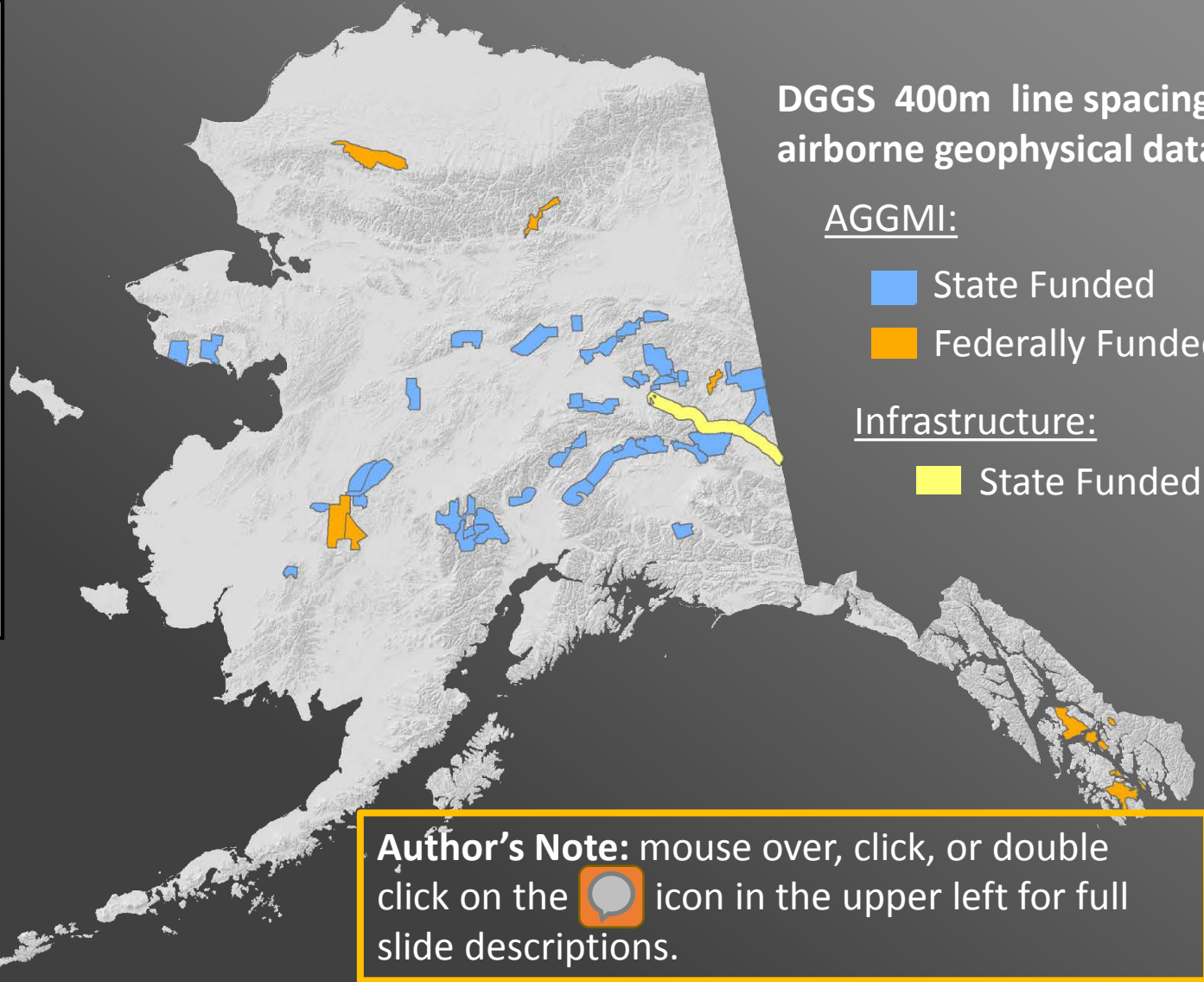



DGGS Airborne Geophysical Data, Applications, Insights, and Updates; Fall 2014

Abraham Emond, Laurel Burns, and Gina Graham
Alaska Division of Geological & Geophysical Surveys

Presented at
Alaska Miners
Association annual
meeting
Anchorage, Alaska,
November 5th
2014

East Styx and
Tonsina data
added February
2015

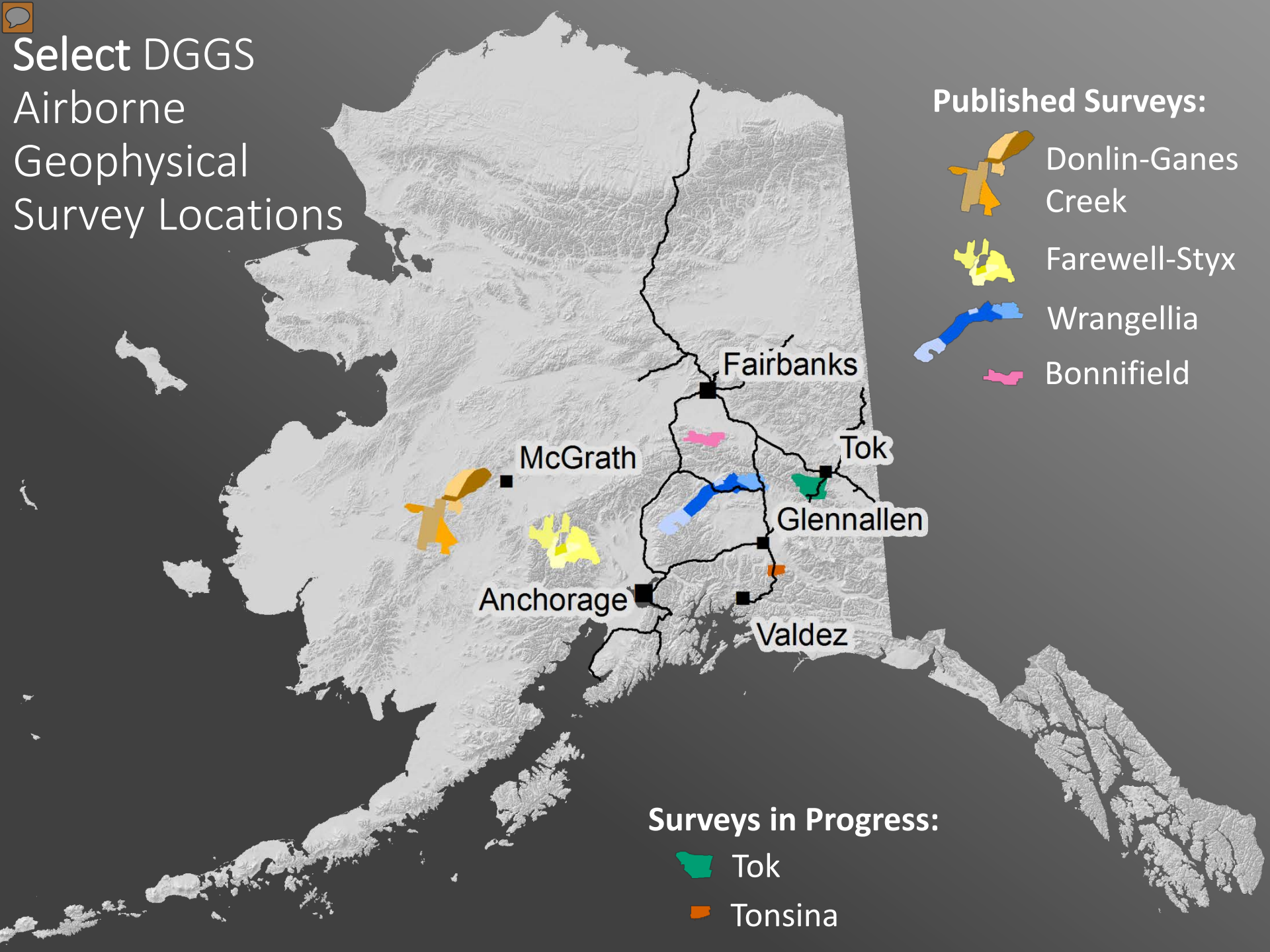


Author's Note: mouse over, click, or double click on the  icon in the upper left for full slide descriptions.

Select DGGS
Airborne
Geophysical
Survey Locations

Published Surveys:

-  Donlin-Ganes Creek
-  Farewell-Styx
-  Wrangellia
-  Bonnifield



Surveys in Progress:

-  Tok
-  Tonsina

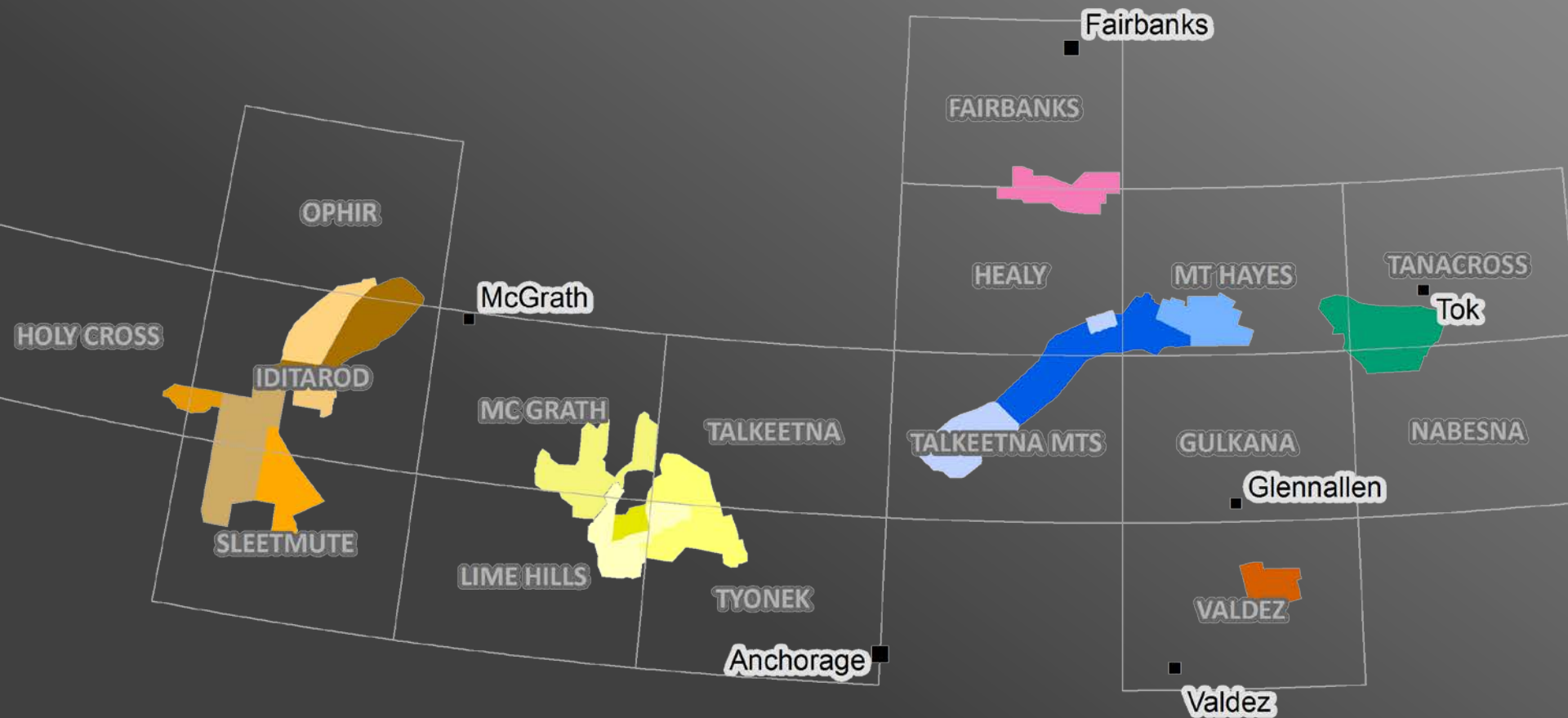
 **Published Surveys:**

-  Donlin-Ganes Creek
-  Farewell-Styx
-  Wrangellia
-  Bonnifield

Surveys in Progress:

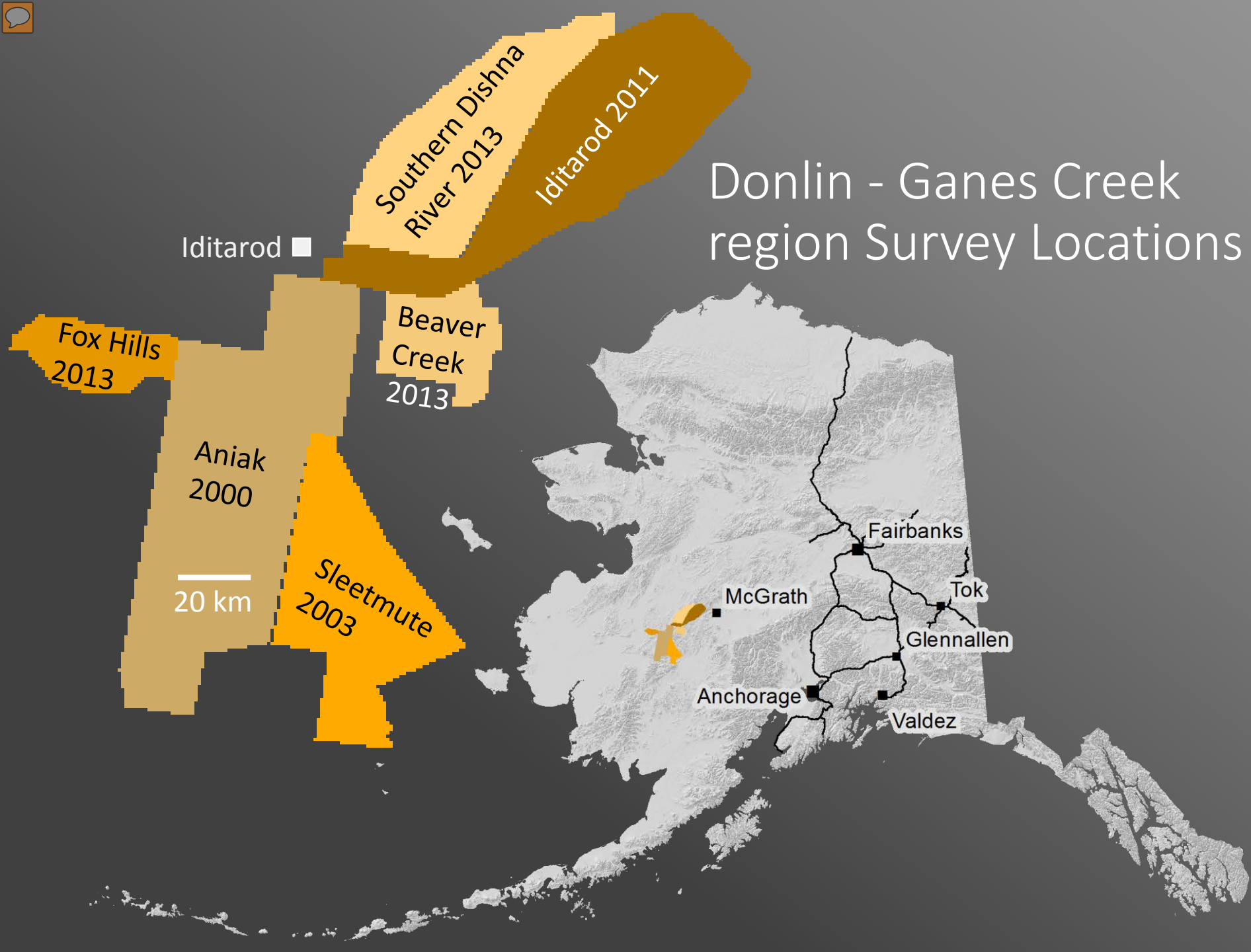
-  Tok
-  Tonsina

Select DGGs Airborne Geophysical Survey Locations and 1:250K Quadrangle boundaries





Donlin - Ganes Creek region Survey Locations





Magnetic and 7200 Hz Apparent resistivity maps: S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys



