

Overview of Geophysical Data Recently Acquired by the Ontario Geological Survey in Southern Ontario*

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Abstract

The Precambrian basement beneath the Paleozoic of eastern Ontario is poorly known due to low-resolution aeromagnetic coverage (800 m line spacing) and limited drilling. To improve our knowledge, in late 2013, 34,724 line km of aeromagnetic data were collected at 400 m line spacing over a 12,515 km² area of eastern Ontario east of longitude 76.51W to the Quebec border. These data were recently released as Ontario Geological Survey Geophysical Dataset 1075. This presentation summarizes both the results of the survey and the preliminary interpretation of the underlying basement geology, based on tracing known surface geology beneath the Paleozoic, which is assumed to be magnetically transparent.

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ES-AAPG Meeting
London, Ontario September 30, 2014

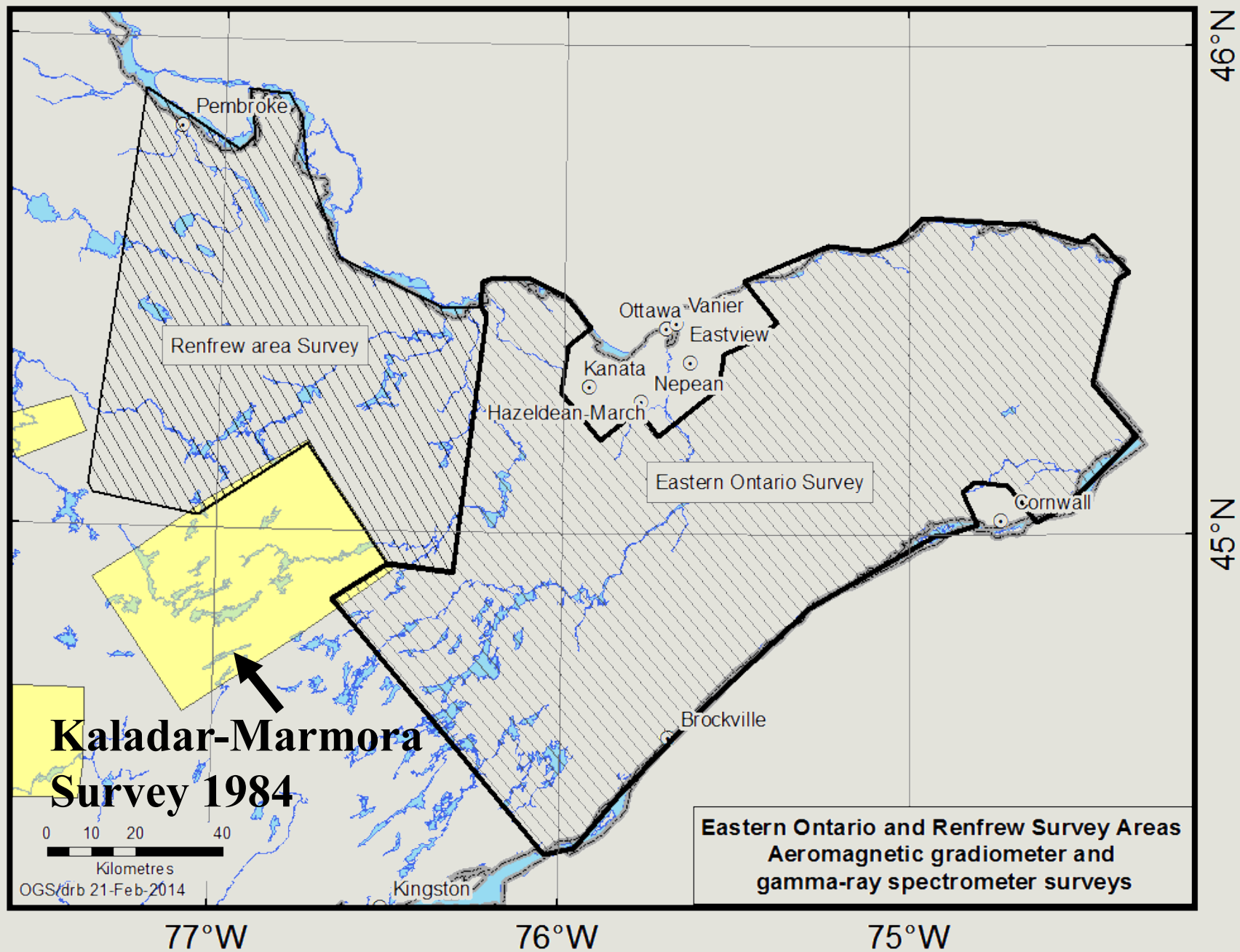
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This Talk

- present a brief overview of newly acquired aeromagnetic data in the Renfrew and eastern Ontario areas
 - first OGS commissioned surveys in 30 years over the Grenville basement, last was published in 1984
- where the 2 surveys were flown and how they differ from one another
- highlight how the new data will provide insights into the region's geology, in part as a lead-in to the next presentation





Overall Survey Objectives

- obtain state of the art aeromagnetic data to improve on existing 1960s vintage coverage (800m line-spacing)
- in the Renfrew area, aid in current basement geology mapping projects
- in eastern Ontario, help to extend our understanding of the basement based on extrapolating from exposed Grenville rocks on the western margin of the survey area
- in eastern Ontario, identify basement structures that may propagate into overlying Paleozoic rocks for groundwater studies



Project Areas

- Pembroke-Renfrew
 - to support current mapping in region by Duguet and Easton as well as mineral exploration
 - 200 m line-spacing, aeromagnetic & radiometrics
- Eastern Ontario
 - map basement geology by extrapolating our knowledge of the exposed Grenville eastward into the study area
 - identify basement structures that may propagate into overlying Paleozoic rocks for groundwater studies
 - 400 m line-spacing, aeromagnetic only



Project Status - 1

- Request for Proposal posted: July, 2013
- Contractor selected (GeoTech): September, 2013
- Survey commenced: October 1st, 2013
- Flying completed: December 7th, 2013
 - the cities of Ottawa and Cornwall were excluded due to flying restrictions, magnetic infrastructure, safety
- Data processing completed: mid-January 2014



Project Status - 2

- Survey results published: June, 2014
 - Geophysical dataset 1074 (Renfrew) and 1075 (eastern Ontario) and hard-copy maps
 - Survey results already used in production of maps P3783 and P3784 released on April 15, 2014

