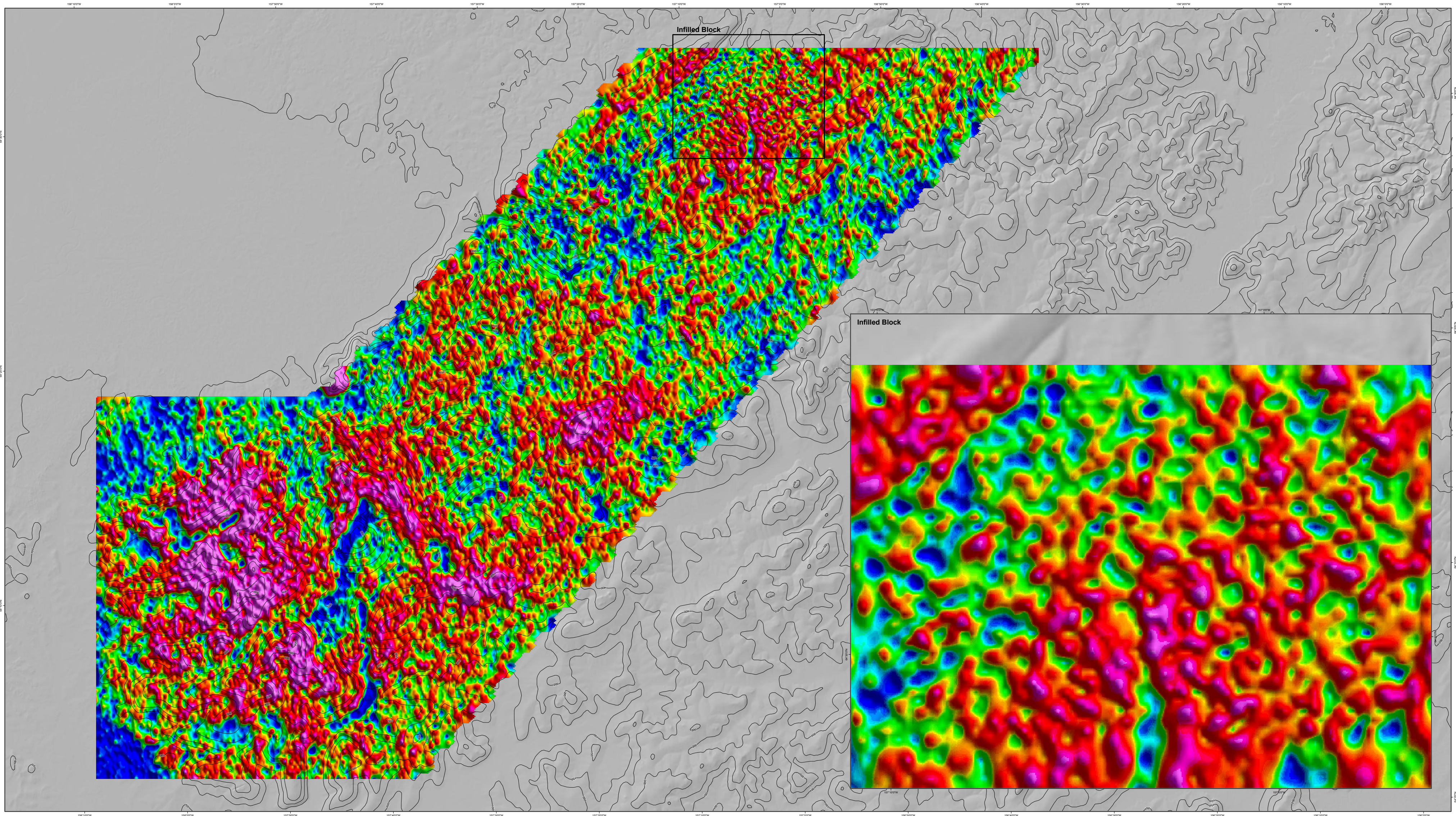

Uranium
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

2025

≤ 0.00	0.61	0.72	0.80	0.87	0.94	1.02	1.10	1.23	≥ 3.94

Uranium (ppm eqU)

SCALE 1:115,000

CONTOUR INTERVAL 100 METERS

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[2] Aqua Geo Frameworks, 10848 Ridge Road, Fort Laramie, Wyoming 82212; formerly DGGS *formerly DGGS*
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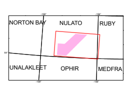