20 km

* lode mineralization

Chicken Mountain,
Golden Horn,
Malemute

Ganes Creek

Iditarod

Donlin

Red Devil



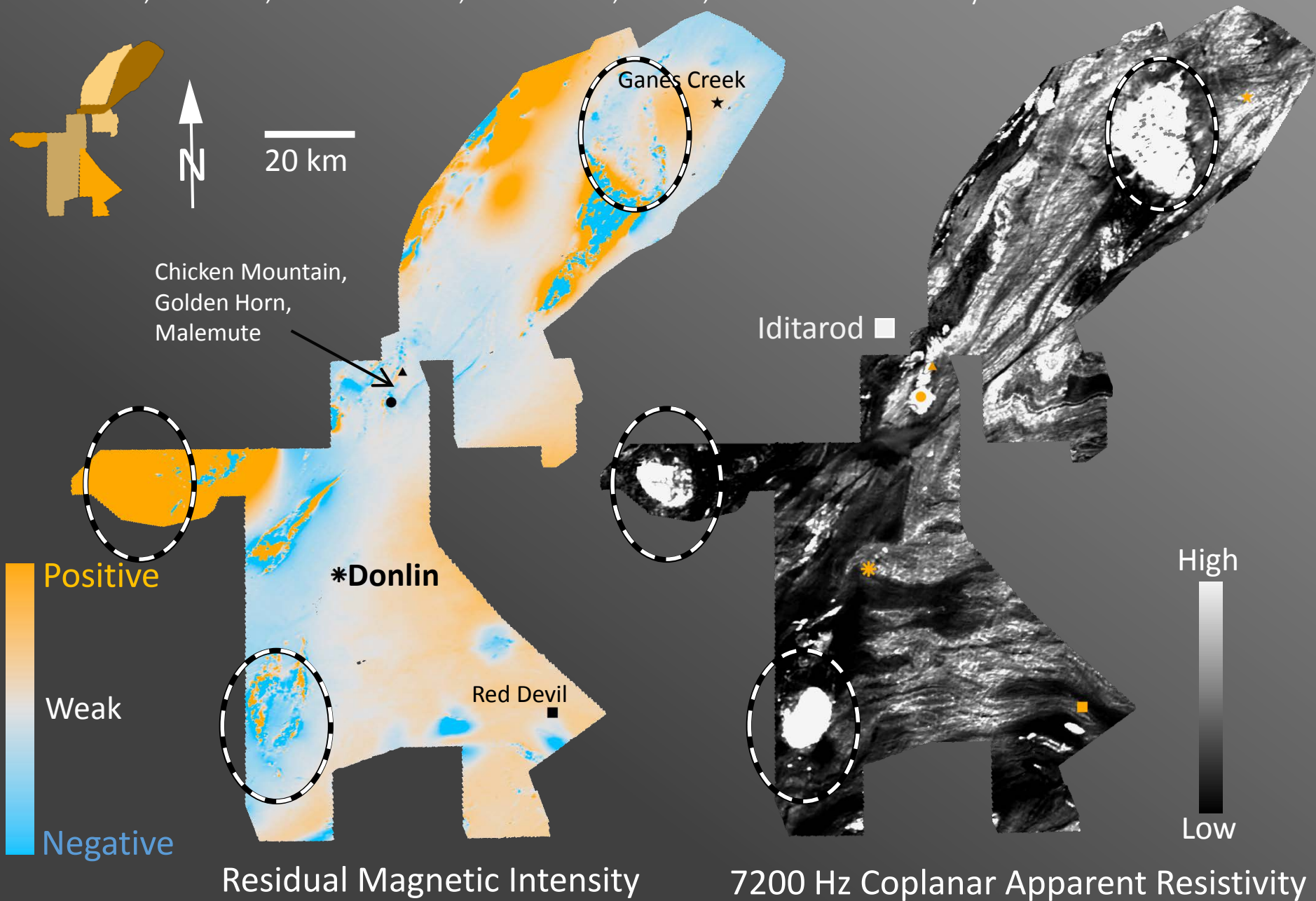
Residual Magnetic Intensity



7200 Hz Coplanar Apparent Resistivity

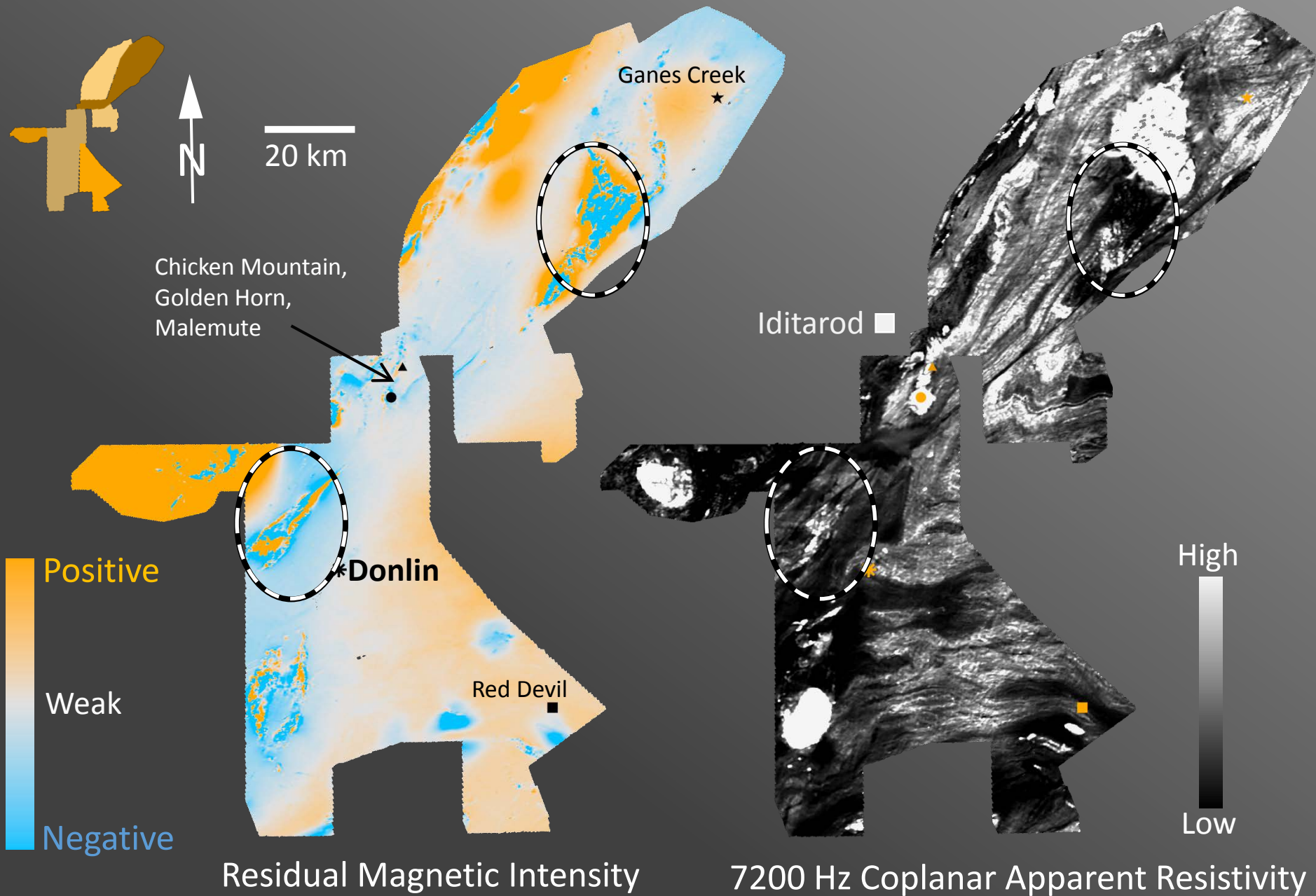


Magnetic and 7200 Hz Apparent resistivity maps: S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys



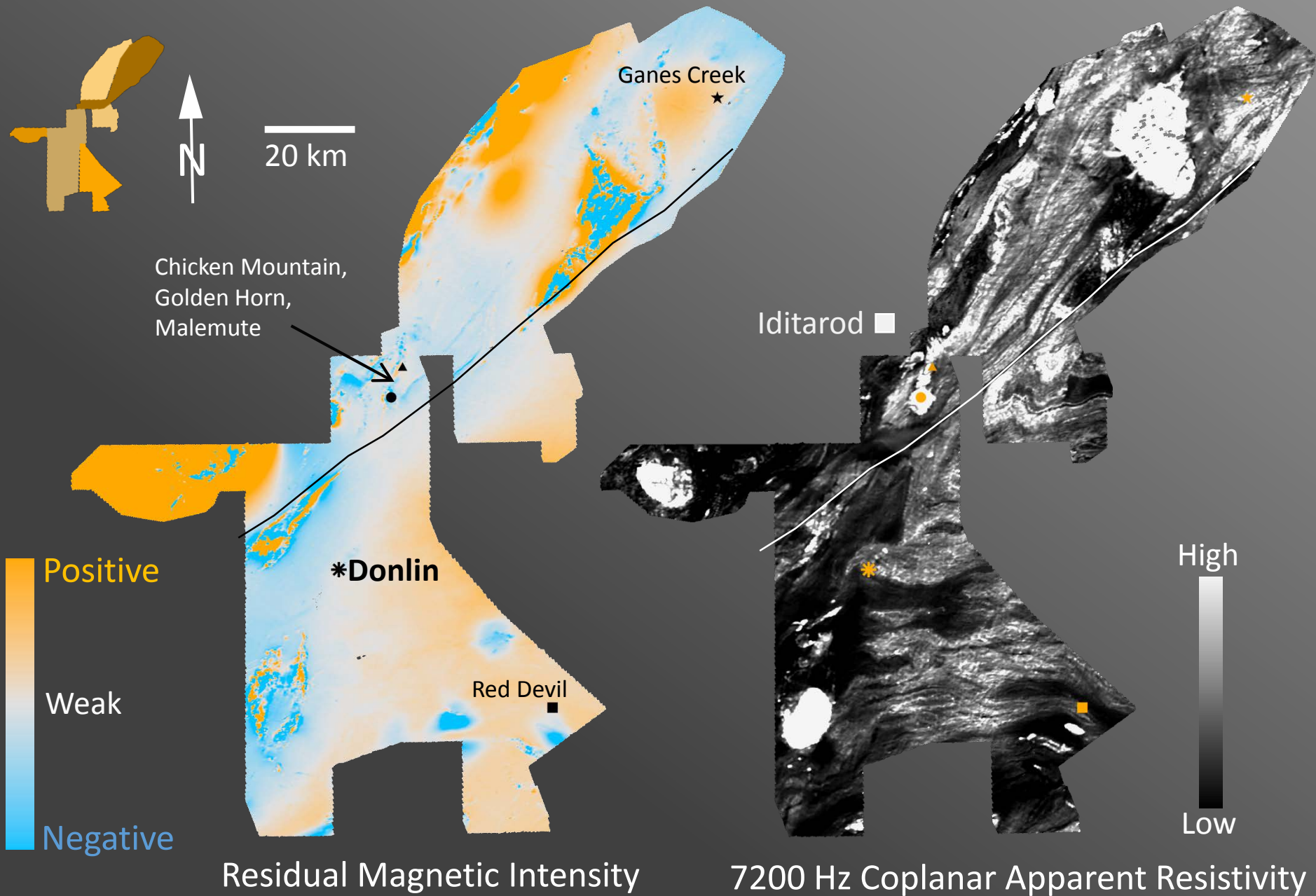


Magnetic and 7200 Hz Apparent resistivity maps: S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys





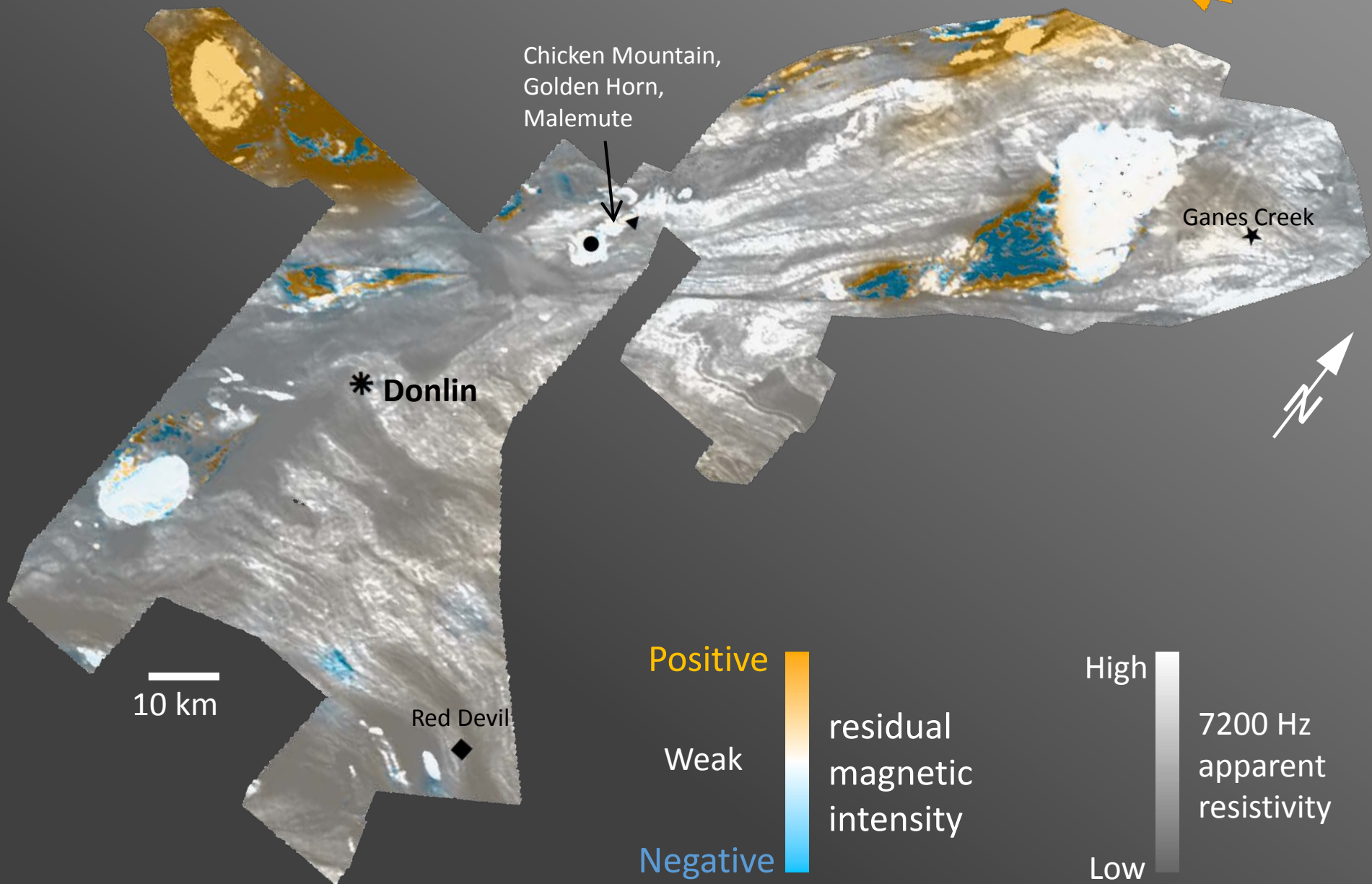
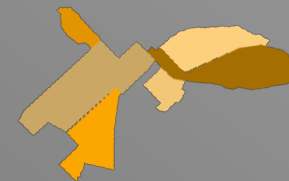
Magnetic and 7200 Hz Apparent resistivity maps: S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys





Resistivity and magnetic data composite map:

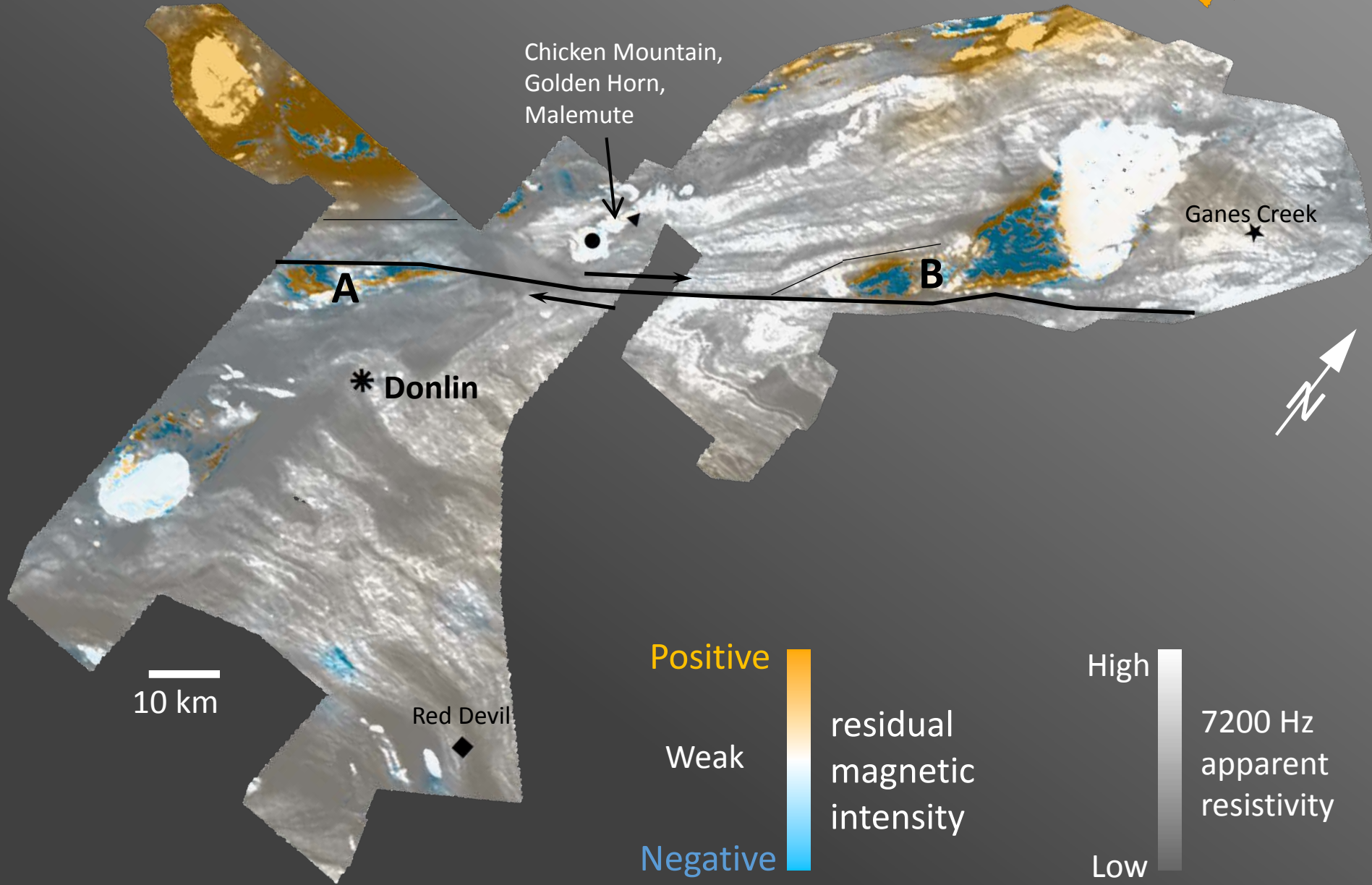
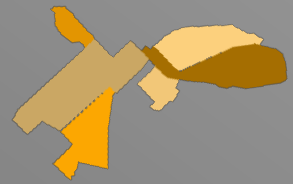
S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys