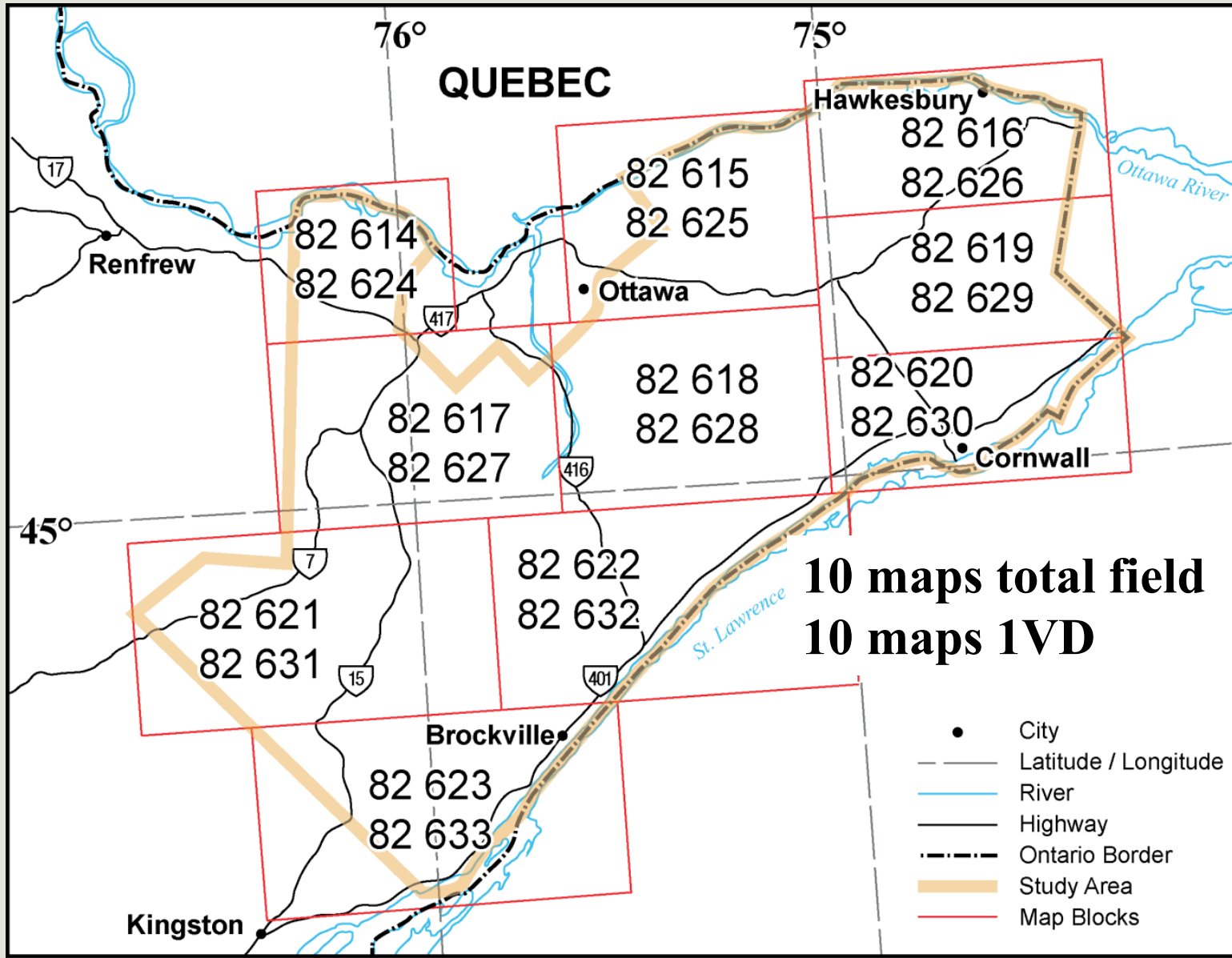


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Eastern Ontario Survey Map Tiles