Location of map area

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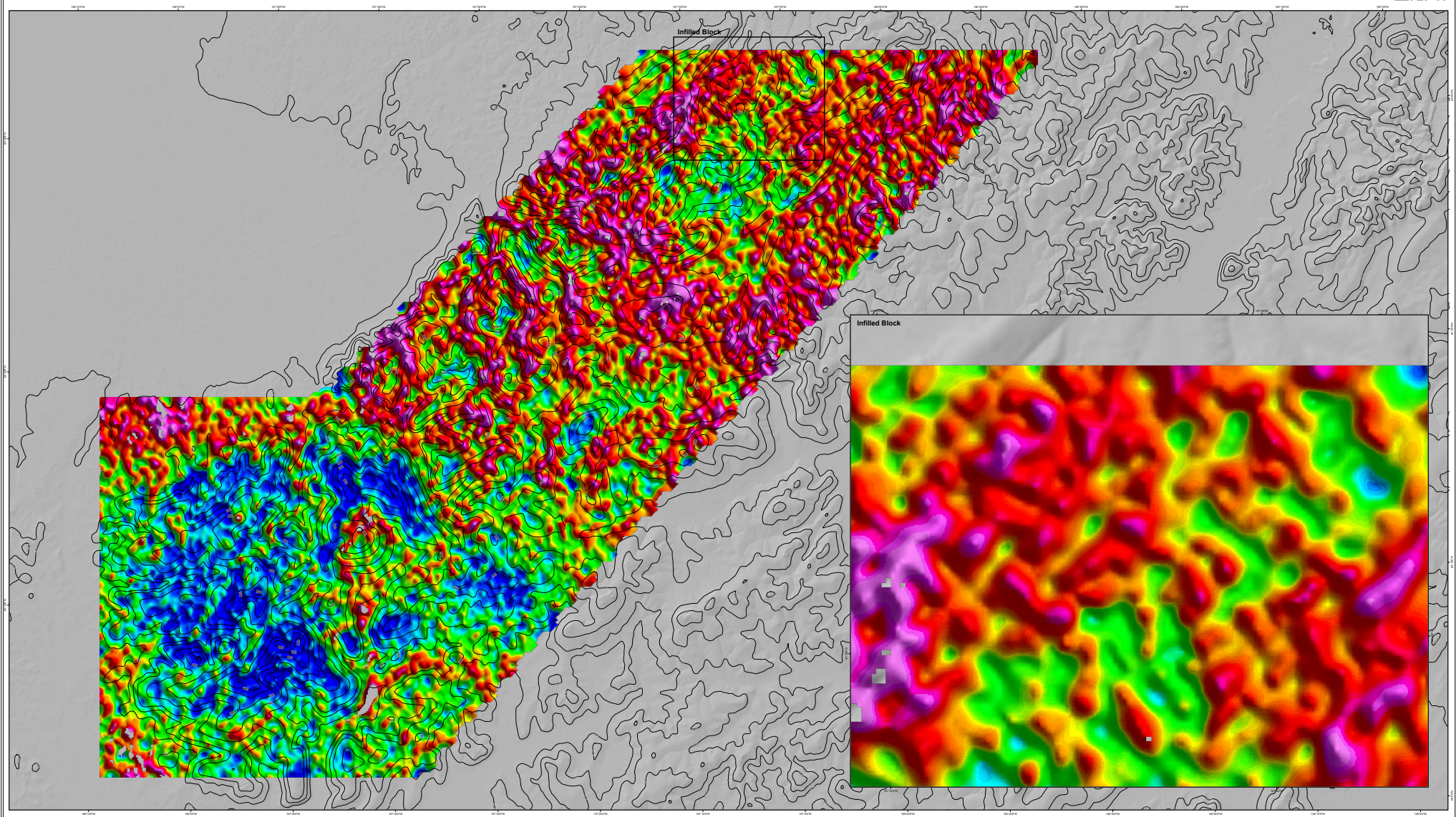

Ratio Uranium / Thorium
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by
Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

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Location of map area

SCALE 1:709,000

coordinate/datum: see text/table

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[2] Aqua Geo Frameworks, 10583 Ridge Road, Fort Lauderdale, Wyoming 82212, formerly DGGS, formerly GSC
[3] EON Geosciences Inc., 3019 Hwd, Côte-Vertu, St-Laurent, QC, Canada H4R 1V5