Resistivity and magnetic data composite map:

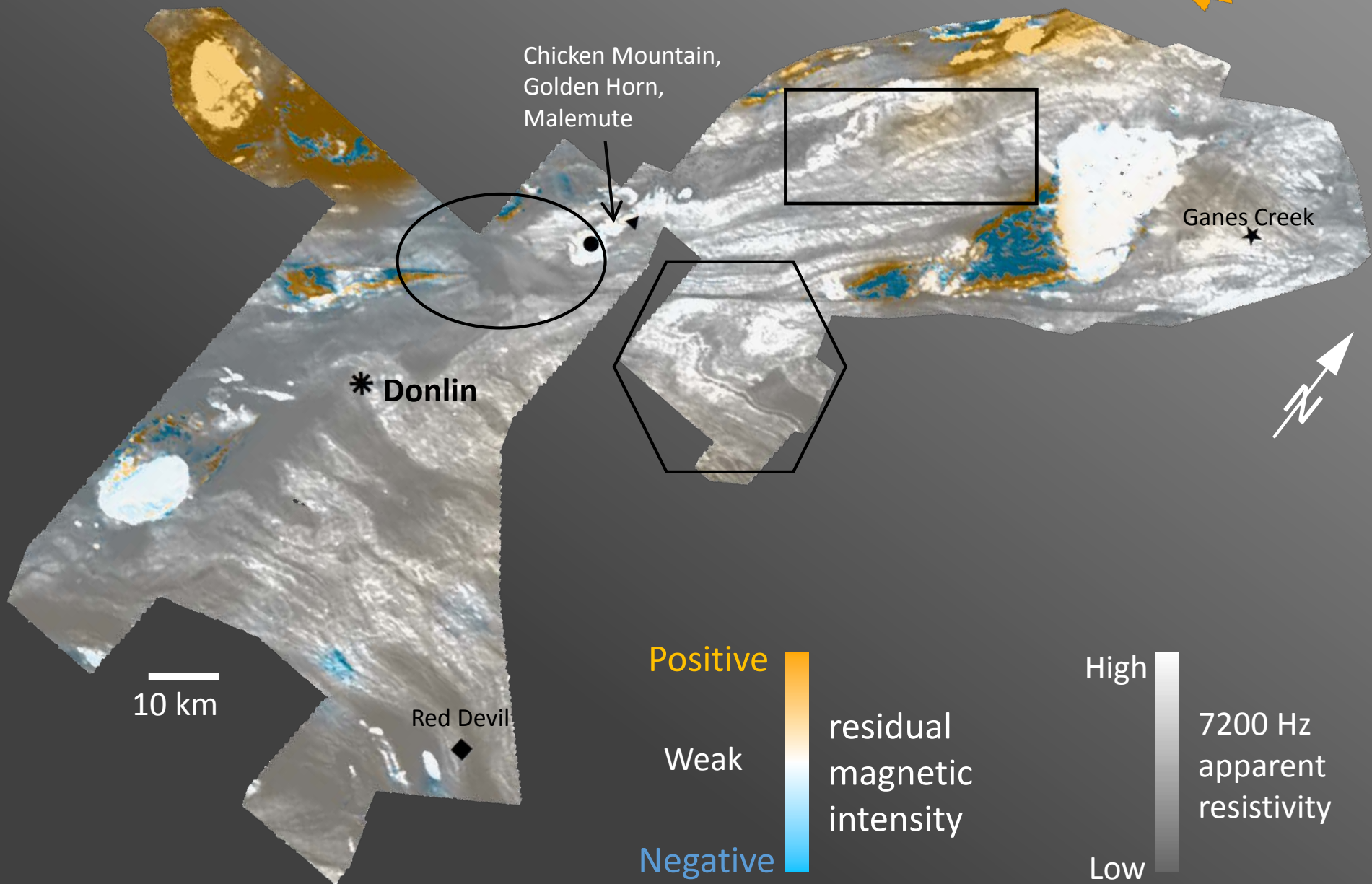
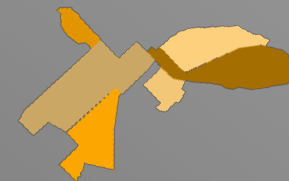
S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys



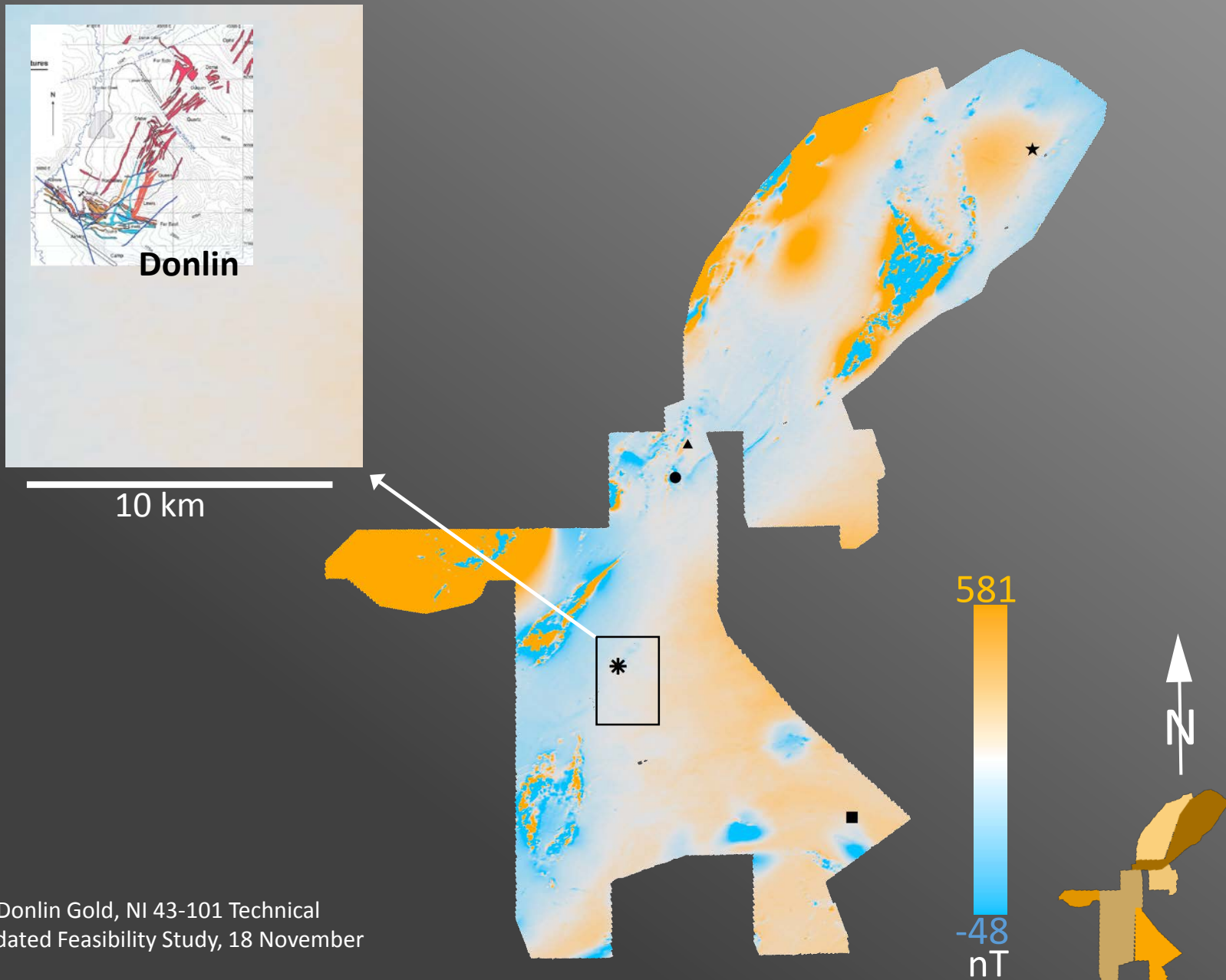


Resistivity and magnetic data composite map:

S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys

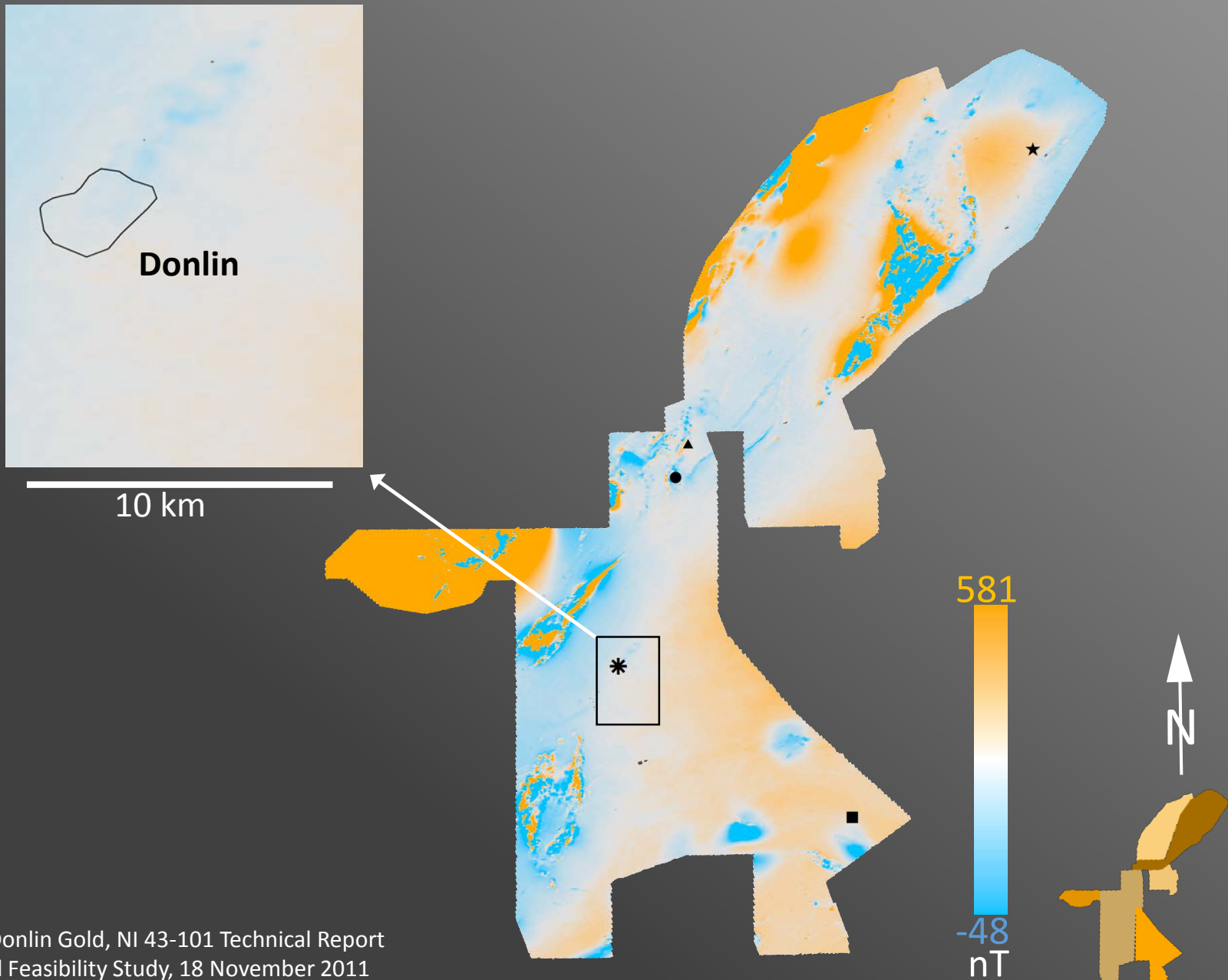


Magnetic data, 80 % data range and local geology, Donlin:
S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys



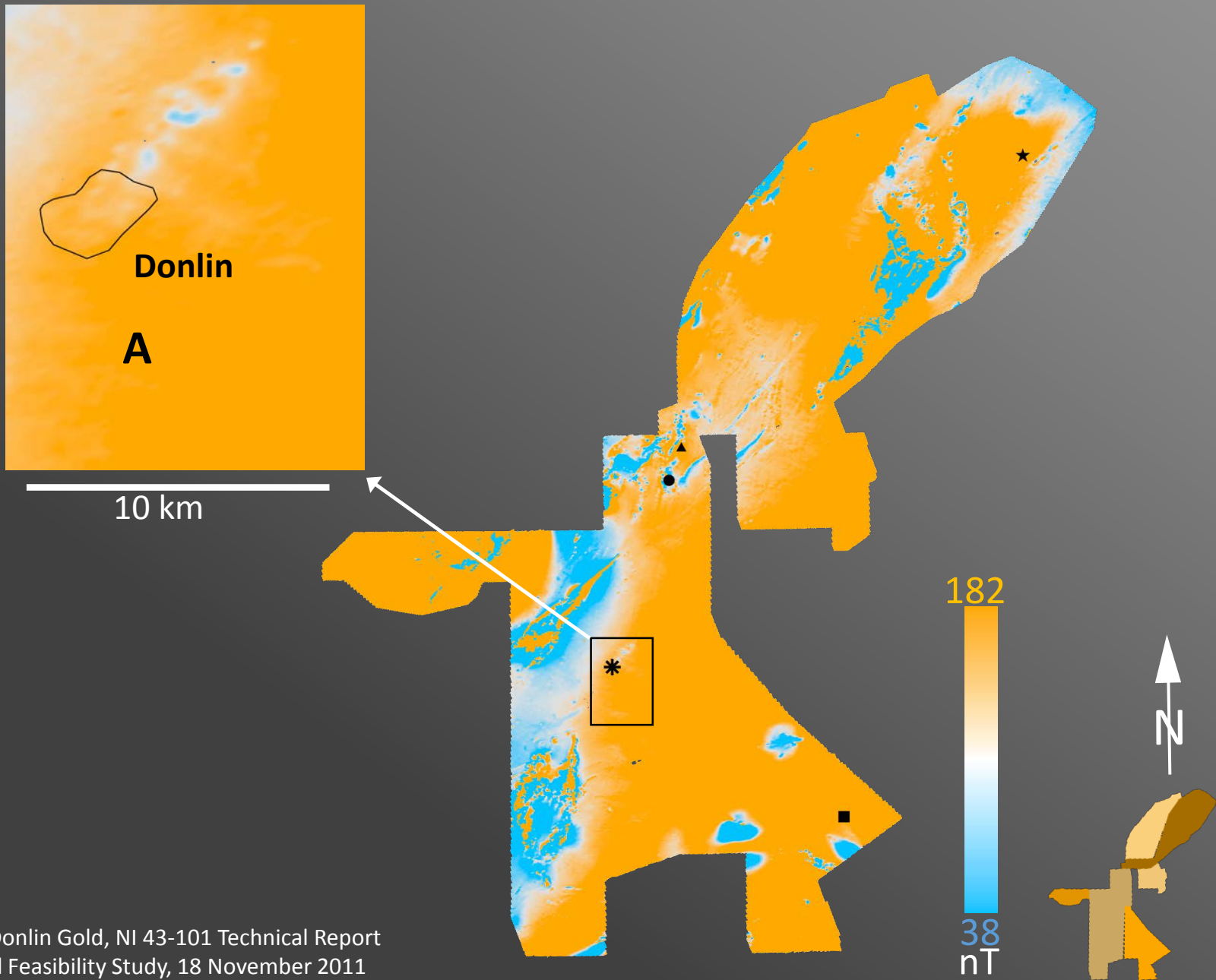
Geology: Figure 7-2, Donlin Gold, NI 43-101 Technical Report on Second Updated Feasibility Study, 18 November 2011

Magnetic data, 80 % data range, Donlin:
S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys



Pit Outline From: Donlin Gold, NI 43-101 Technical Report on Second Updated Feasibility Study, 18 November 2011

Magnetic data, 20 % data range, Donlin:
S. Dishna, Iditarod, Beaver Creek, Sleetmute, Aniak, and Fox Hills surveys



Pit Outline From: Donlin Gold, NI 43-101 Technical Report on Second Updated Feasibility Study, 18 November 2011