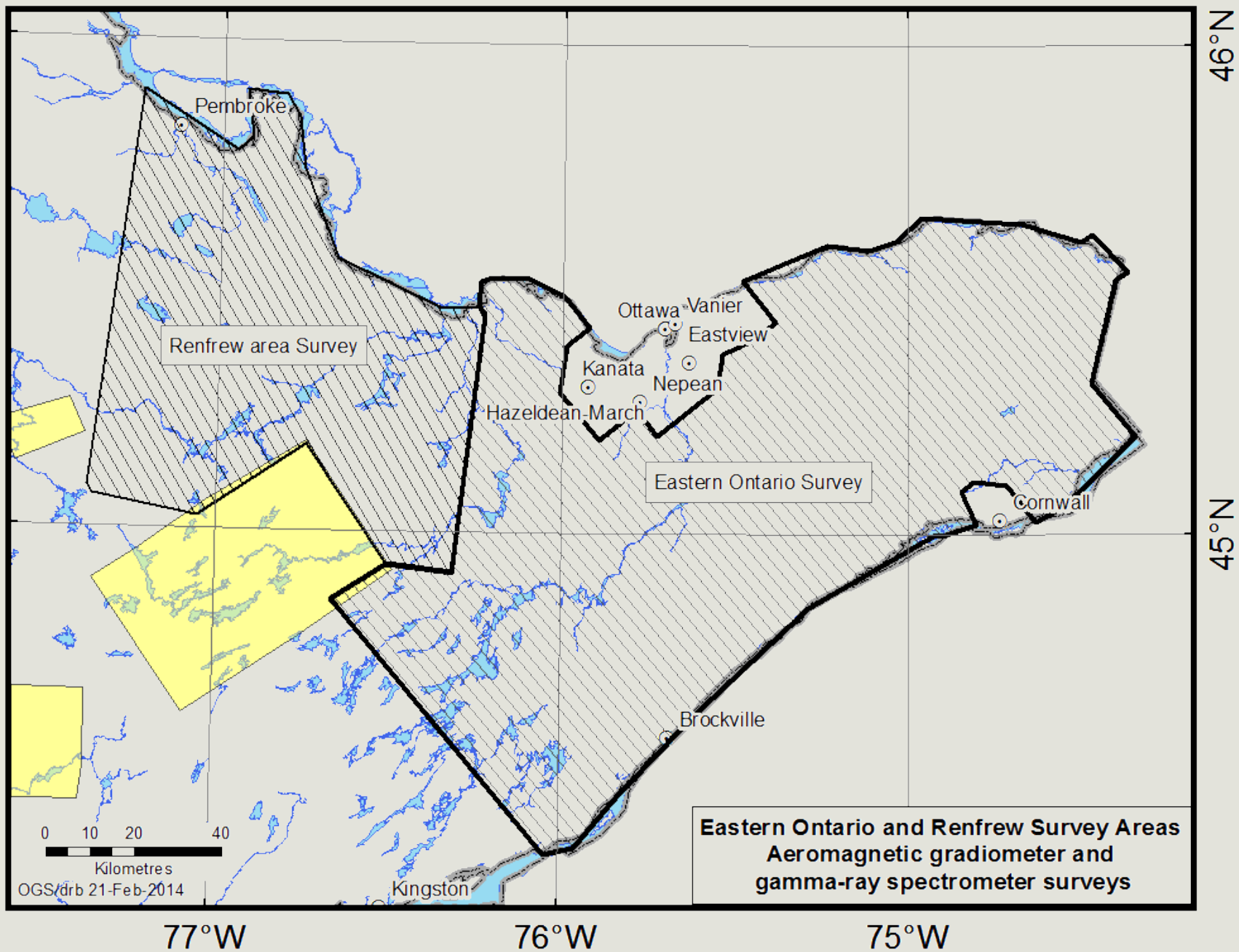
PEMBROKE-RENFREW SURVEY



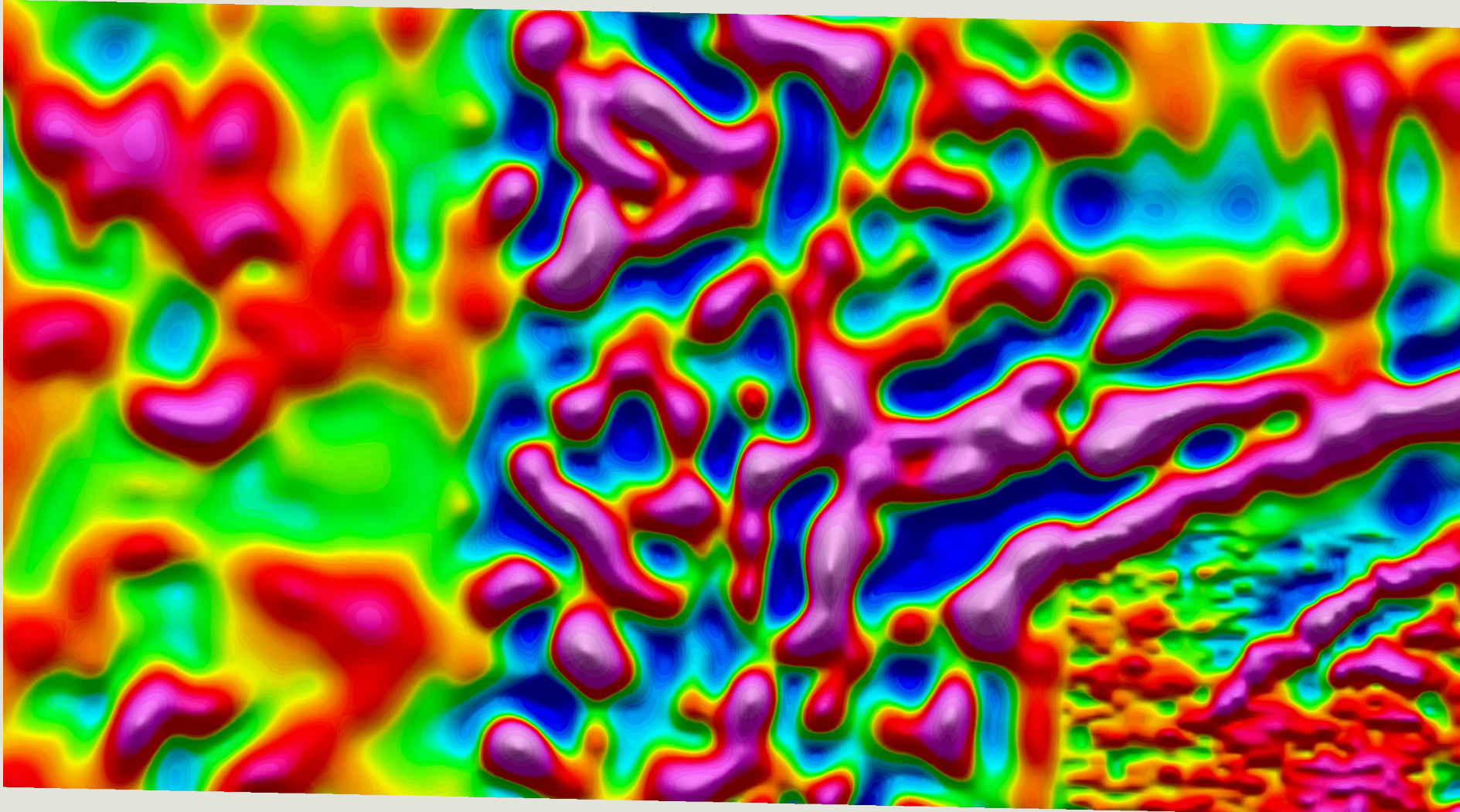
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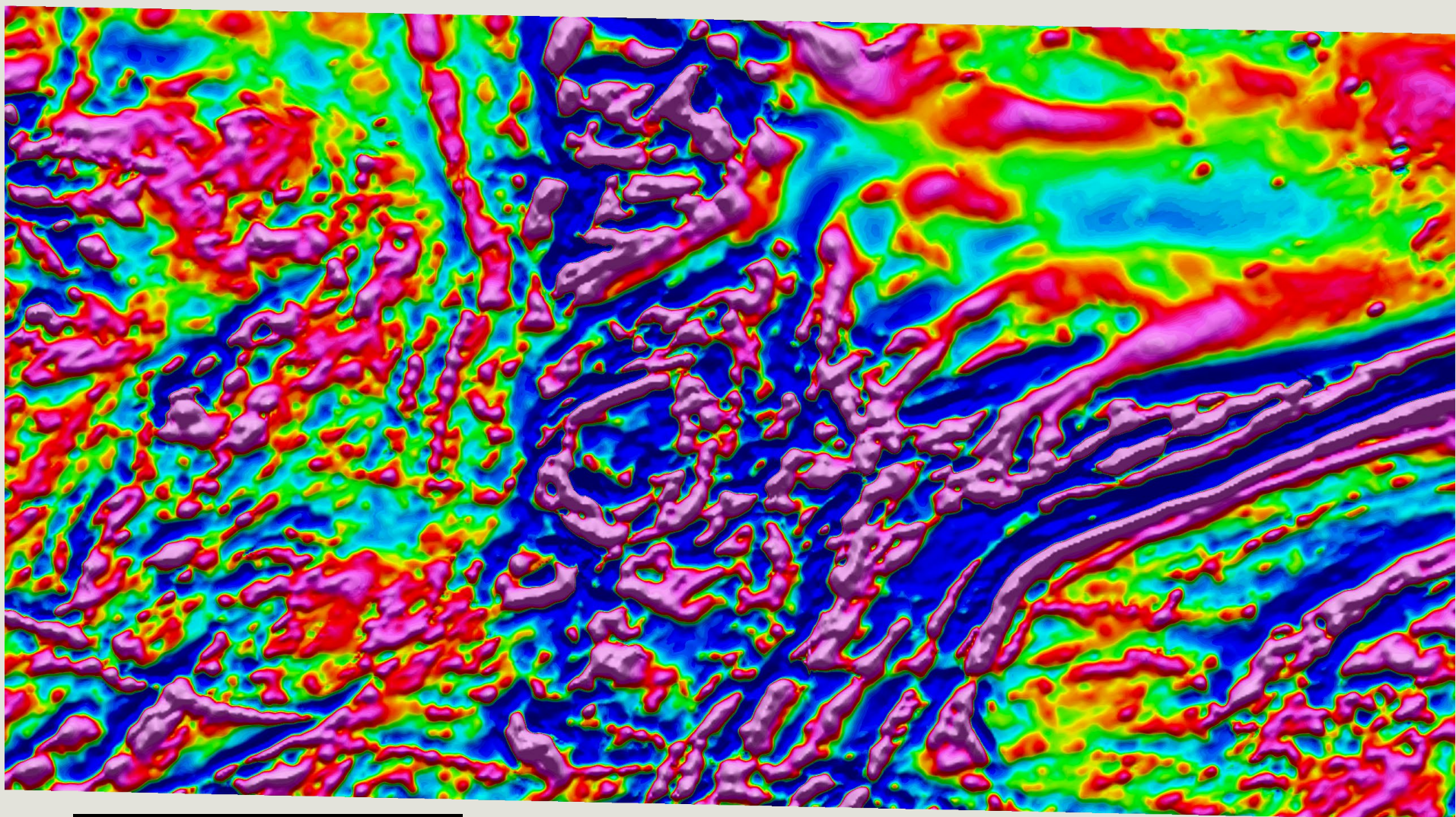


Admaston-Horton – existing 1VD aeromagnetics



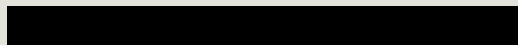
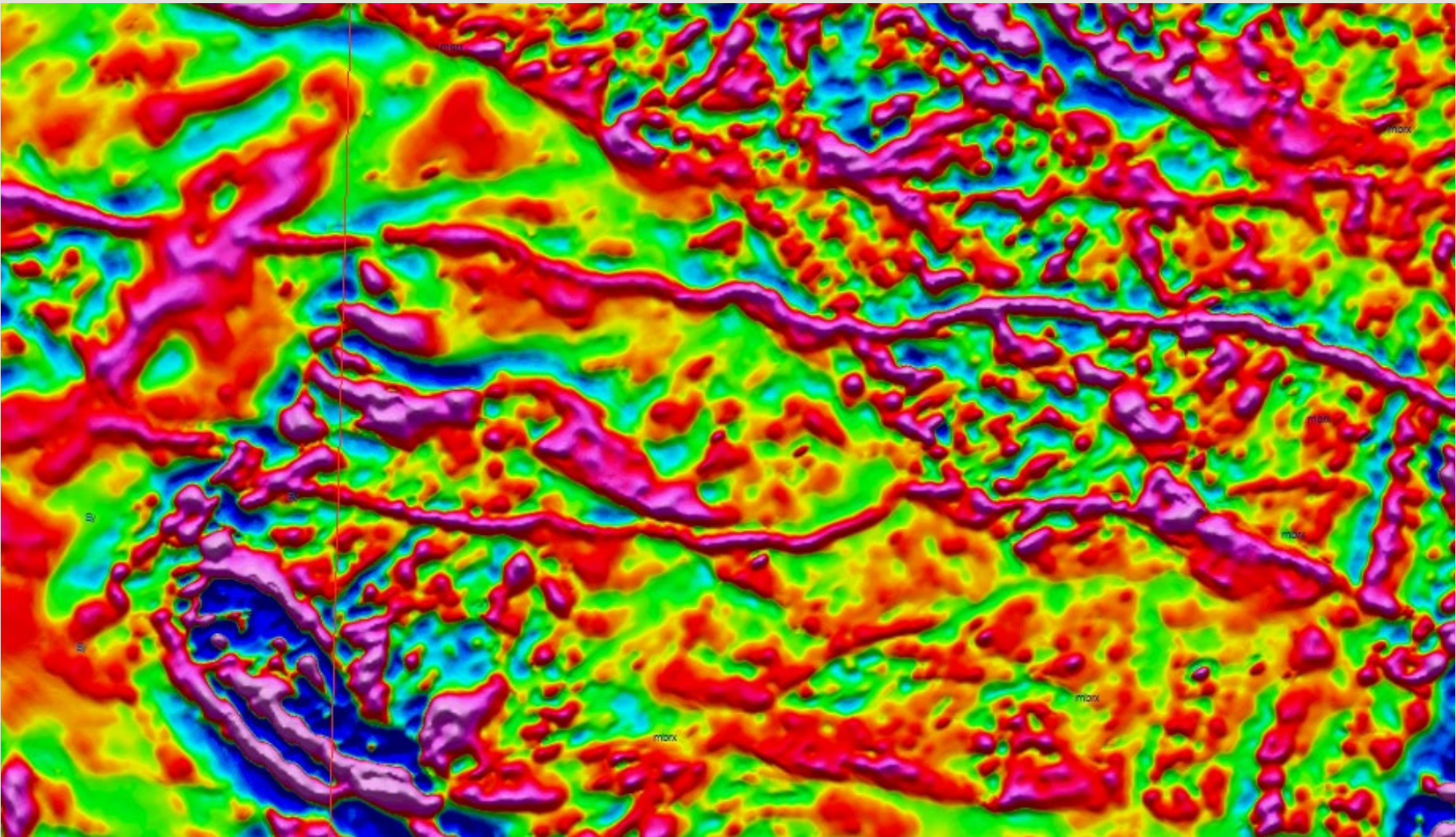
10 km