≤ 0.13 0.26 0.30 0.33 0.35 0.38 0.41 0.44 0.49 ≥ 0.65

Ratio Uranium / Thorium (ppm eqU / ppm eqTh)

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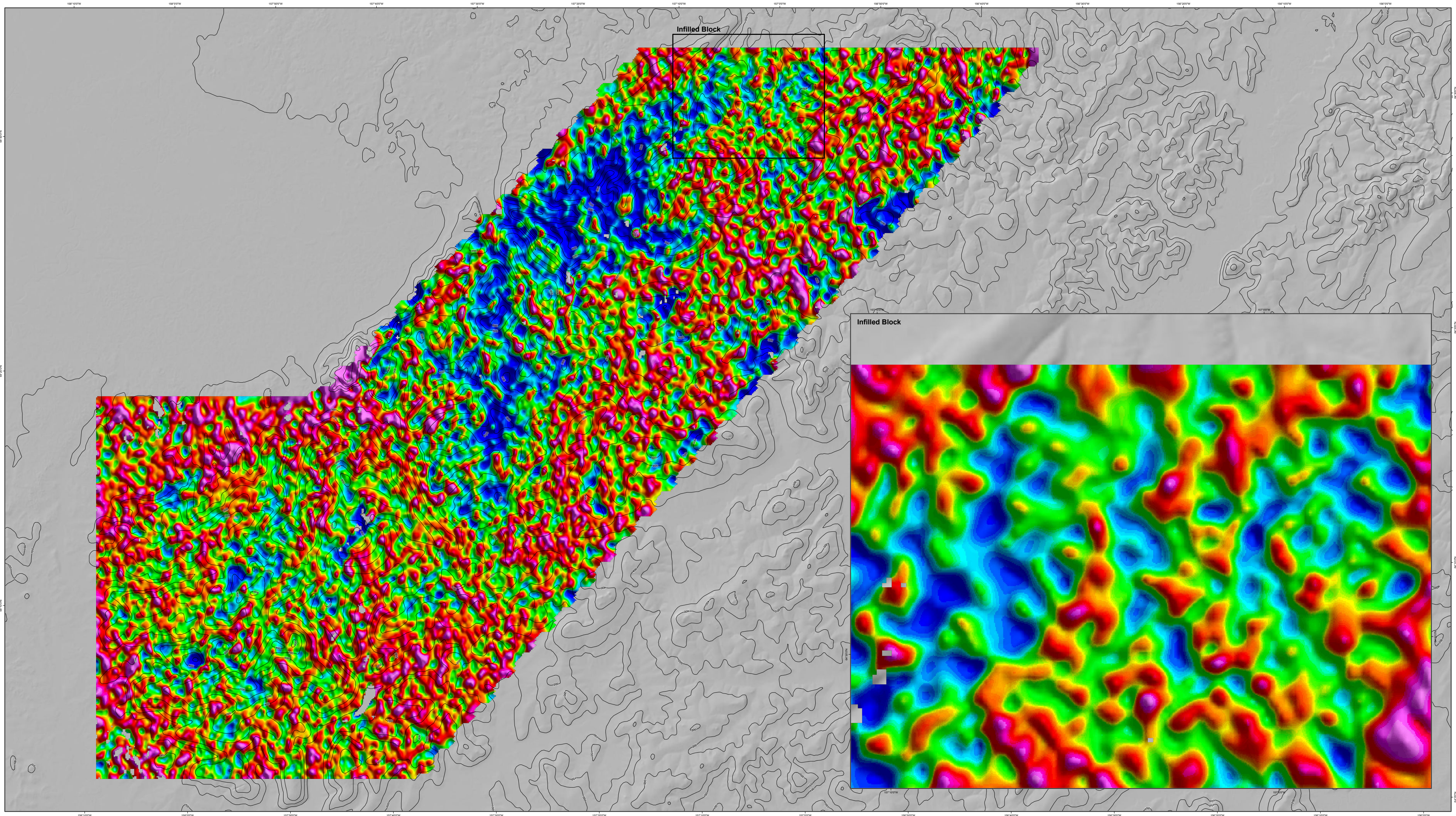

Ratio Thorium / Potassium

Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

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SCALE 1:115,000

CONTOUR INTERVAL 100 METERS

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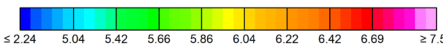

Ratio Thorium / Potassium (ppm eqTh / %K)

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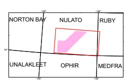