Farewell and Styx Survey Locations

20 km

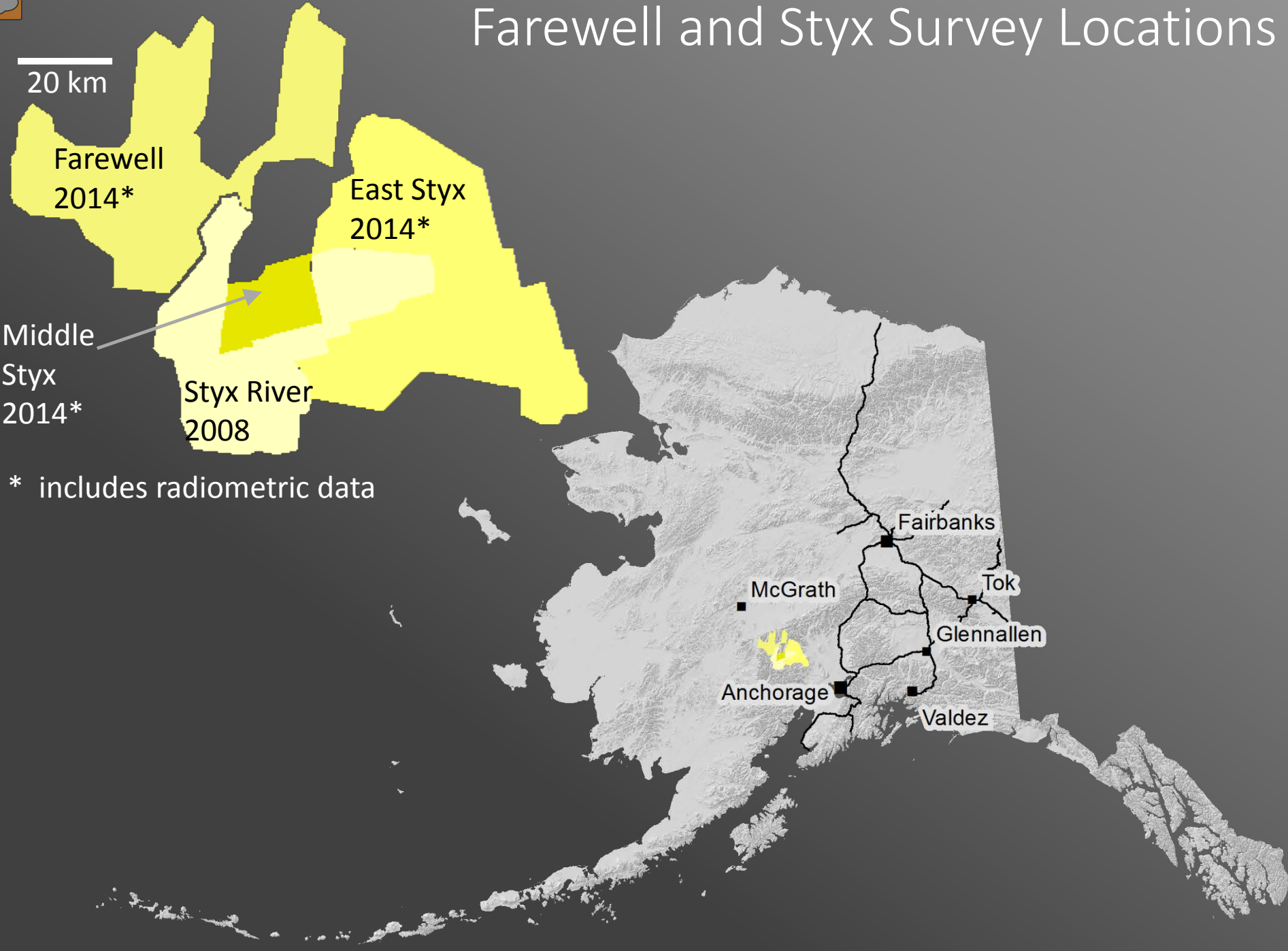
Farewell
2014*

East Styx
2014*

Middle
Styx
2014*

Styx River
2008

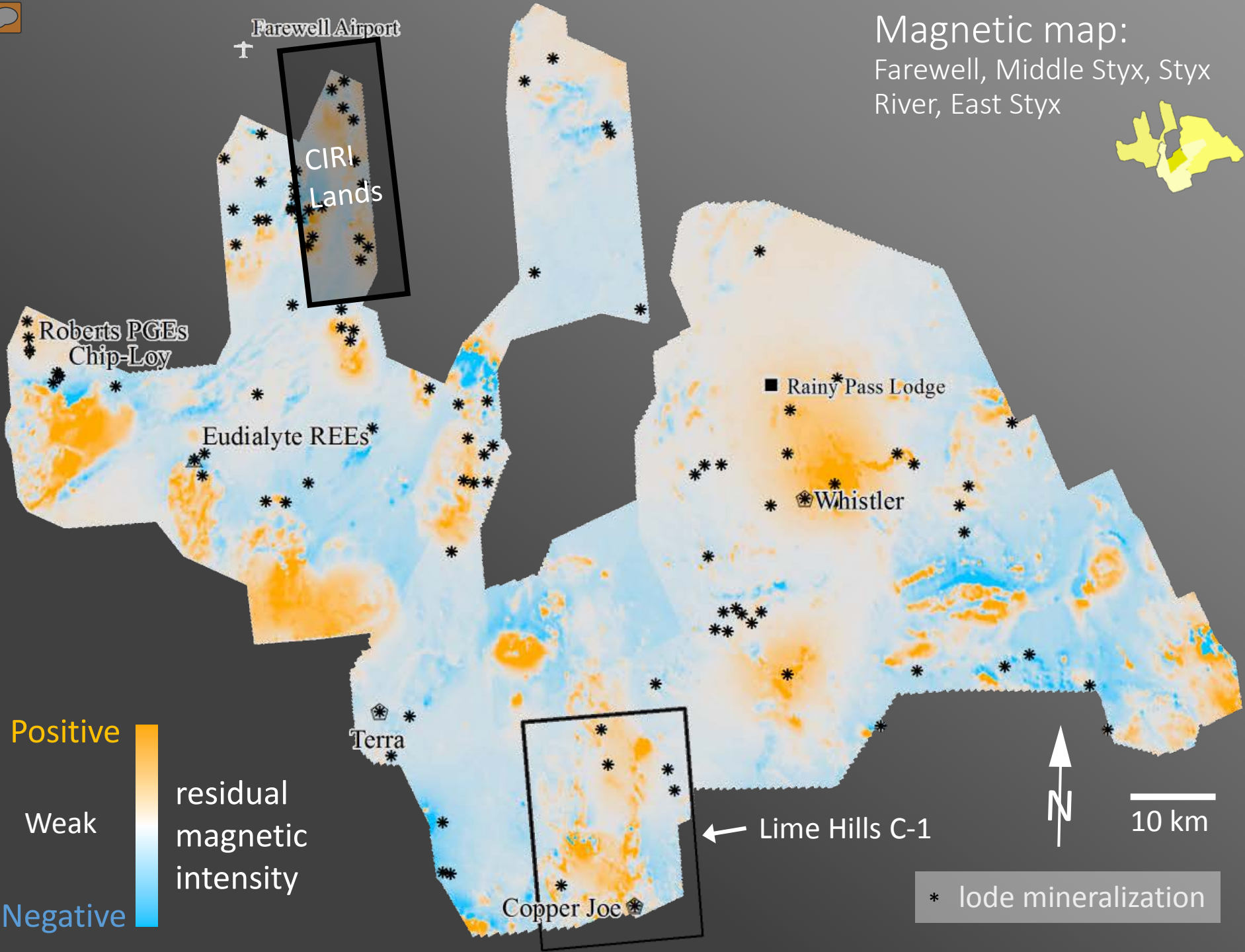
* includes radiometric data





Magnetic map:

Farewell, Middle Styx, Styx River, East Styx



Positive
Weak
Negative

residual
magnetic
intensity

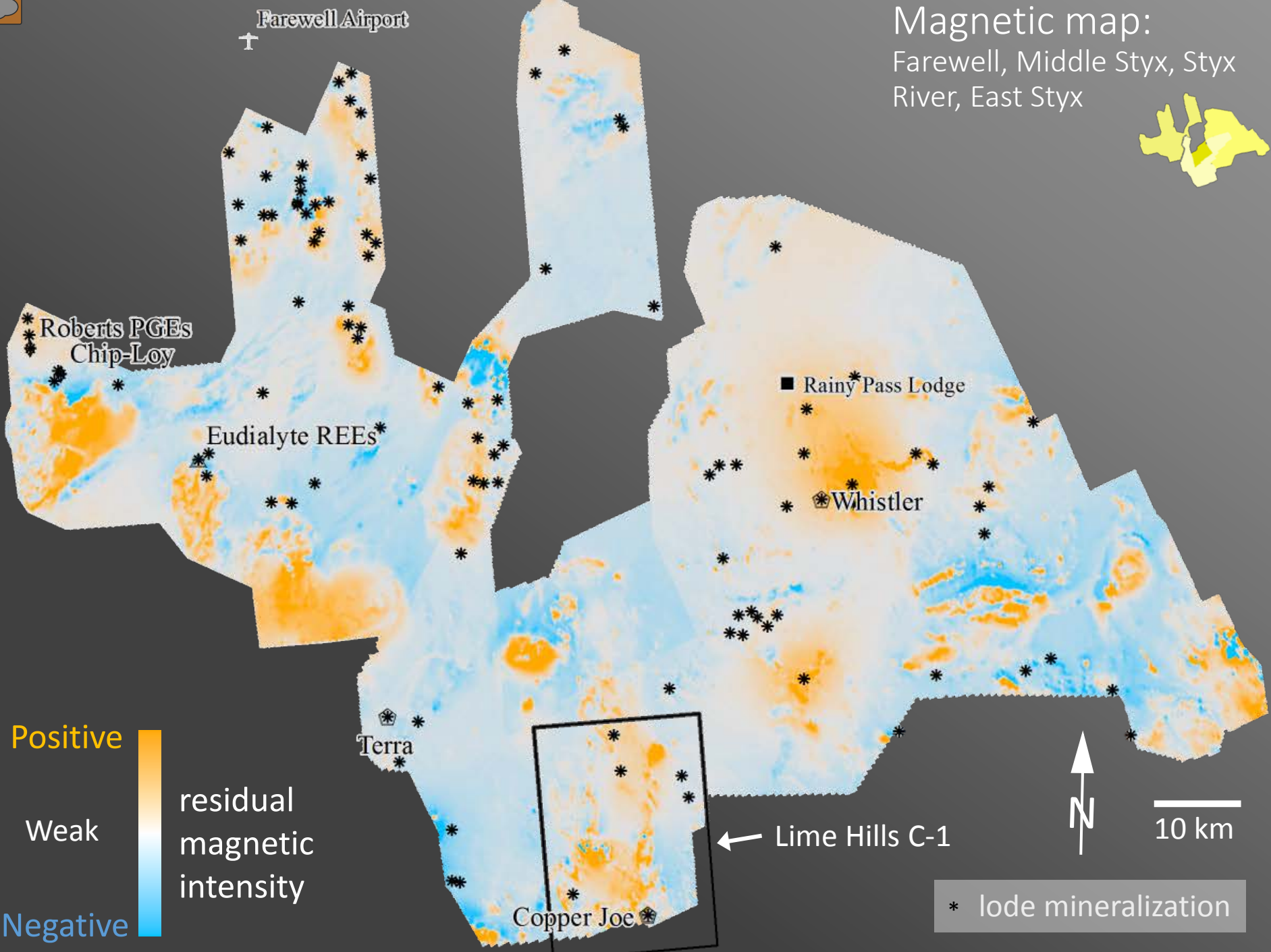
* lode mineralization



10 km



Magnetic map:
Farewell, Middle Styx, Styx
River, East Styx



Positive
Weak
Negative

residual
magnetic
intensity

* lode mineralization



7200 Hz Apparent Resistivity map: Farewell, Middle Styx, Styx River, East Styx

Farewell Airport
↑



Roberts PGEs
♦♦

Chip-Loy
♦

Eudialyte REEs
▲

Rainy Pass Lodge
□

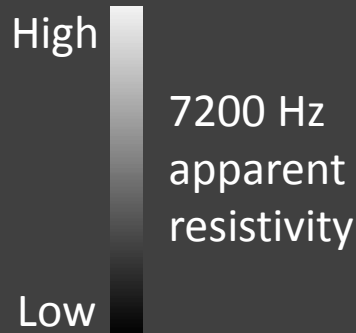
Whistler
◆

Terra
◆



← Lime Hills C-1

Copper Joe
◆



10 km



7200 Hz Apparent Resistivity map: Farewell, Middle Styx, Styx River, East Styx



Farewell Airport
↑

Roberts PGEs
Chip-Loy

Eudialyte REEs

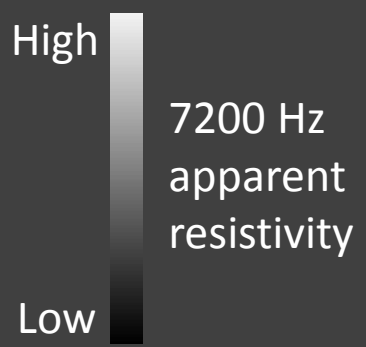
Rainy Pass Lodge

Whistler

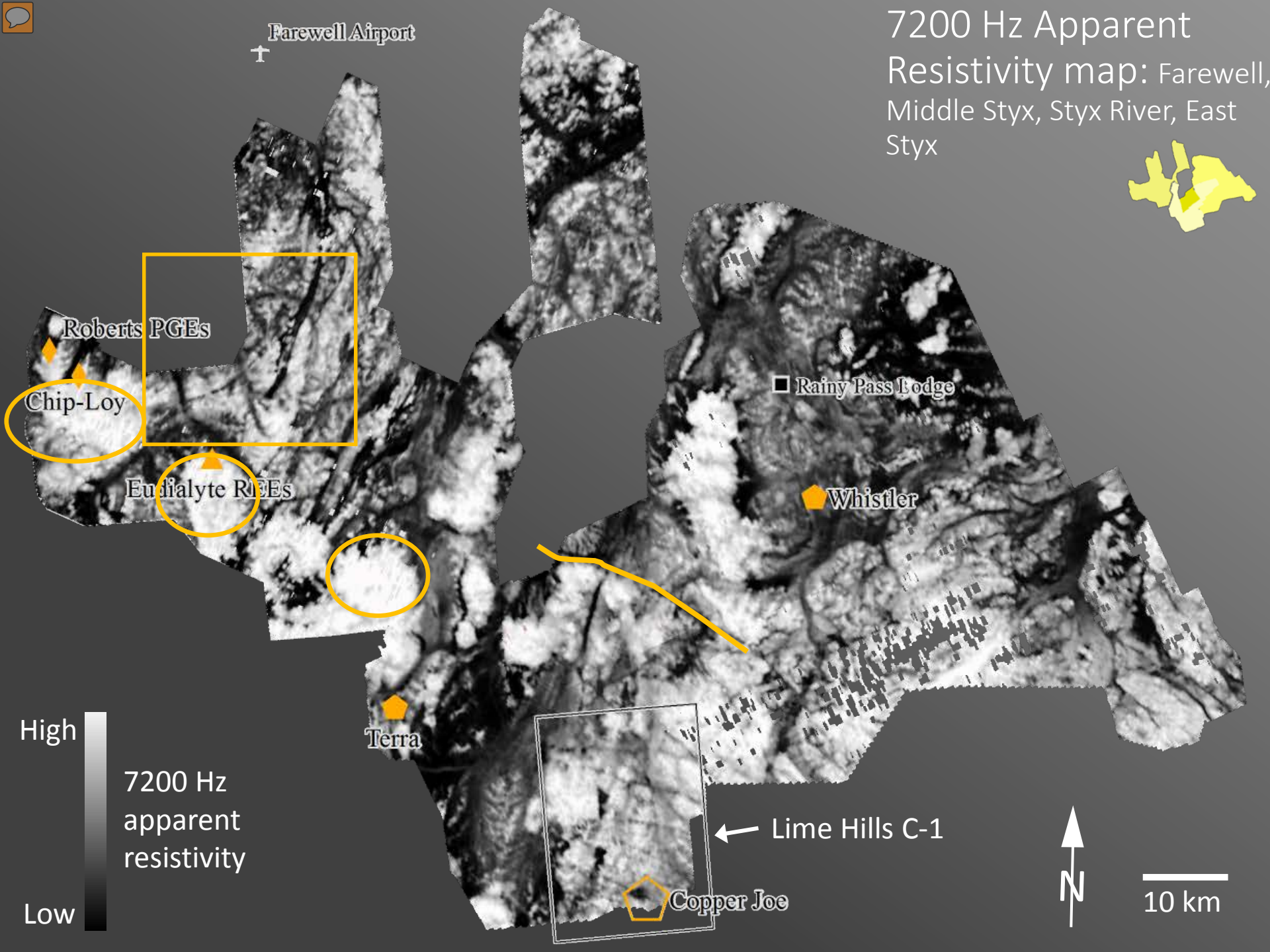
Terra

← Lime Hills C-1

Copper Joe

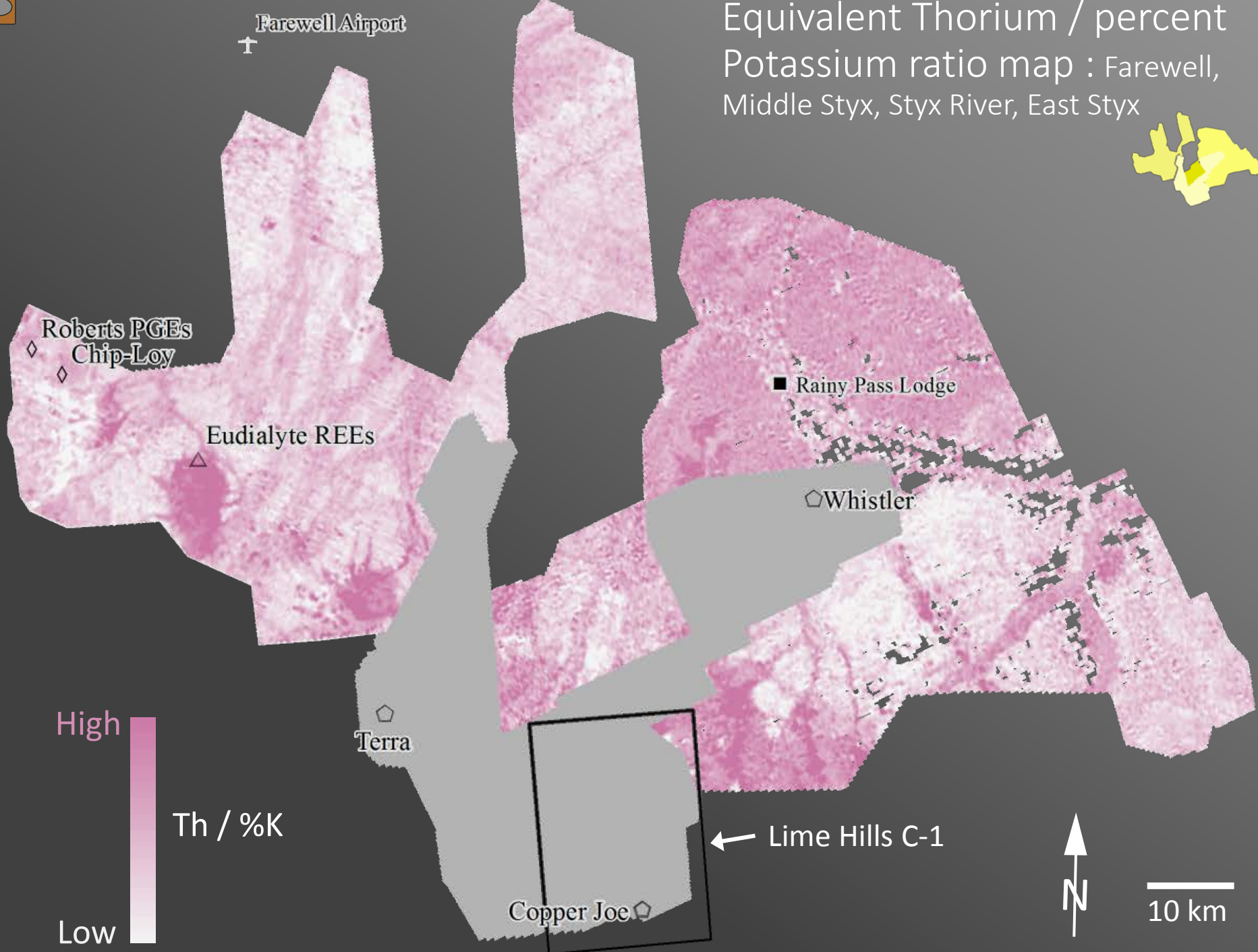


10 km



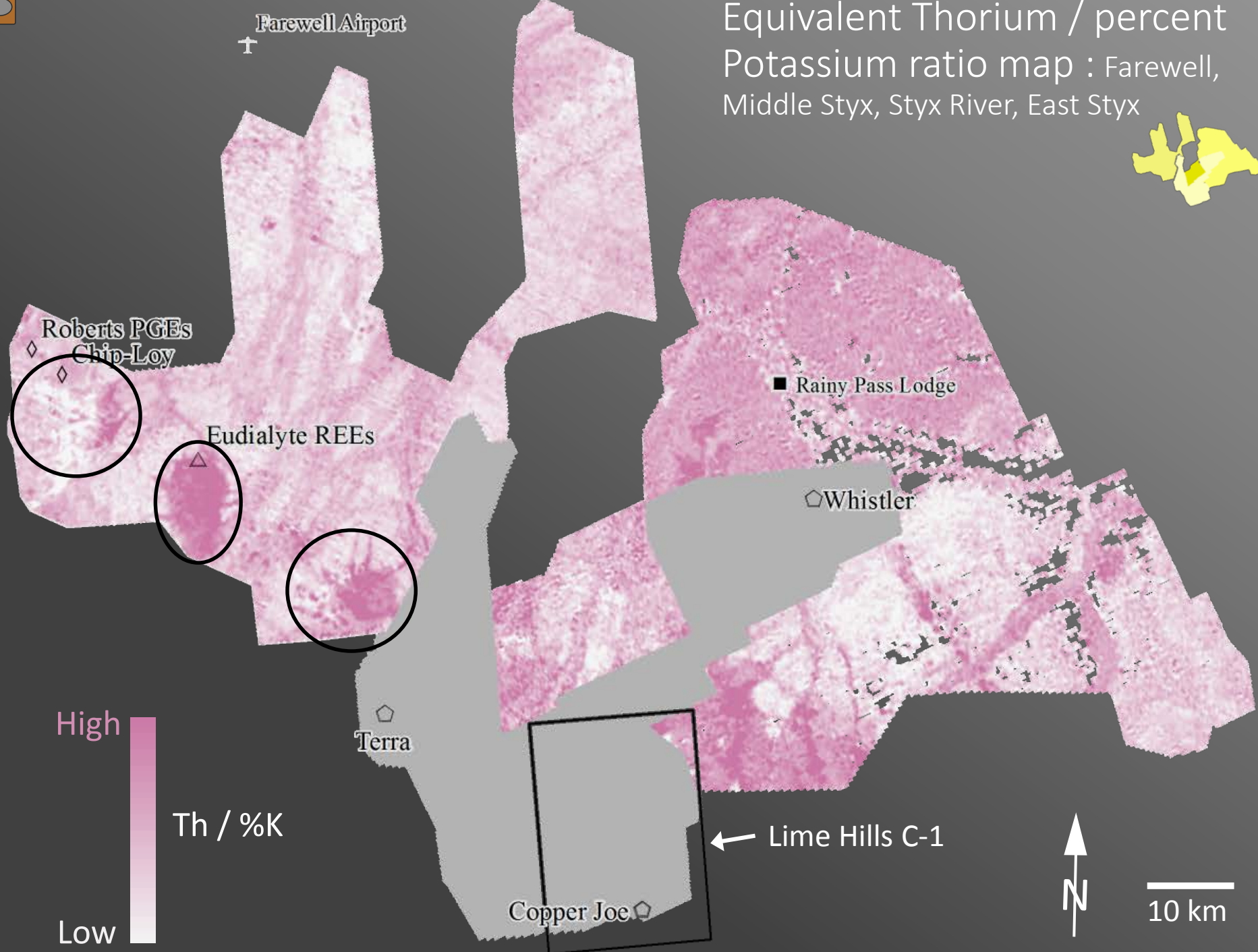


Equivalent Thorium / percent Potassium ratio map : Farewell, Middle Styx, Styx River, East Styx





Equivalent Thorium / percent Potassium ratio map : Farewell, Middle Styx, Styx River, East Styx



Farewell Airport
†

Roberts PGEs
Chip-Loy

Eudialyte REEs

■ Rainy Pass Lodge

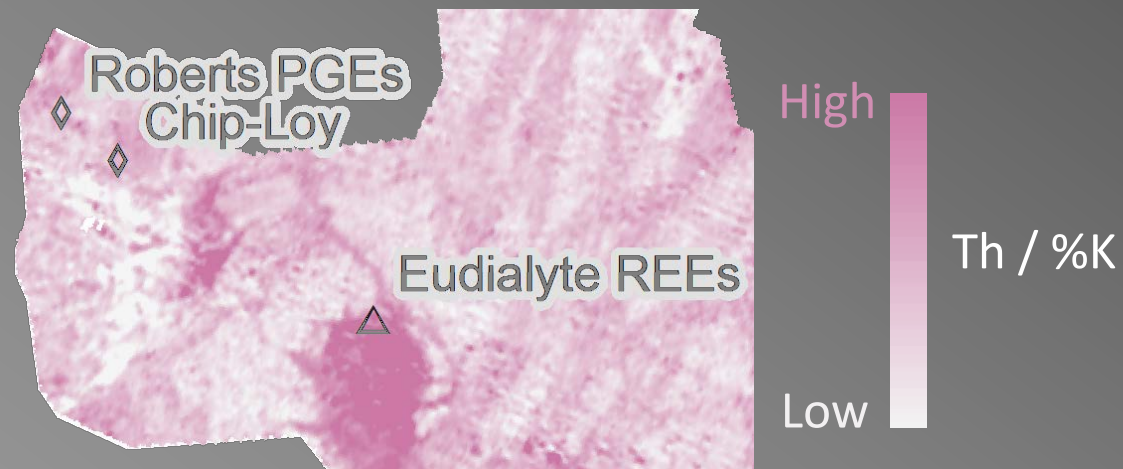
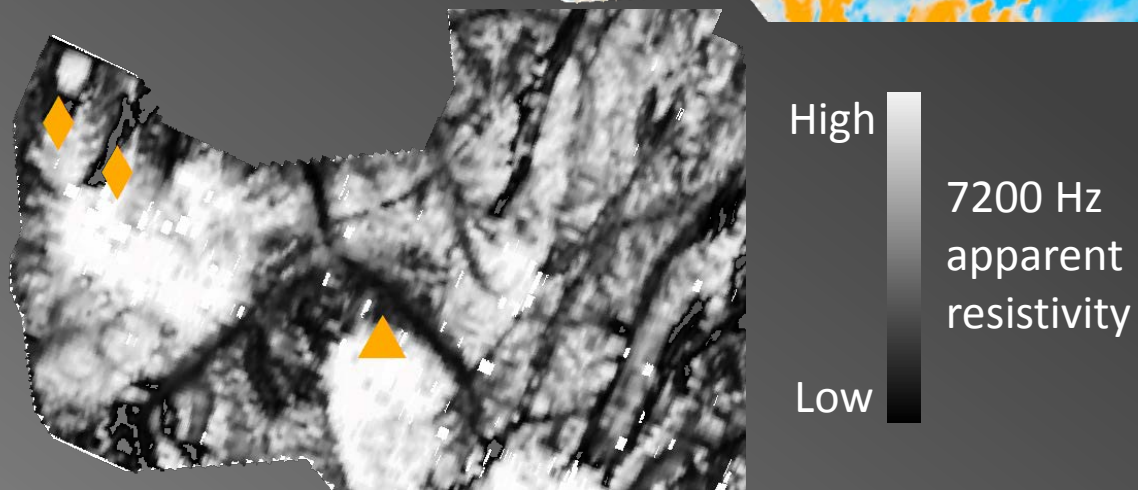
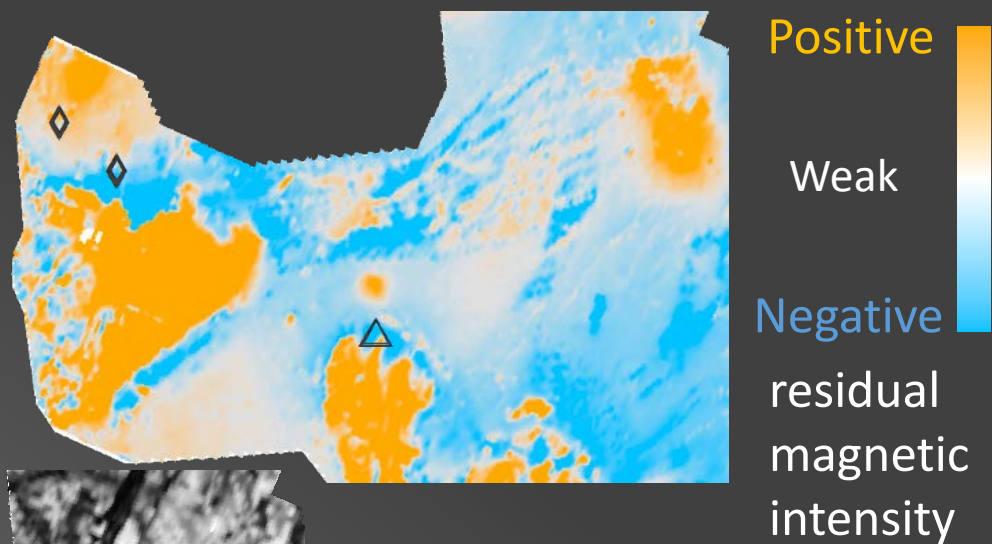
◻ Whistler

◻ Terra

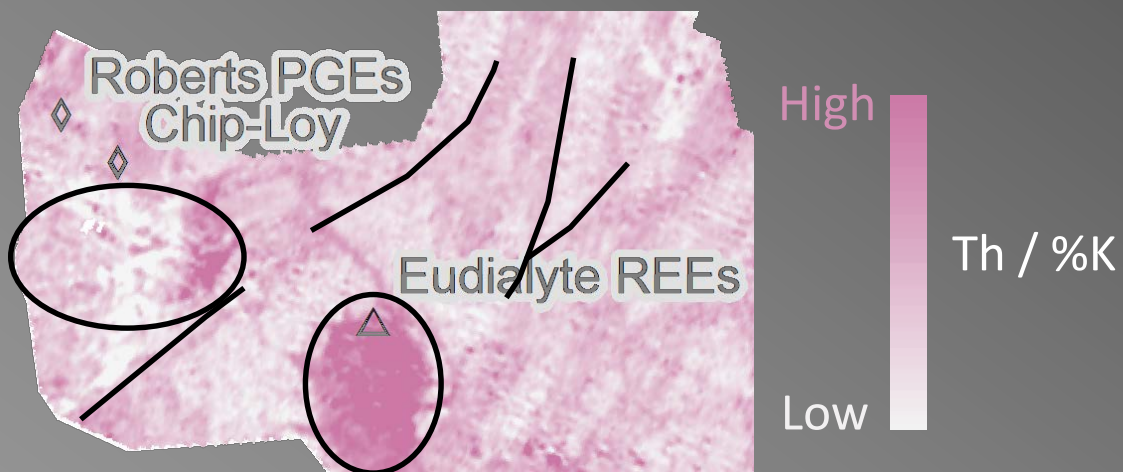
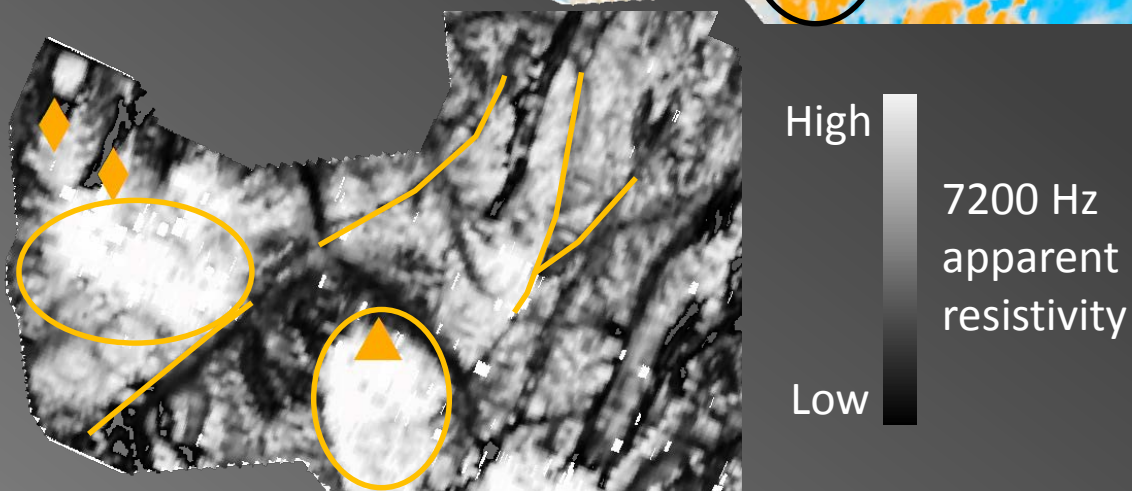
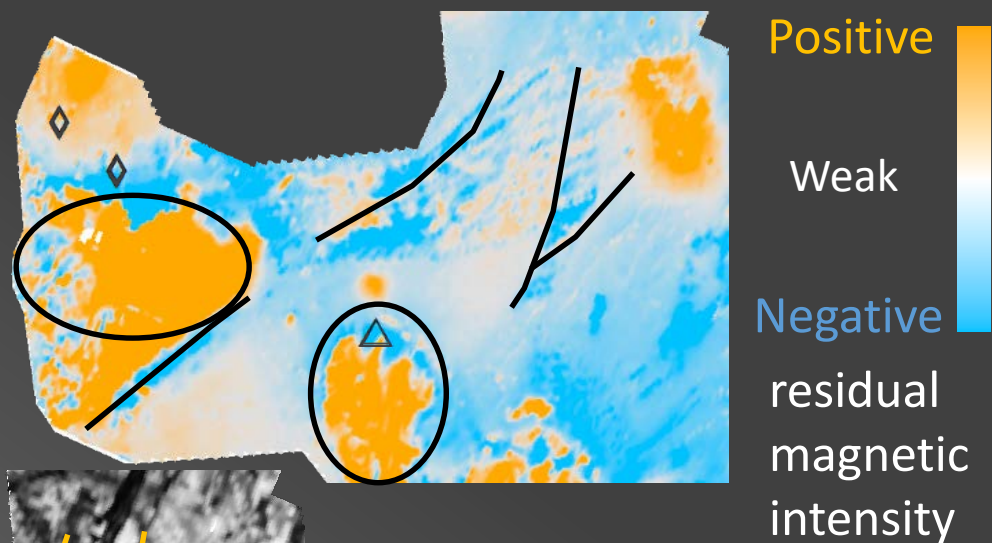
← Lime Hills C-1