Admaston-Horton - new 1VD magnetics



10 km

SW Cobden area - new 1VD

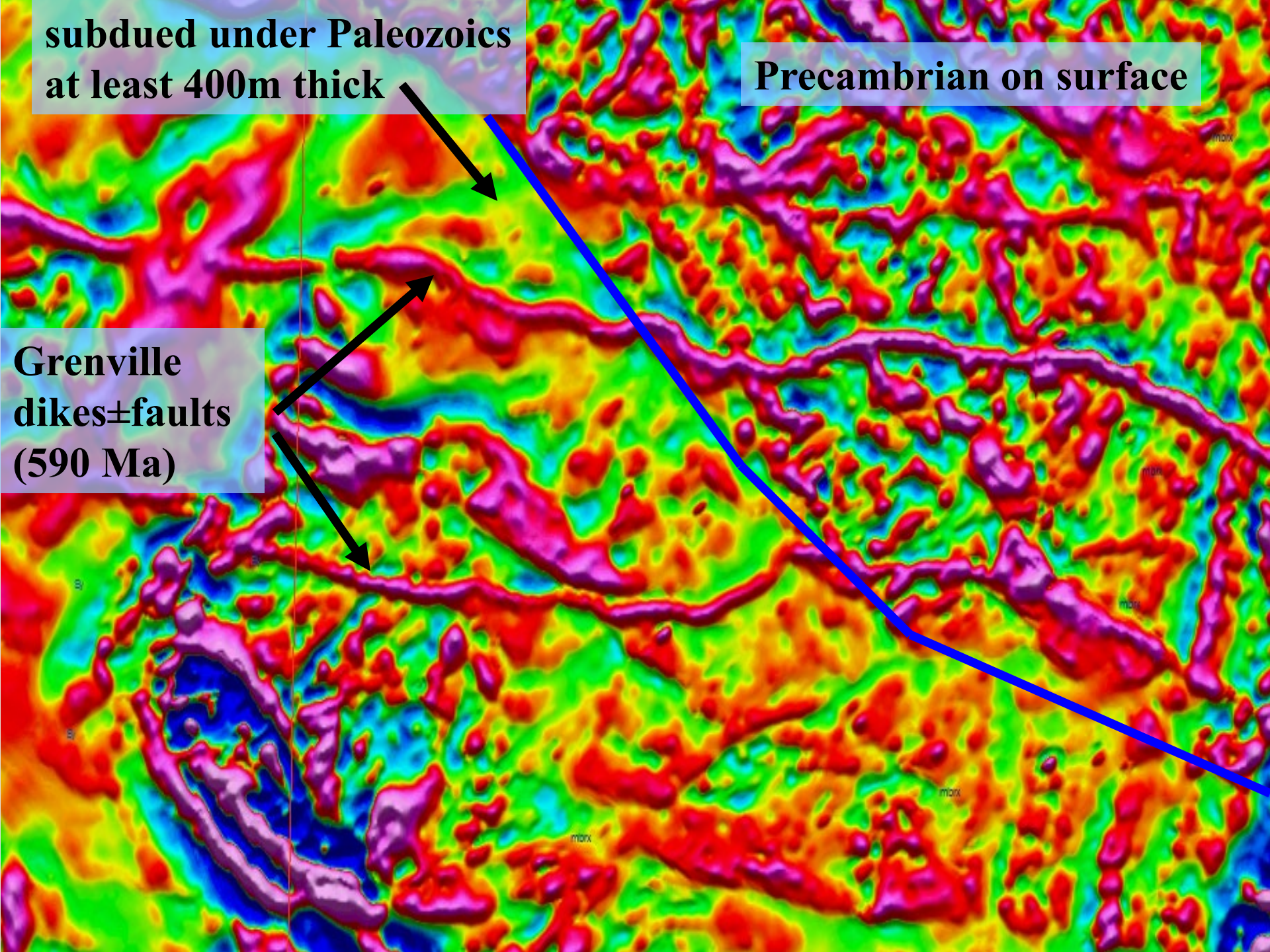


5 km

**subdued under Paleozoics
at least 400m thick**

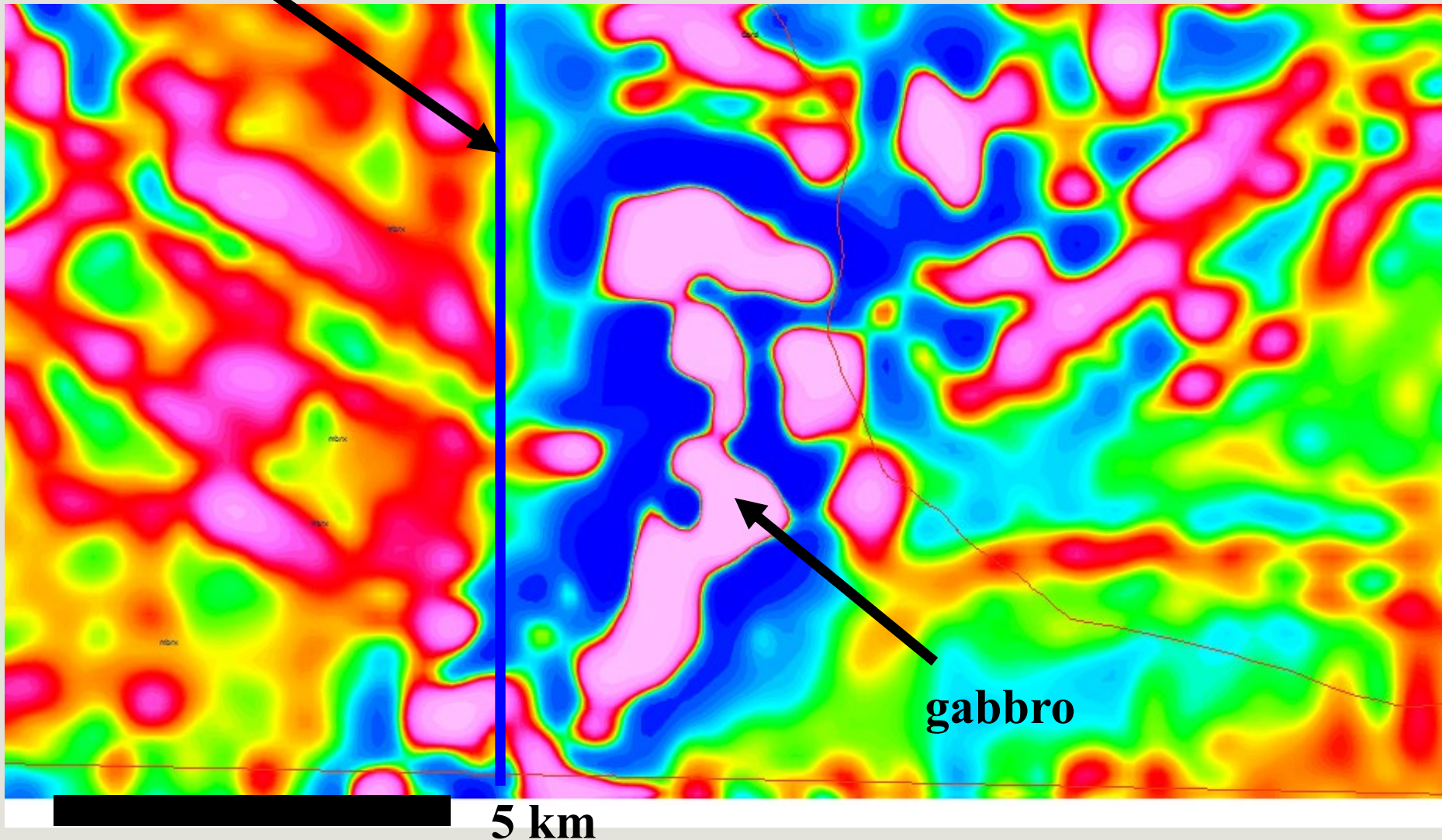
Precambrian on surface

**Grenville
dikes±faults
(590 Ma)**

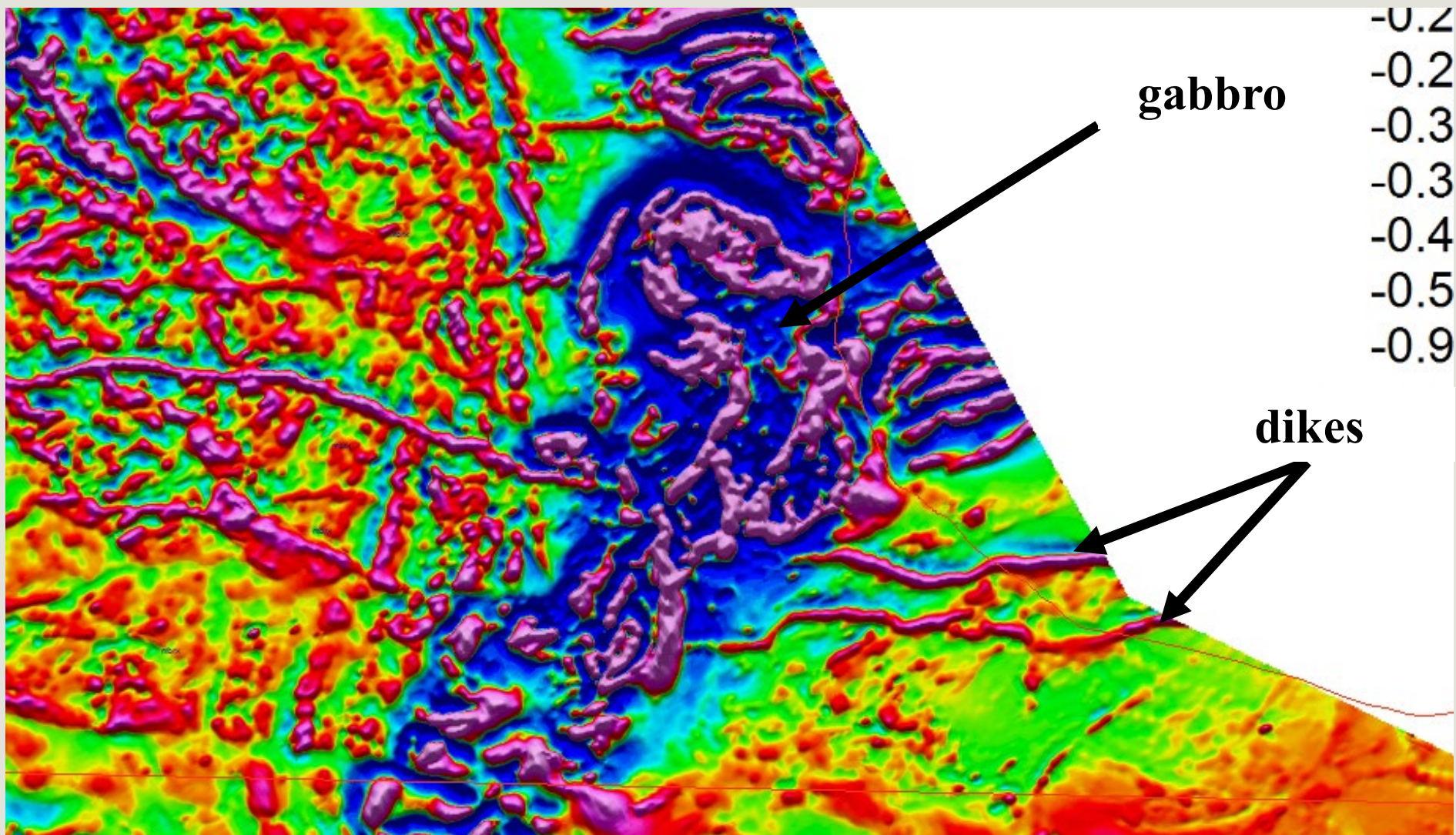