Location of map area

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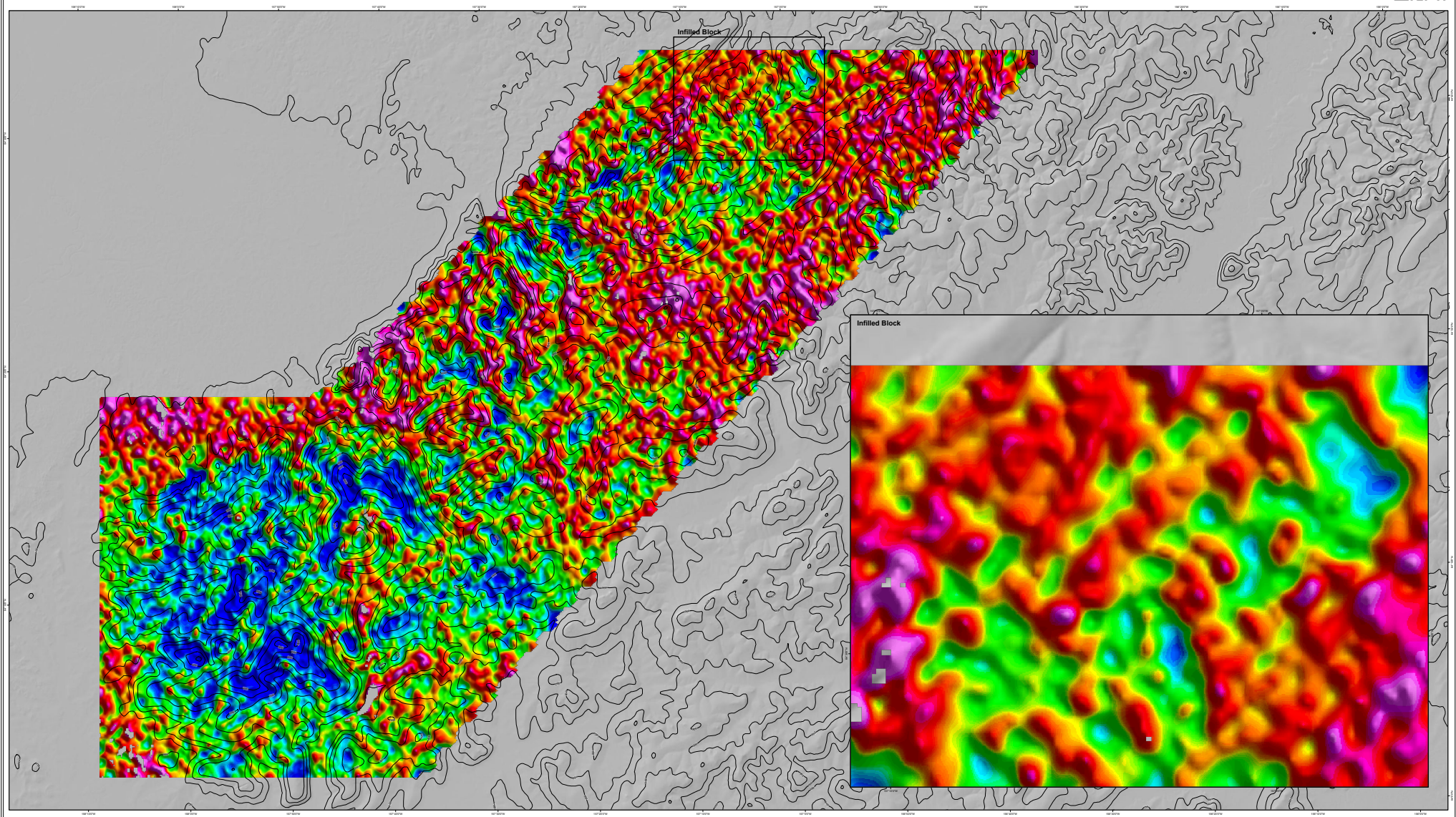

Ratio Uranium / Potassium
Kuskokwim airborne magnetic and radiometric survey, northern Kaiyuh Mountains, Alaska

by

Fusso, L.A.[1], Petersen E.I.[1], Elmard, A.M.[1], and EON Geosciences Inc.[2]

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Location of map area

SCALE 1:709,000

coordinate reference: NAD1983

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≤ 0.67 | 1.53 | 1.76 | 1.94 | 2.10 | 2.27 | 2.44 | 2.65 | 2.95 | ≥ 3.90