◻ Copper Joe

Farewell survey (portion):
magnetic, resistivity,
Th / % K maps



Farewell survey (portion):
magnetic, resistivity,
Th / % K maps



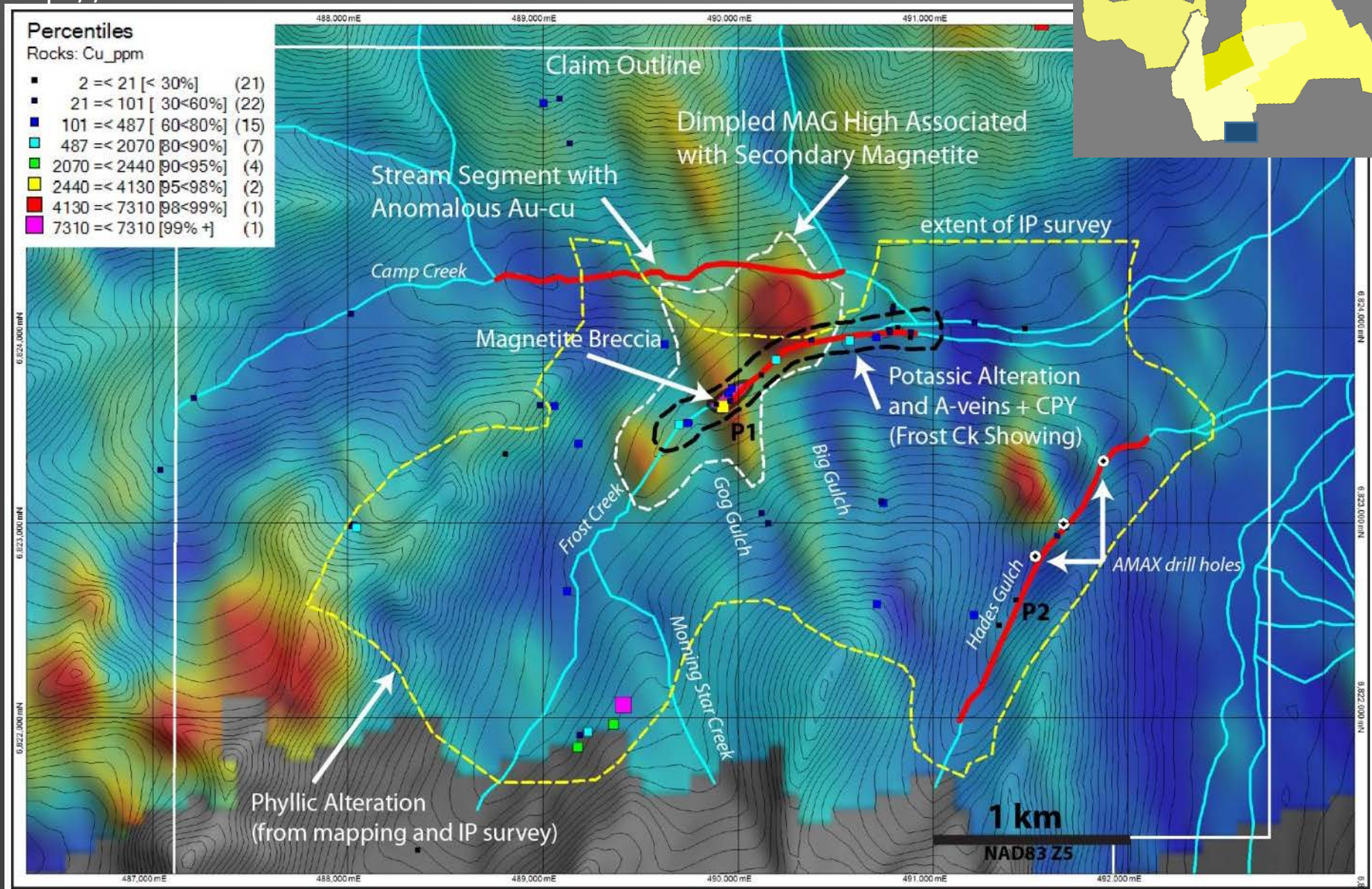
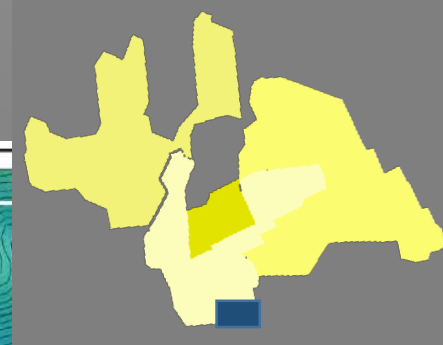


Figure 6. Distribution of alteration and mineralization at the Copper Joe prospect. The background image is Total Magnetic Field from the Alaska State Styx River Geophysical Survey, 2008.