Chenaux gabbro, SE Cobden area – old 1VD magnetics

Ross fault

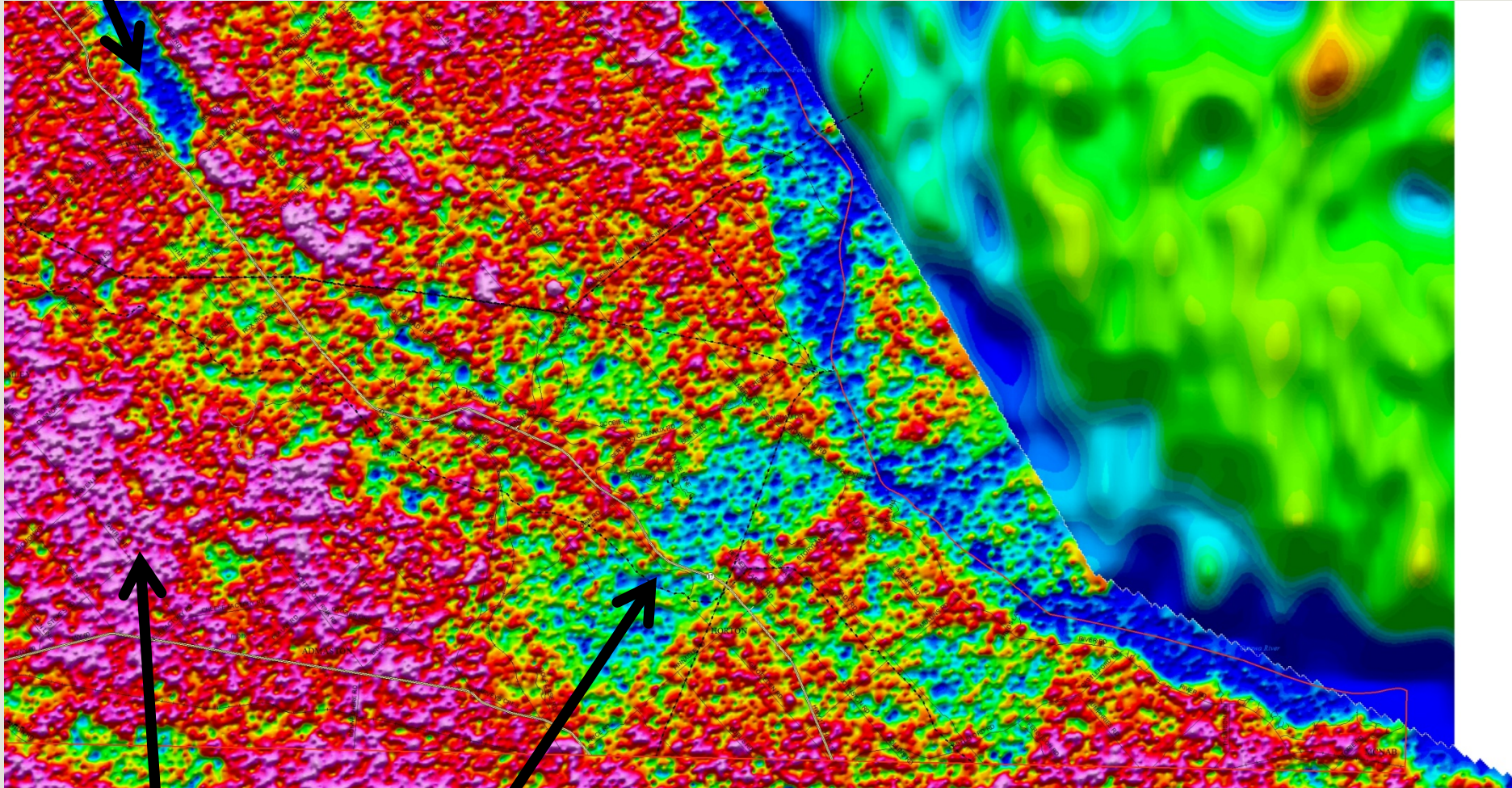


Chenaux gabbro, SE Cobden area – new 1VD



**Muskrat
Lake**

Radiometrics - eTh

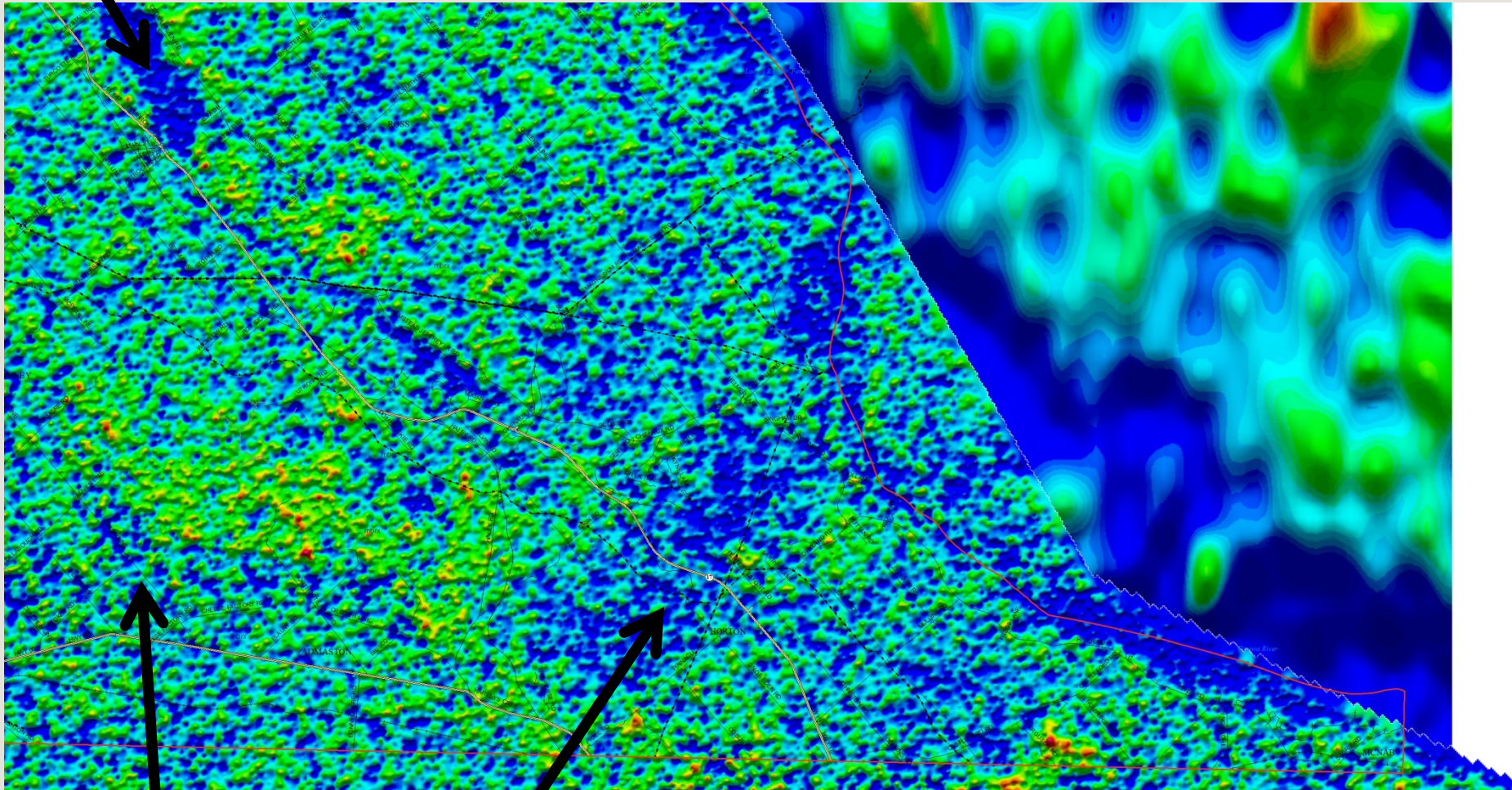


farmland

Chenaux gabbro – low & treed

**Muskrat
Lake**

Radiometrics - eU



farmland