Ratio Uranium / Potassium (ppm eqU / %K)

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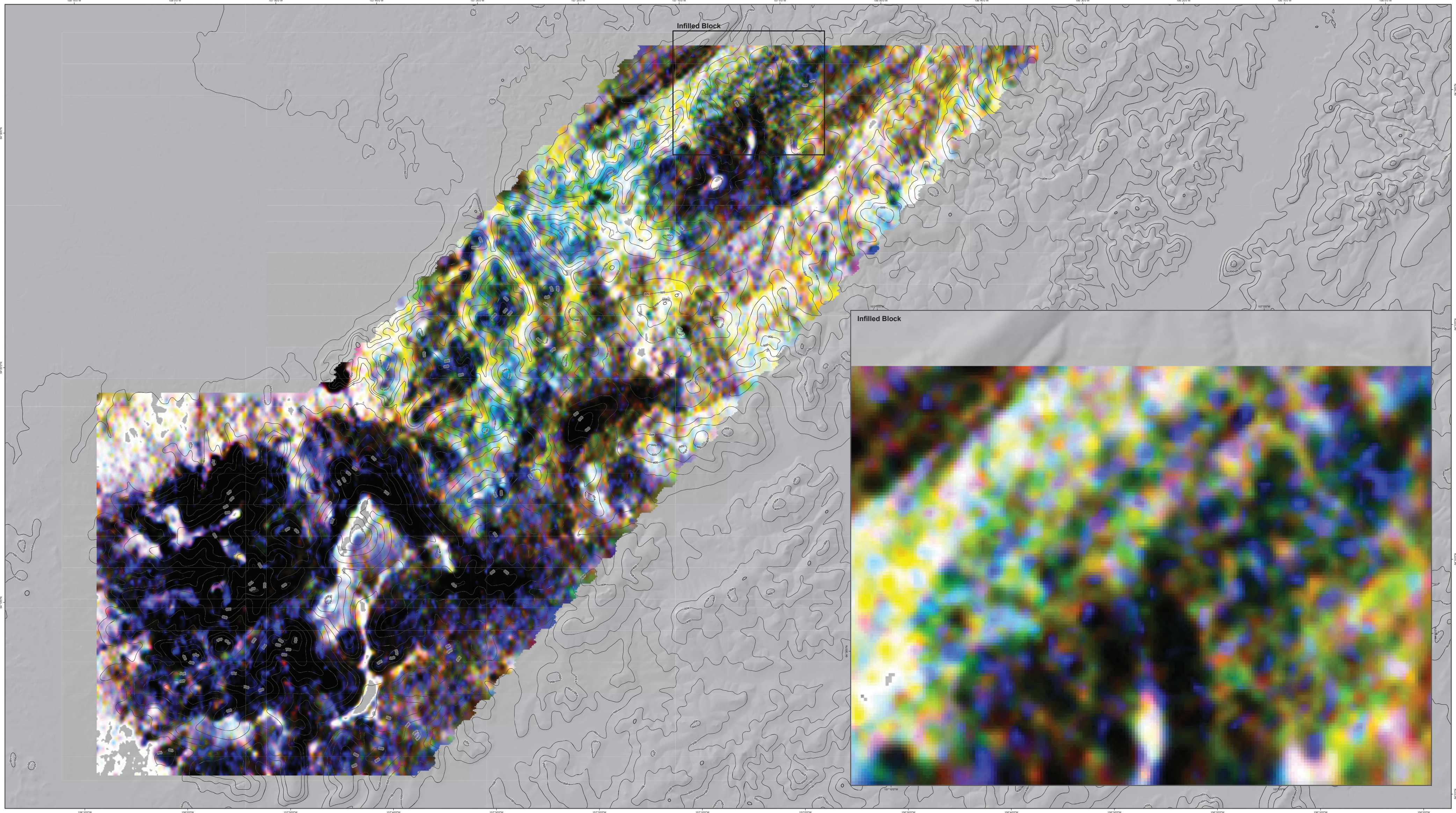

Radiometric Ternary Map
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by
Fusso, L.A.[1], Petersen E.I.[1], Emond, A.M.[2], and EON Geosciences Inc.[3]

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SCALE 1:115,000

CONTOUR INTERVAL 100 METERS

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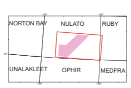

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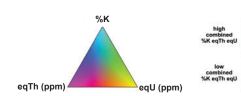

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