Wrangellia Survey Locations

Valdez Creek 2004

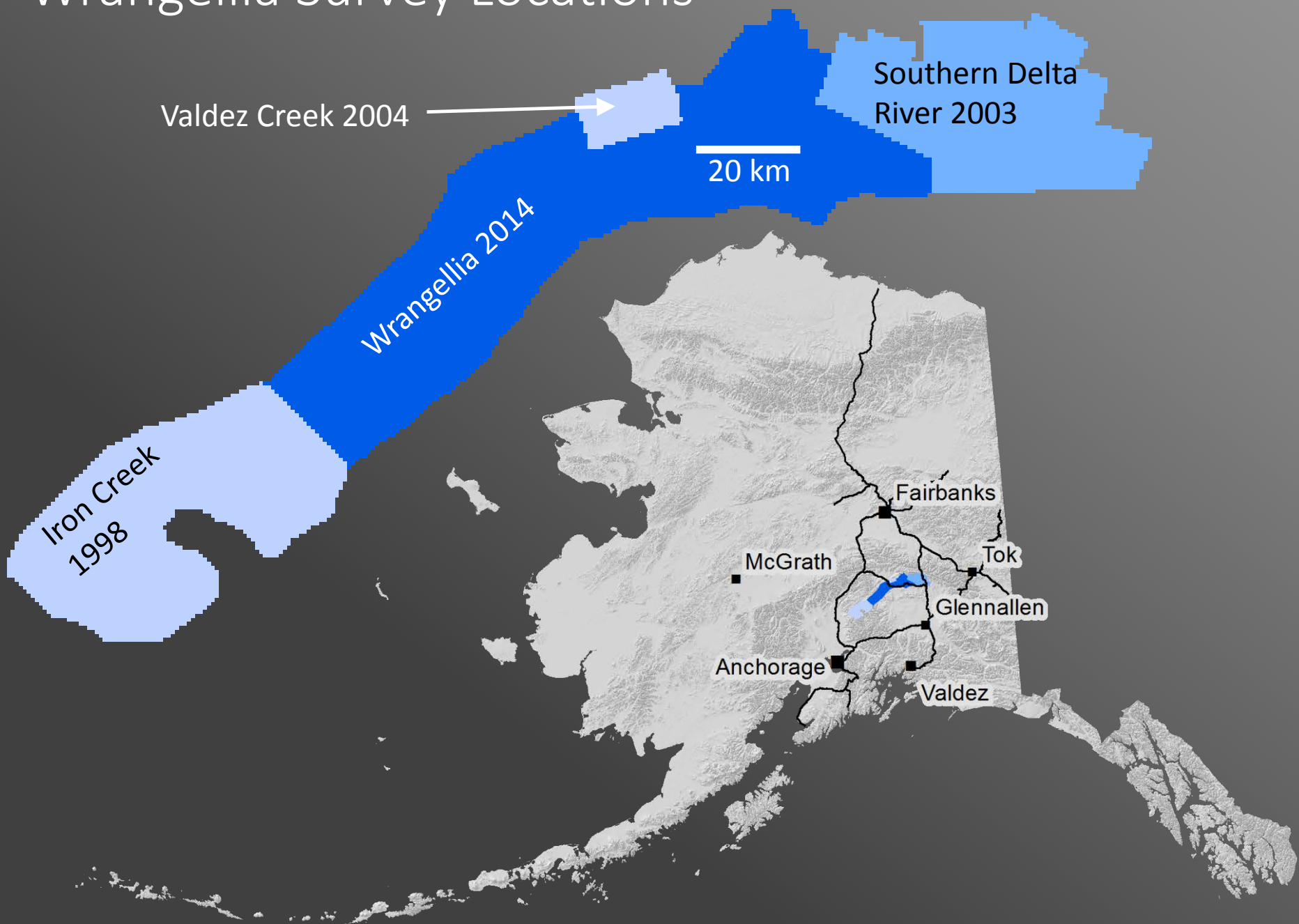


Southern Delta
River 2003

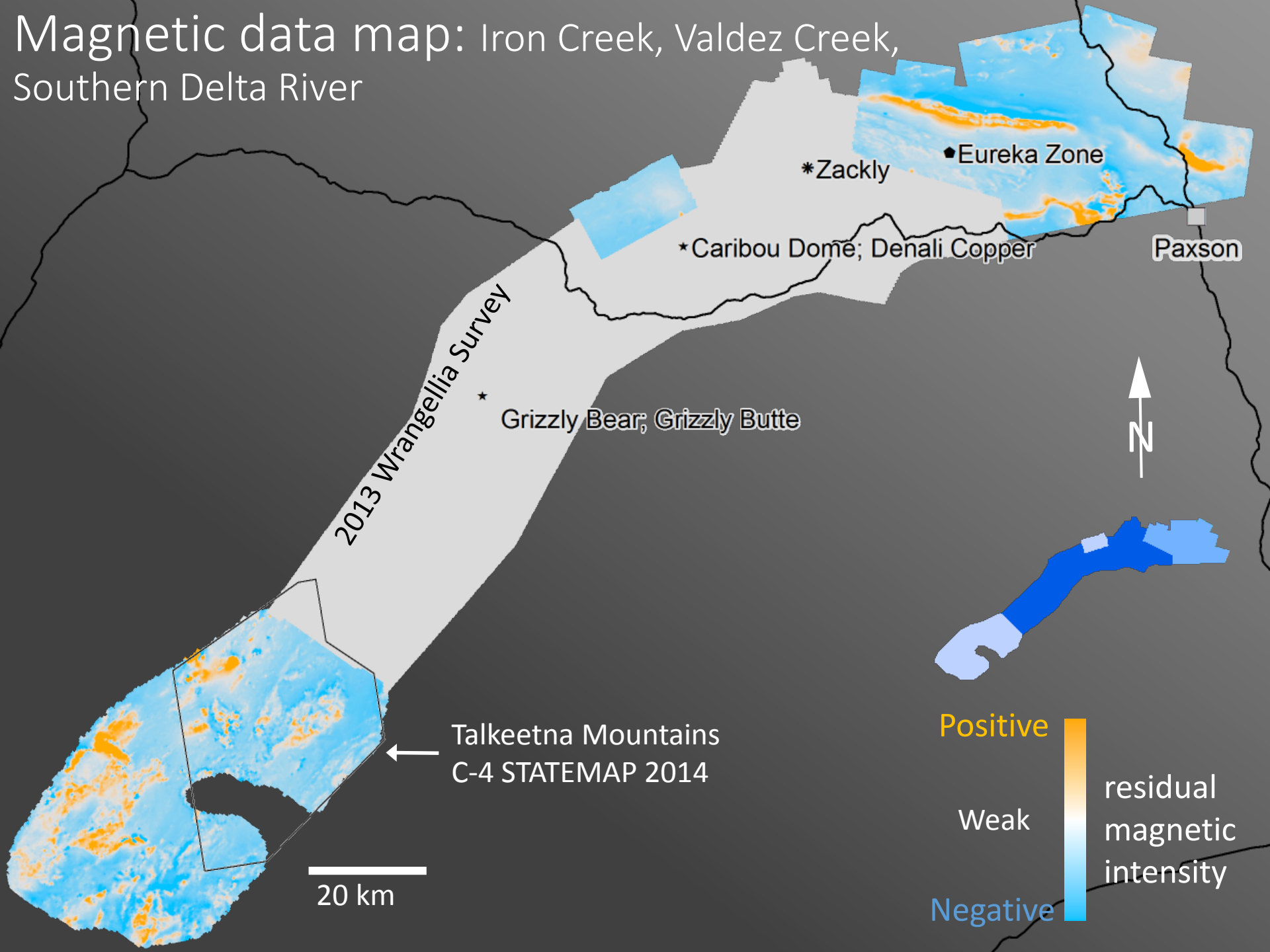
20 km

Wrangellia 2014

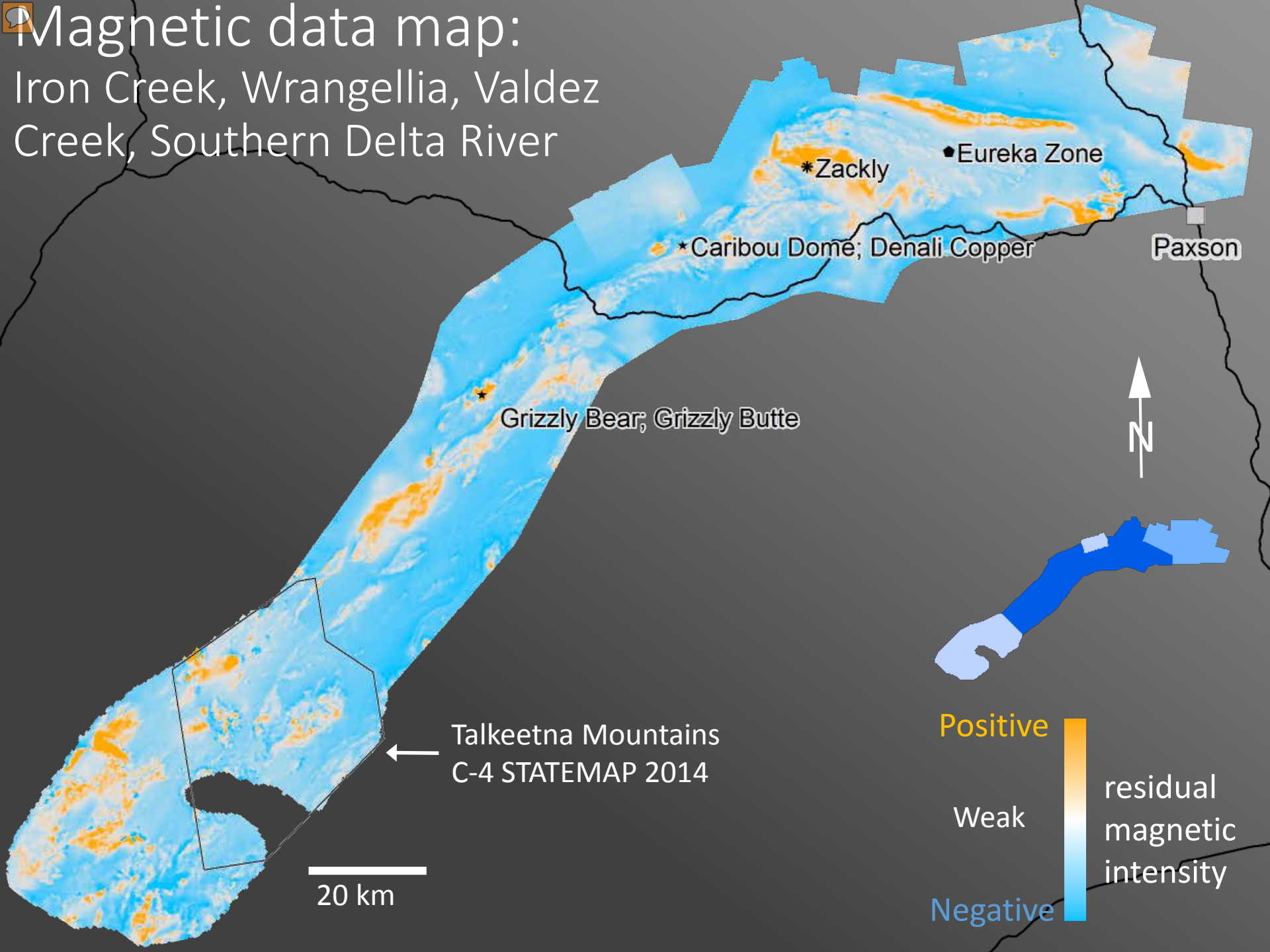
Iron Creek
1998



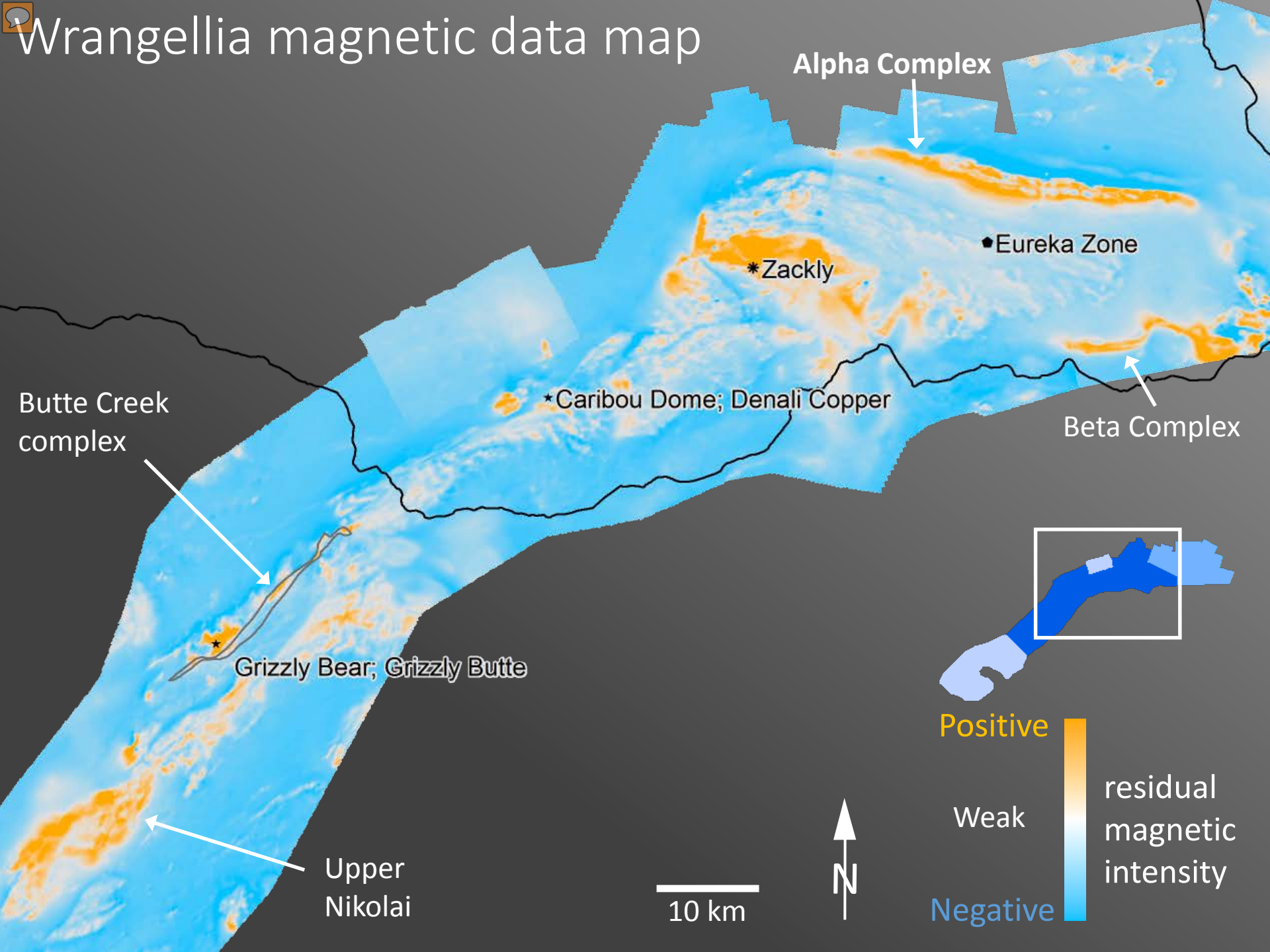
Magnetic data map: Iron Creek, Valdez Creek, Southern Delta River



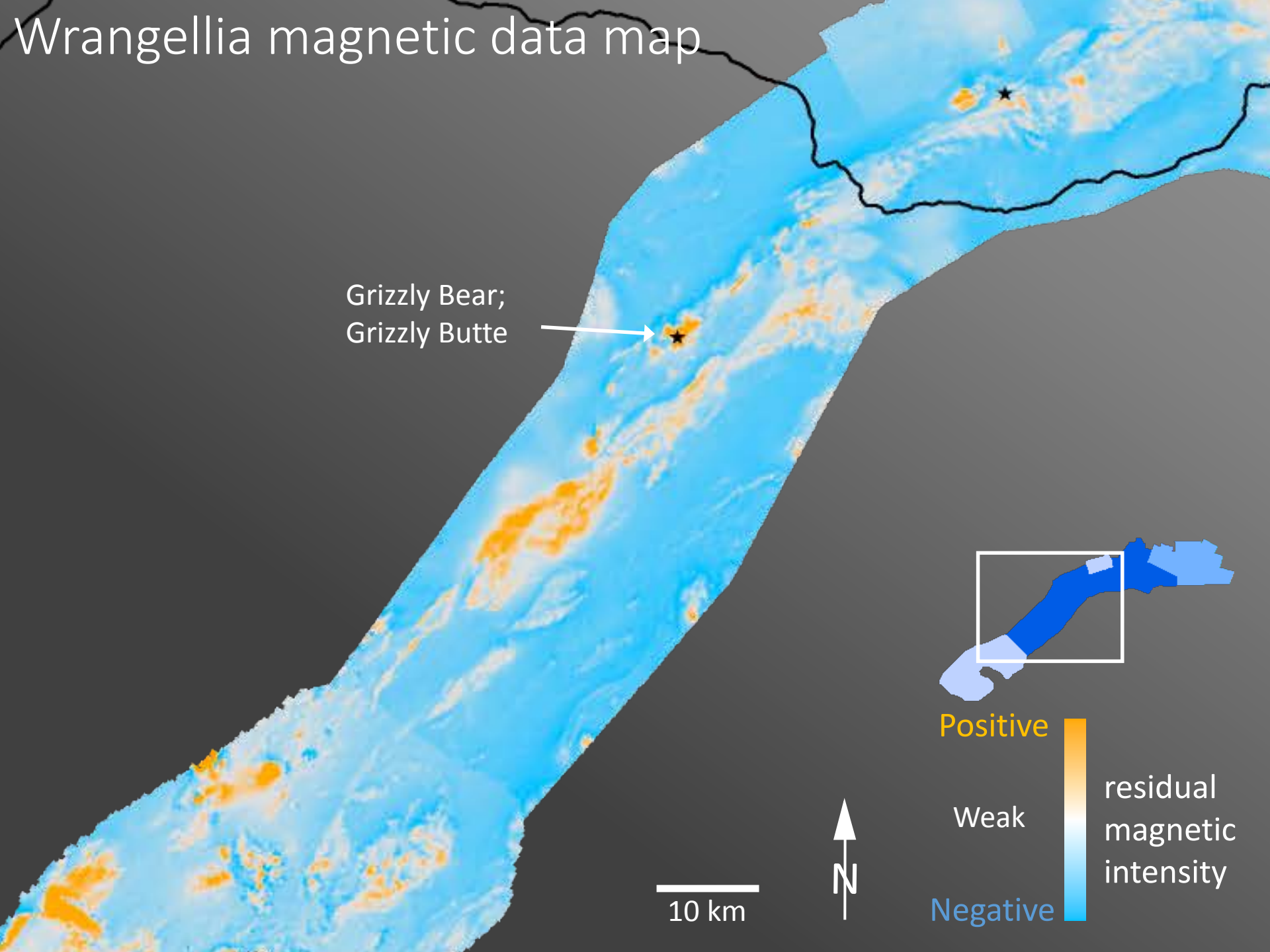
Magnetic data map: Iron Creek, Wrangellia, Valdez Creek, Southern Delta River



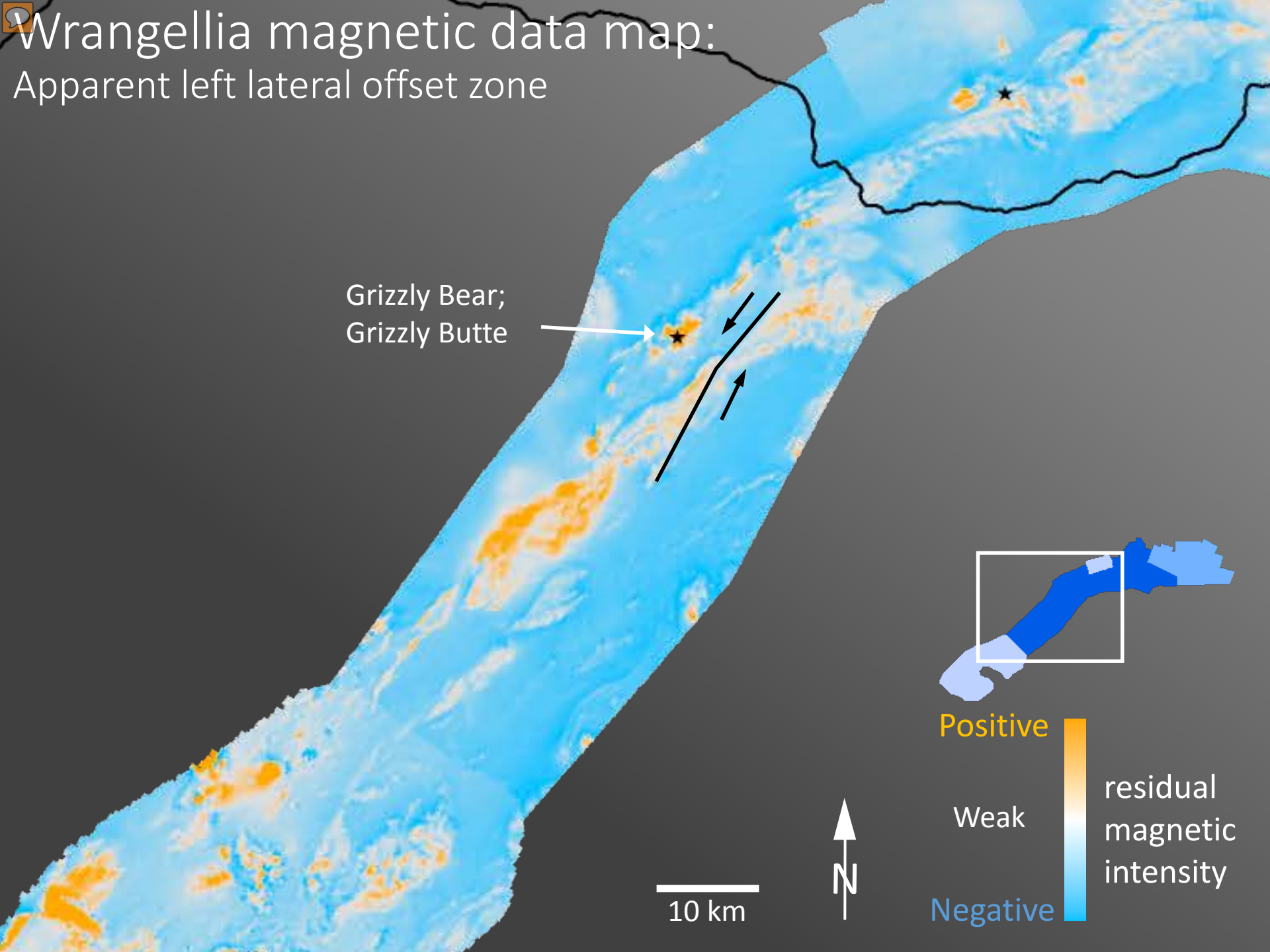
Wrangellia magnetic data map



Wrangellia magnetic data map

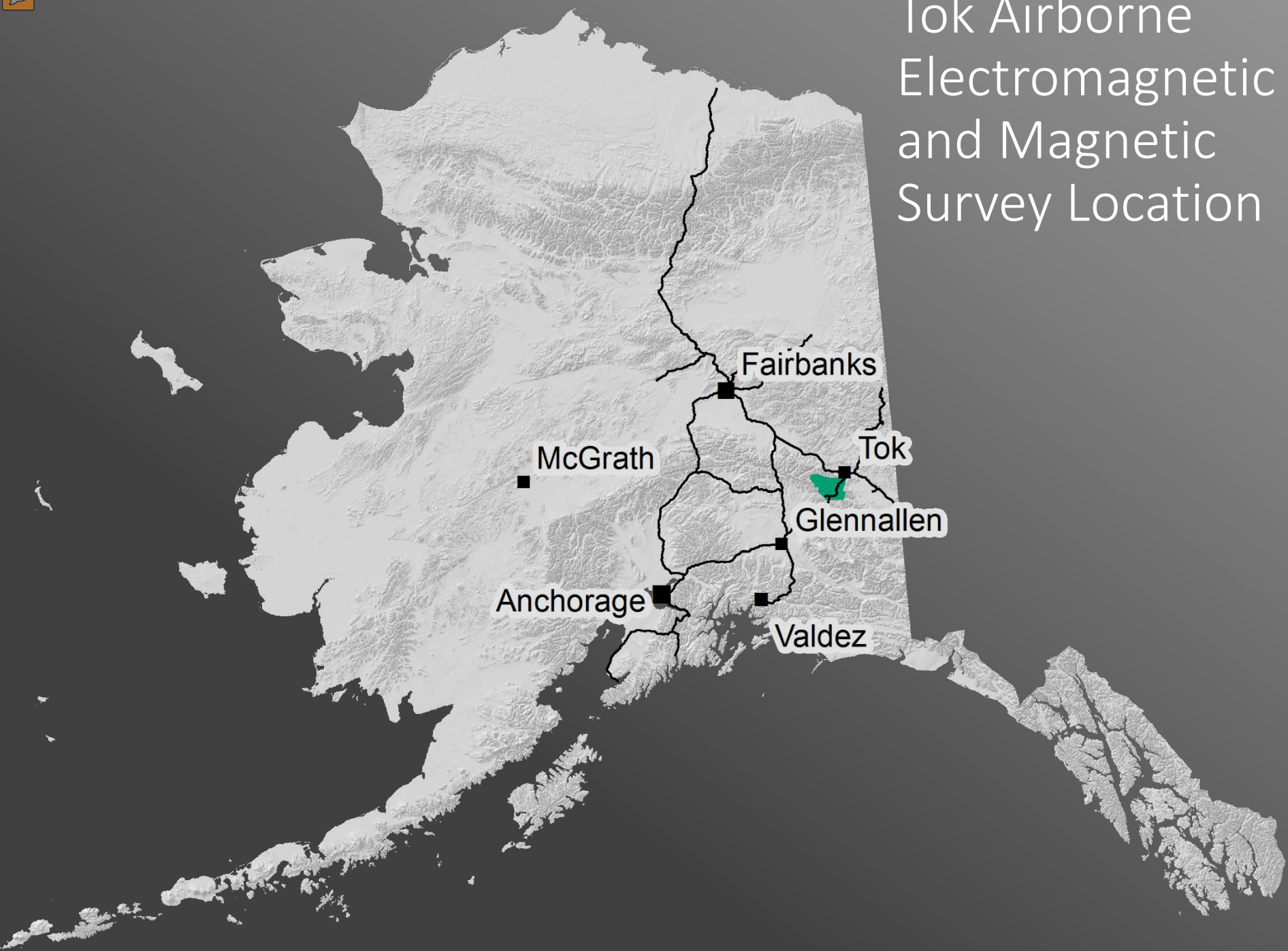


Wrangellia magnetic data map: Apparent left lateral offset zone

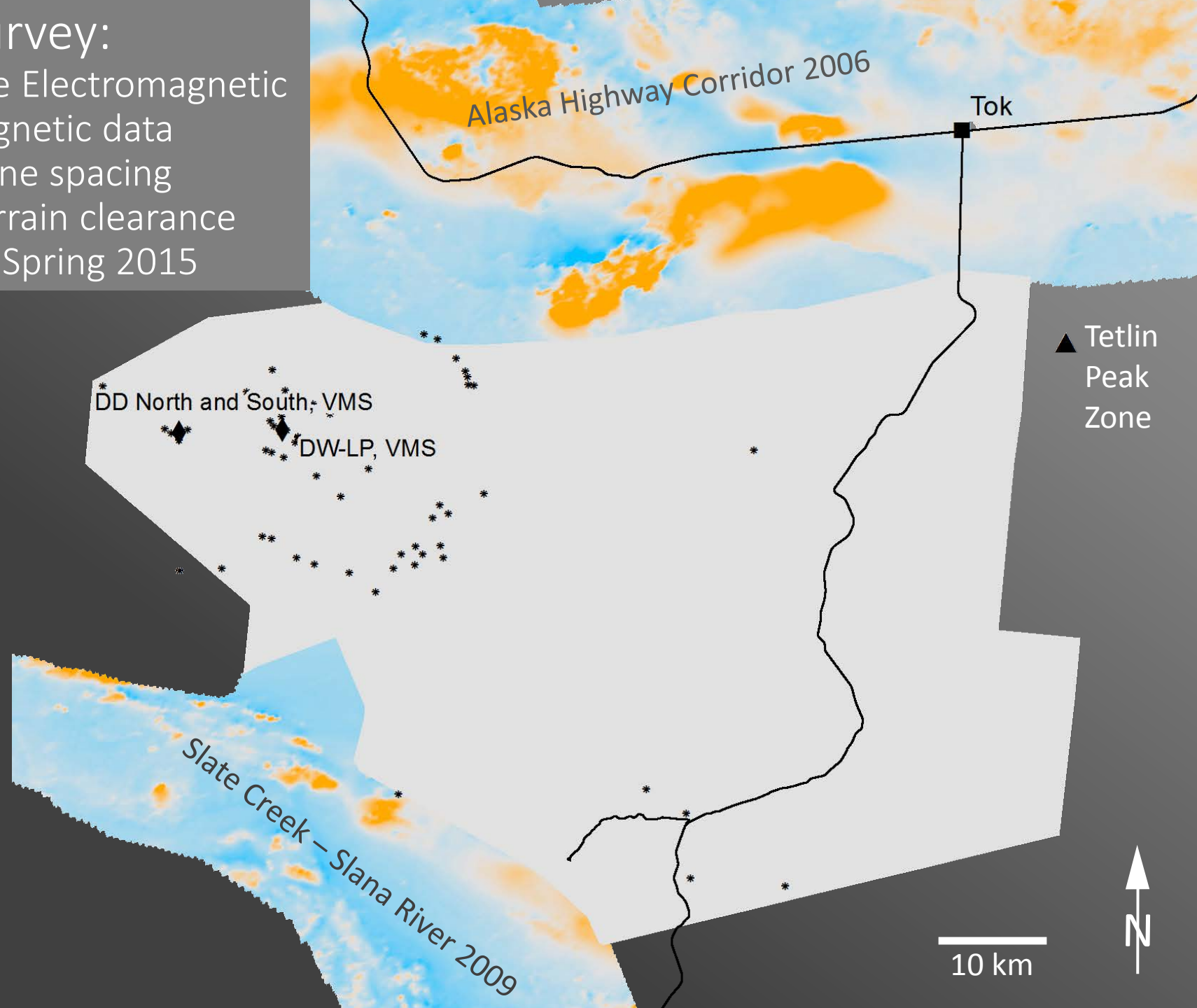




Tok Airborne Electromagnetic and Magnetic Survey Location



Tok Survey:
Airborne Electromagnetic
and Magnetic data
400 m line spacing
30 m terrain clearance
Release Spring 2015