Chenaux gabbro – low & treed

EASTERN ONTARIO SURVEY



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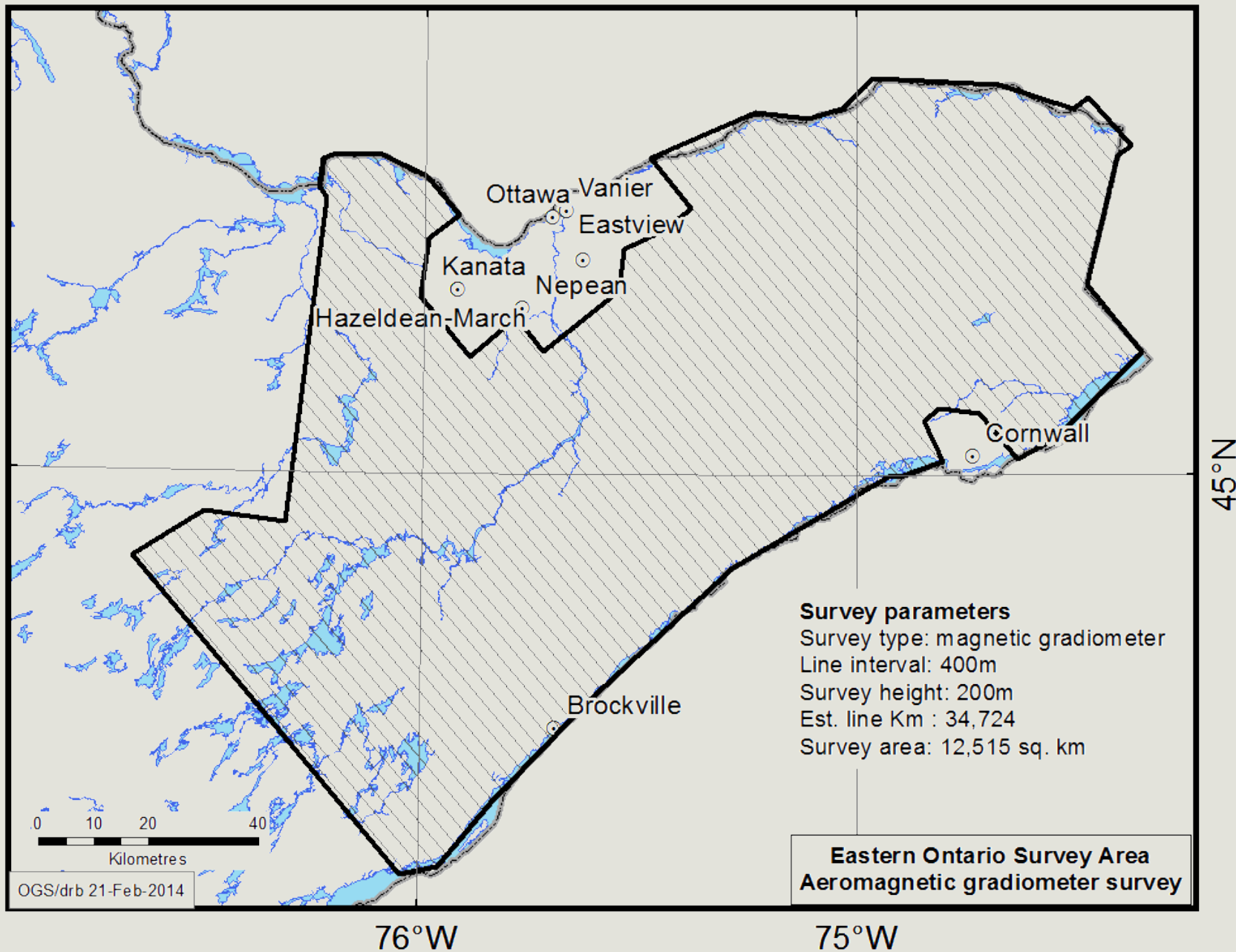
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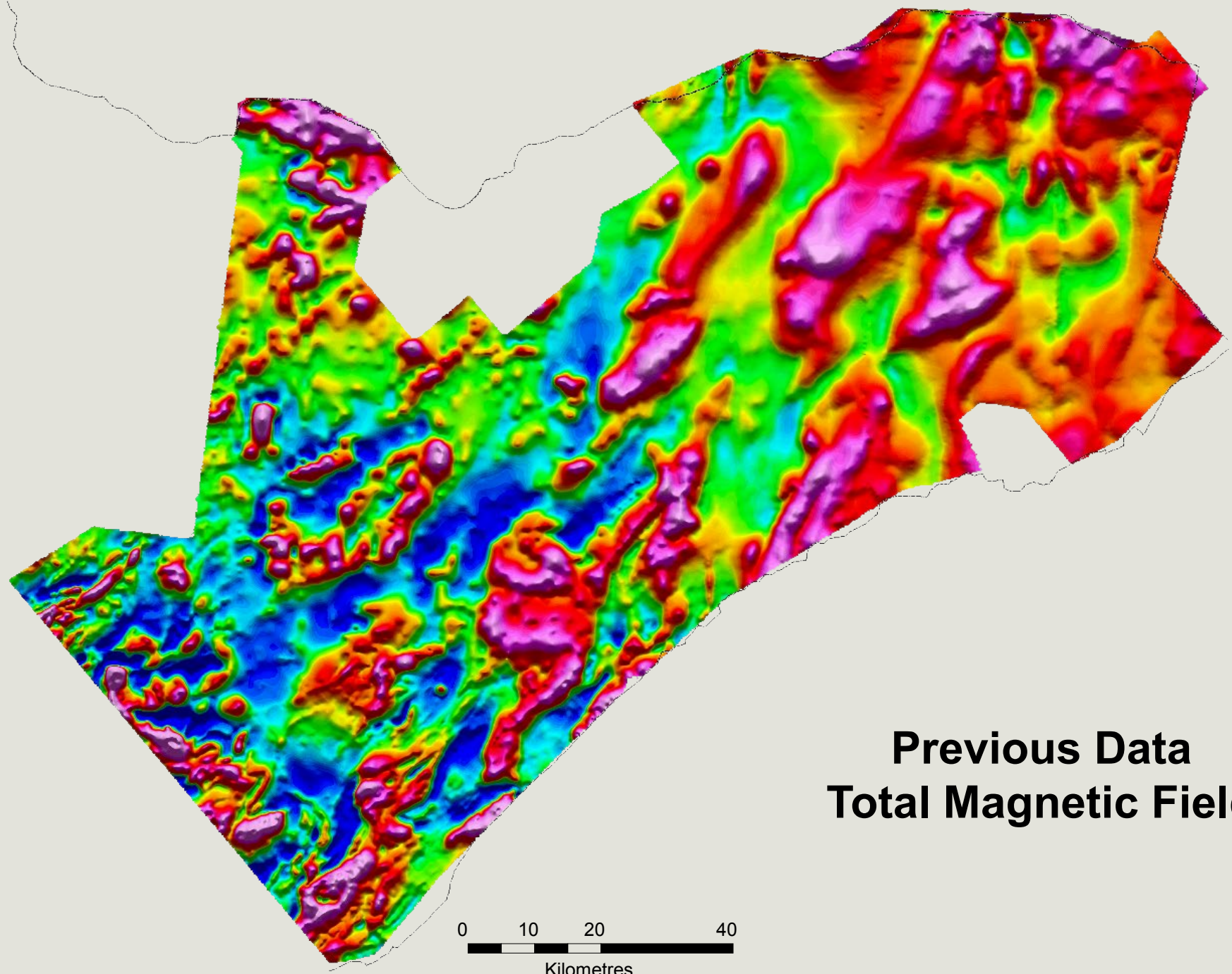


Survey Assumptions

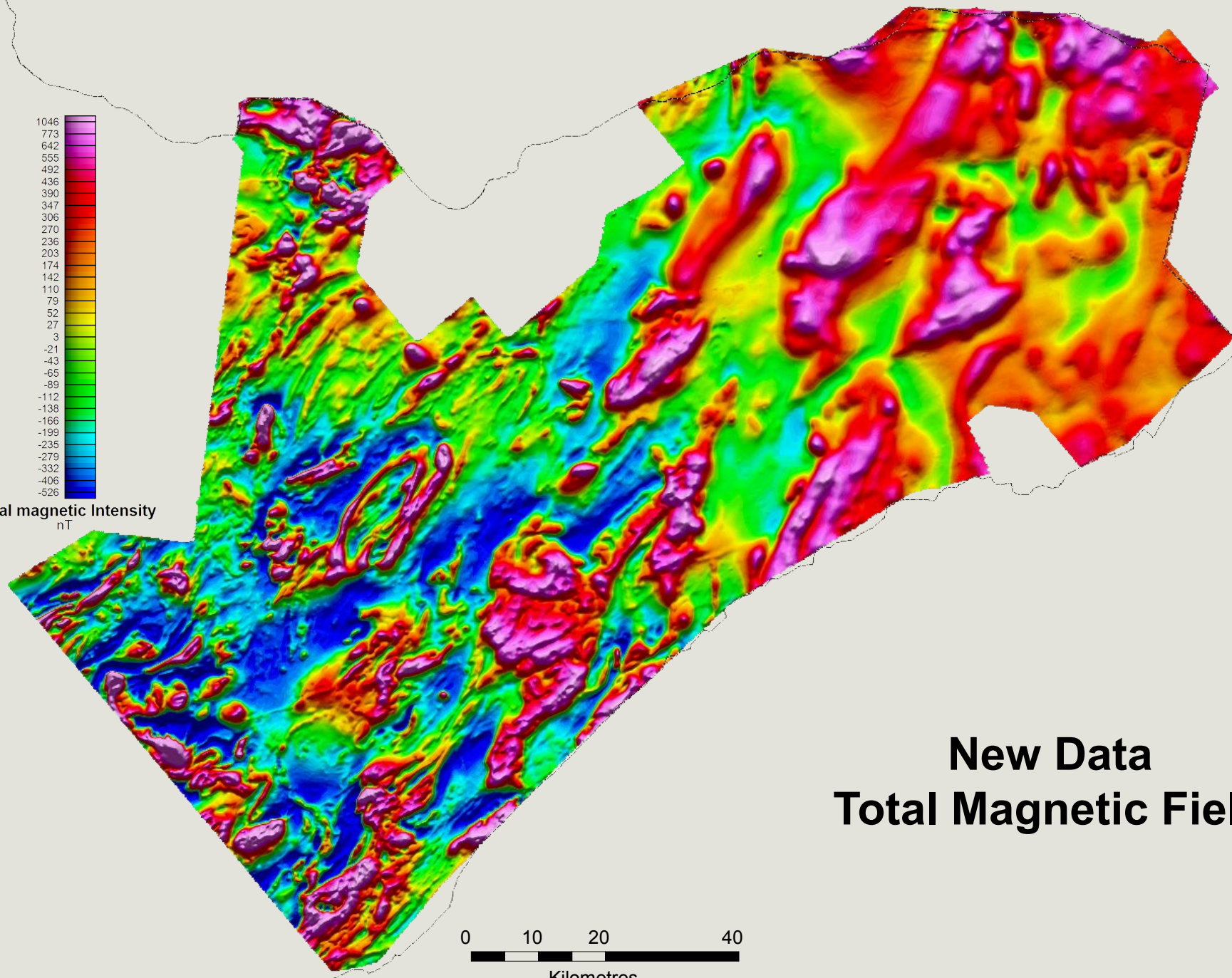
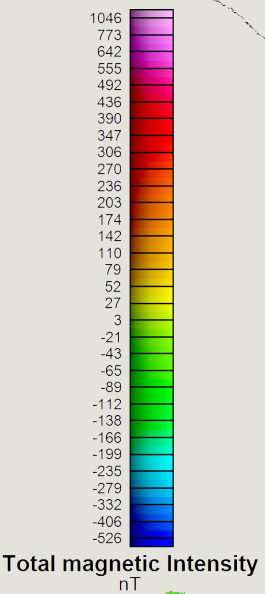
- Paleozoic rocks are non-magnetic ,
i.e. “magnetically transparent”
- in contrast, basement rocks are variably magnetic
- geological contacts and faults can be identified by contrasting magnetic responses
- *basement faults continued to be active in Paleozoic and post-Paleozoic times*