Alaska Highway Corridor 2006

Tok

DD North and South, VMS

DW-LP, VMS

Tetlin
Peak
Zone

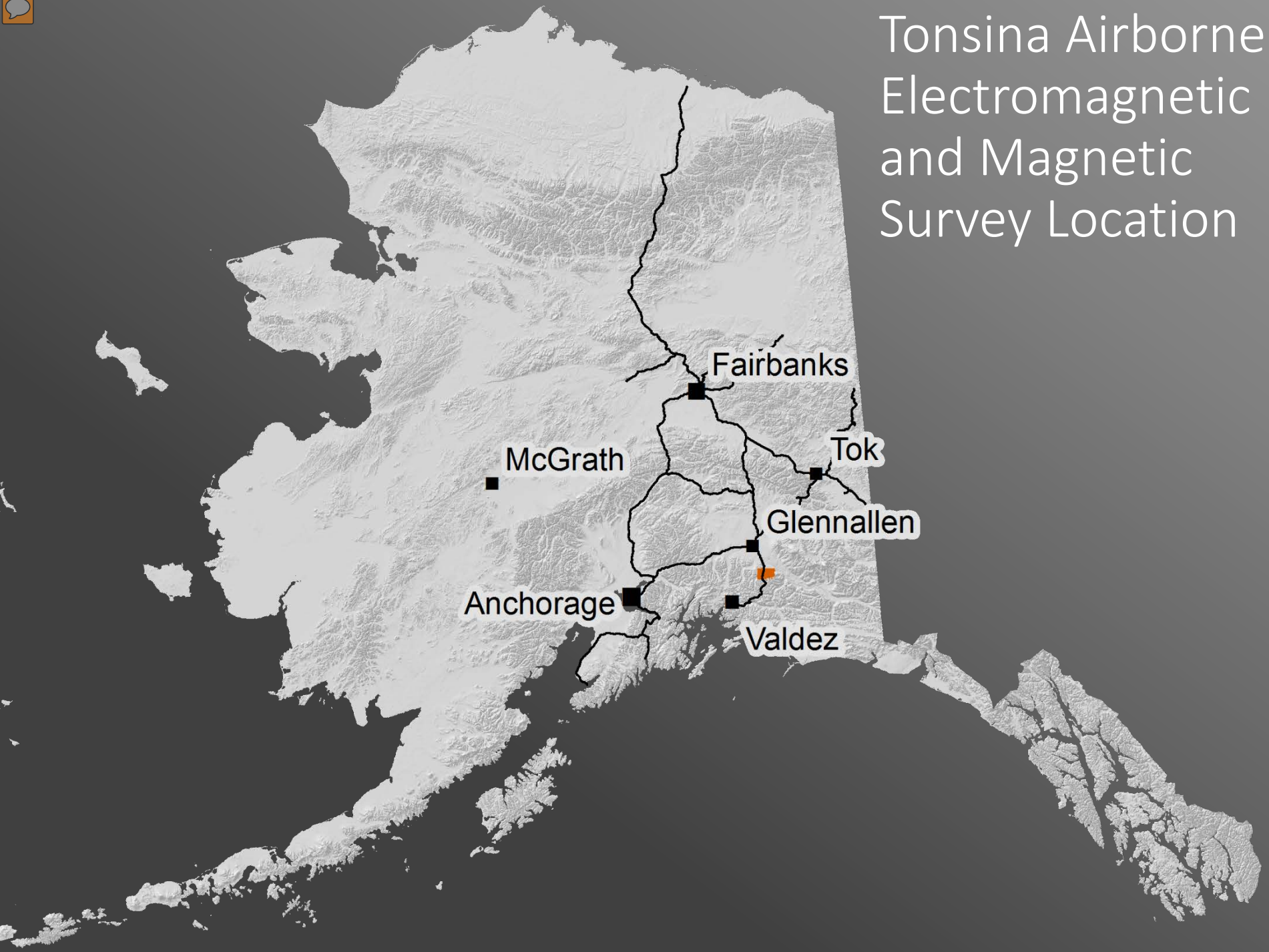
Slate Creek - Slana River 2009

10 km





Tonsina Airborne Electromagnetic and Magnetic Survey Location



Tonsina Survey:

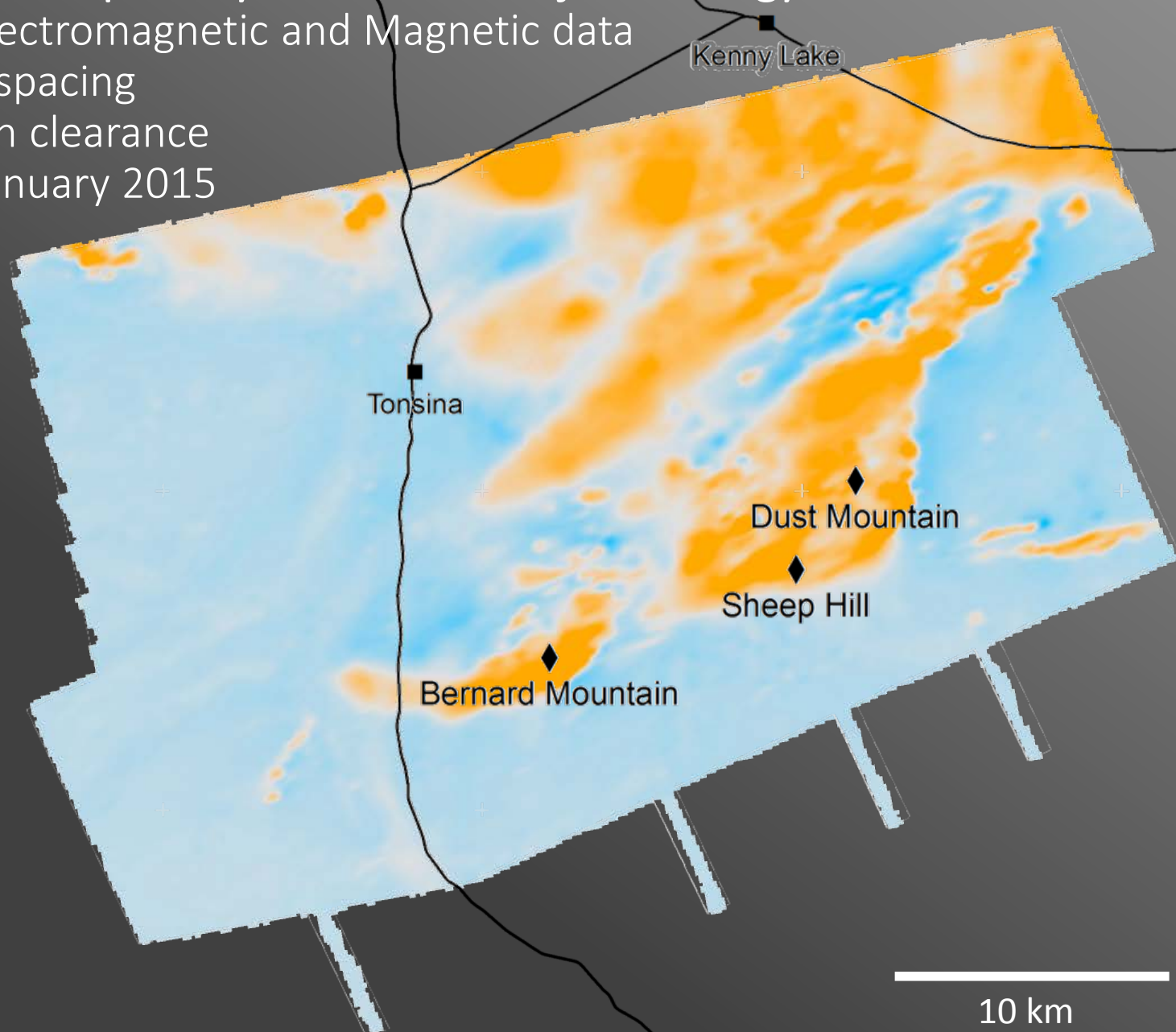
Magnetic Susceptibility data for all major lithology's

Airborne Electromagnetic and Magnetic data

400 m line spacing

30 m terrain clearance

Released January 2015



UNSURVEYED CANDIDATE AREAS (TRIANGLES) OF STATE, STATE-SELECTED, & NATIVE LANDS (NOT IN ORDER OF PRIORITY)

- 1 DeLong Mountains
- 2 Baird Mountains
- 3 Candle
- 4 Nome North
- 5 Marshall
- 6 Shotgun Hills
- 7 Sleetmute
- 8 Pebble area
- 9 Jurassic Arc
- 10 Arctic (Ambler schist belt)
- 11 Upper Kobuk River
- 12 Wiseman
- 13 Chandalar
- 14 W. Melozi
- 15 Shaw Creek/Upper Salcha
- 16 West Delta
- 17 60-Mile Butte
- 18 Bonnifield South
- 19 Paxson/McLaren
- 20 Gold Hill
- 21 Yentna
- 22 Skwentna
- 23 Yenik Hills
- 24 Willow Hills
- 25 King Mountain
- 26 Boulder Creek
- 27 Sheep Mountain
- 28 Haines/Klukwan
- 29 Chichagof

GEOPHYSICAL SURVEY TRACTS & RELEASE DATES
All surveys shown managed by Alaska Division of Geological & Geophysical Surveys (DGGS).

Completed surveys funded by Alaska State Legislature are shown in blue, green, or magenta. Dominantly State- and Native-interest lands surveyed.

- Nome west, Circle, Valdez Creek, Nyac, 1994
- Fairbank, Richardson, 1995
- Fairbank/Manley, 1996, 1997
- Chunitna, Petersburg, 1997
- Ruby, Iron Creek, 1998
- Livengood, Fortymile, 1999
- Salcha River/Pogo, 2000
- SE Pogo, Liberty Bell, Broad Pass, 2002
- Council, 2003
- Goodpaster, 2005
- NE Fairbanks, 2006
- Black Mtn, Liscum, & E Richardson, 2006
- Bonnifield, 2007
- Styx River, 2008
- Slate Ck-Slana River, 2009
- Moran, 2010
- Iditarod, Ladue, 2011

Recently completed State-funded surveys

- S Dishna River, Fox Hills, 2013
- Beaver Creek, Middle Styx, 2013
- Wrangellia, Farewell, 2014
- West Styx, 2014

Completed surveys shown in orange were funded by US BLM and others. Mainly Federal- and Native-interest lands were surveyed.

- Stikine, 1997
- Koyukuk, 1998
- Ketchikan, 1999
- Aniak, 2001
- Sleetmute, 2003
- southern Delta River, 2003
- southern NPR-A, 2006
- western Fortymile, 2008

<http://www.dggs.alaska.gov/>

Acknowledgements:
 DGGS Staff

Alaska Geophysical and Geological Mineral Inventory program
 Alaska Strategic & Critical Minerals Program

State interest lands shown in light blue.

GEOPHYSICAL SURVEYS RELEASED TO DATE IN 2014

- A - Wrangellia area, south-central Alaska**
- B - Farewell area, south-central Alaska**
- C - East Styx area, south-central Alaska**

UPCOMING GEOPHYSICAL SURVEY RELEASES

- D - Tonsina area, south-central Alaska**
- E - Tok area, east-central Alaska**

DGGS ALASKA AIRBORNE GEOPHYSICAL/GEOLOGICAL MINERAL INVENTORY

DGGS Airborne Geophysical Data, Applications, Insights, and Updates; Fall 2014

Abraham Emond, Laurel Burns, and Gina Graham
Alaska Division of Geological & Geophysical Surveys

The Alaska Division of Geological & Geophysical Surveys (DGGS) has collected and published airborne geophysical data for more than 22,000 square miles of State-owned land in Alaska during the past 21 years. These data are an important asset for mineral exploration, transportation, hydrology, and environmental monitoring. The effort is part of the State-funded Alaska Geophysical and Geological Mineral Inventory program (AGGMI), through which DGGS also published geophysical and geological mapping products that contributed to the discovery of International Tower Hill's 20-million-ounce Livengood gold deposit. Recently, Kiska Metal Corp. used the 2008 DGGS Styx River survey to further their exploration of the Copper Joe project. These examples illustrate the role public-domain data can play in the exploration community.

DGGS has been able to acquire data more quickly between 2012 and 2014 with additional funding from the Alaska Strategic & Critical Minerals Program. During the last 13 months, DGGS released data for seven separate areas: Wrangellia, Farewell, Middle Styx, Southern Dishna River, Fox Hills, Beaver Creek, and East Styx. The combined area for these surveys is more than 4,000 square miles. Each published geophysical survey shows geologic features important to mineral exploration. The Wrangellia survey suggests right-lateral fault movement in the eastern part of the survey area and left-lateral movement on faults in the southeastern limb of the survey. Folded Kahiltna rocks on both sides of the Iditarod–Nixon Fork faults, and Riedel (or similar) shears are apparent throughout most of the Iditarod and Southern Dishna River surveys. The Farewell survey shows multiple N70°E-trending faults subparallel to the Denali–Farewell fault. A major structure trending N–S is visible in the central portion of the Farewell survey. East Styx survey data will be discussed during the presentation.

In 2014 DGGS acquired airborne frequency domain electromagnetic data and magnetic data in two areas. One survey area, centered around the village of Tonsina between Valdez and Glenallen in the Nelchina mining district, includes copper–nickel–platinum-group element (PGE) potential hosted in a mafic–ultramafic (MUM) complex. The second survey is south of Tok and the Alaska Highway in the eastern Alaska Range in the Tok and Chistochina mining districts. Potential and identified mineralization in the Tok survey area includes volcanogenic massive sulfide, low-sulfide-quartz gold veins, copper–molybdenum–gold porphyry systems, and related skarns. MUM-hosted copper–nickel–PGE mineralization is also possible. Data from the Tonsina and Tok surveys are scheduled to be released in winter and spring 2015.

DGGS continues to improve access and availability of geophysical data through its website, <http://www.dggs.alaska.gov/>. The GeophysWeb spatial and/or keyword search interactive map at <http://maps.dggs.alaska.gov/gp/> makes finding and downloading data fast and efficient. GeophysWeb continues to improve with the addition of new digital data, more preview images, and improved speed. Digital data from past surveys will be made available for download on the DGGS publications page and GeophysWeb. Re-released datasets from Bonnifield and Iron Creek will be available for download by mid-December.

Additional contributors to the AGGMI program include the U.S. Bureau of Land Management, Native corporations, and mineral companies. DGGs would like to thank Millrock Resources for contributing Wrangellia data, and CIRI for providing funds for part of the Farewell geophysical survey.

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- Burns, L.E., CGG, and Fugro GeoServices, Inc., 2014, Farewell survey area—Airborne magnetic, electromagnetic, and radiometric data in line (point), grid, vector, and map formats, McGrath and Lime Hills quadrangles, south-central Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2014-2. doi:[10.14509/27291](https://doi.org/10.14509/27291)
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- Burns, L.E., Fugro Airborne Surveys Corp., and Fugro GeoServices, Inc., 2013, Southern Dishna River, Fox Hills, and Beaver Creek survey areas: Airborne Magnetic and electromagnetic data in line (point), grid, vector, and map formats, Iditarod, Ophir, and Holy Cross quadrangles, western Alaska: Alaska Division of Geological & Geophysical Surveys Geophysical Report 2013-1. doi:[10.14509/26701](https://doi.org/10.14509/26701)
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