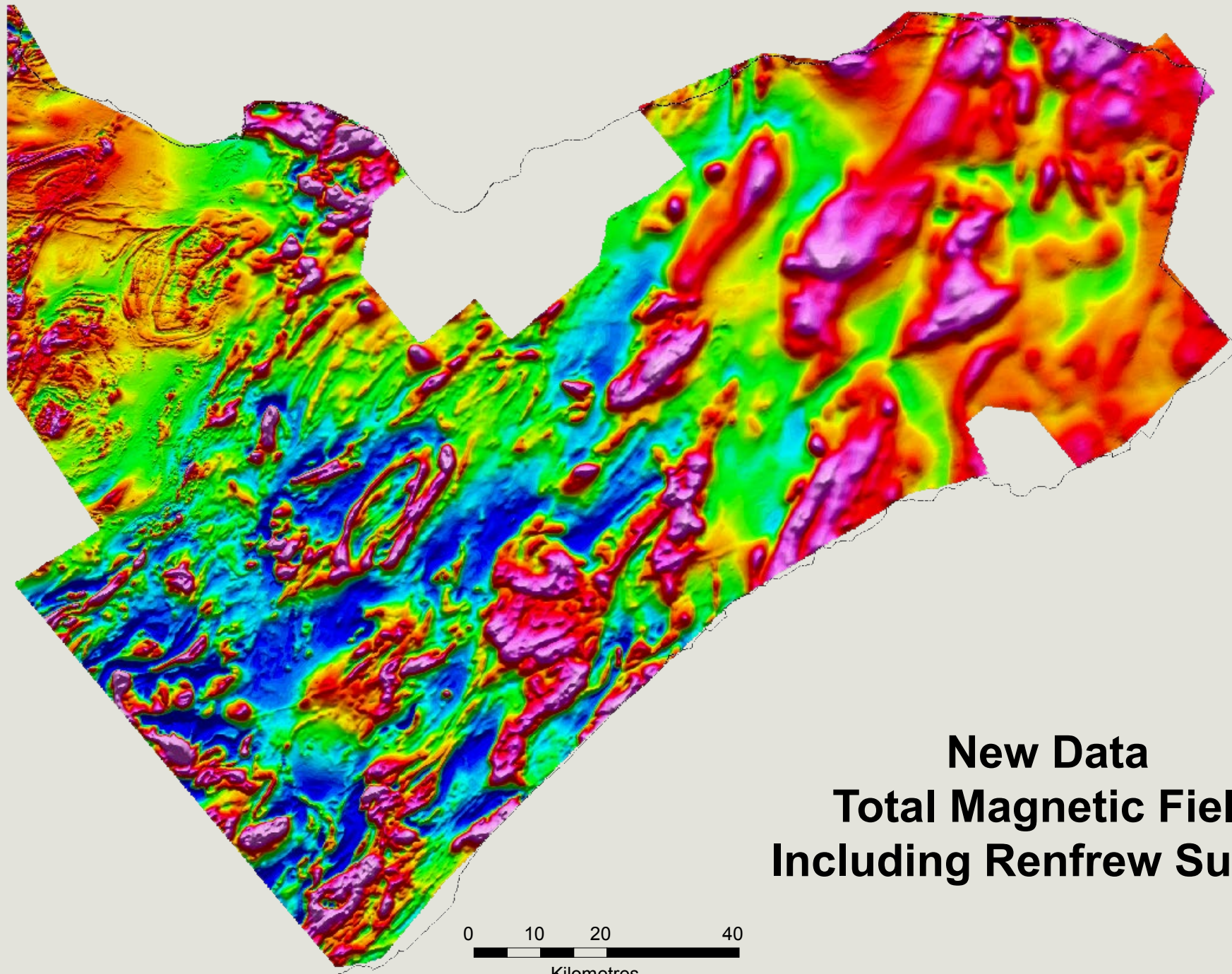




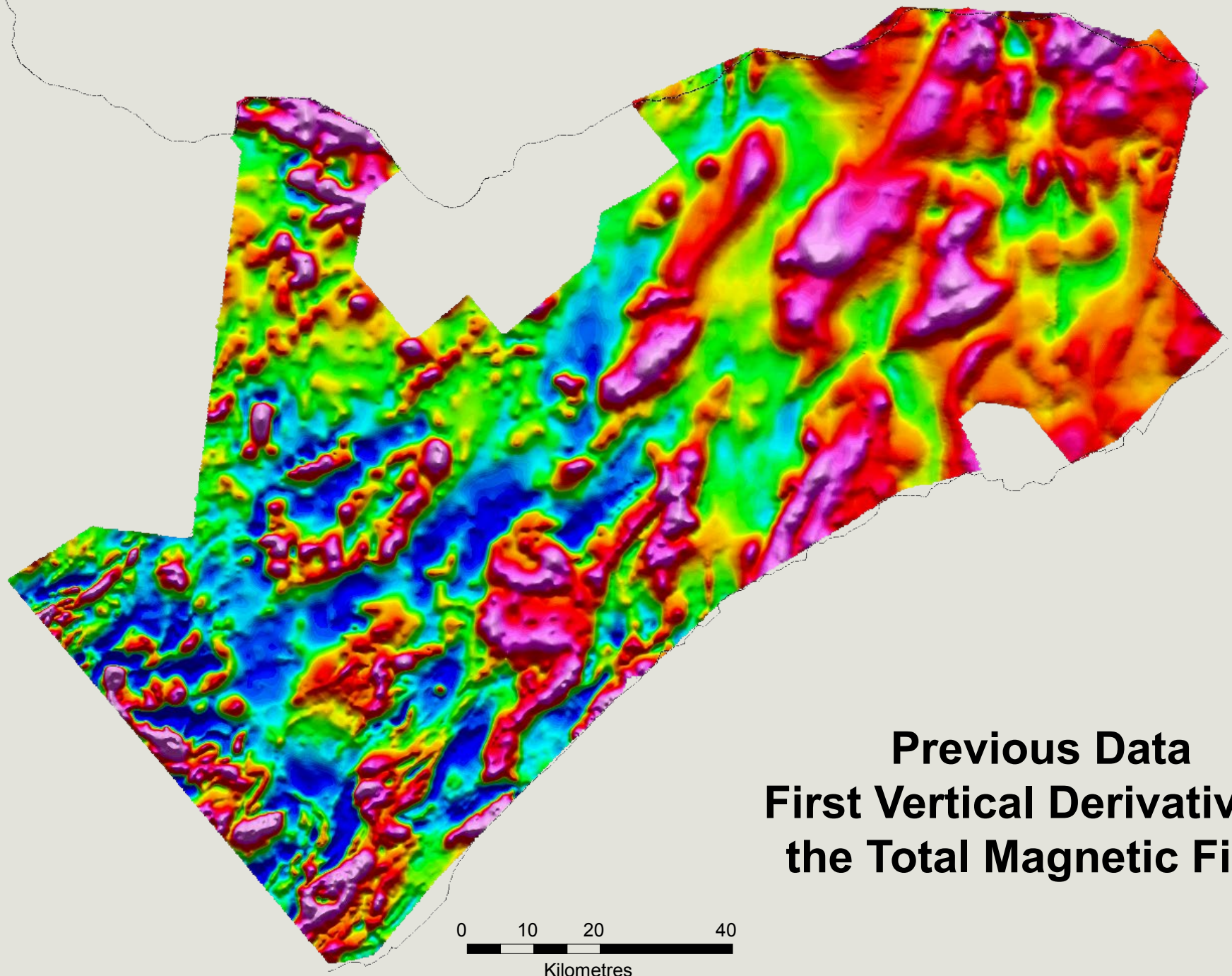
**Previous Data
Total Magnetic Field**



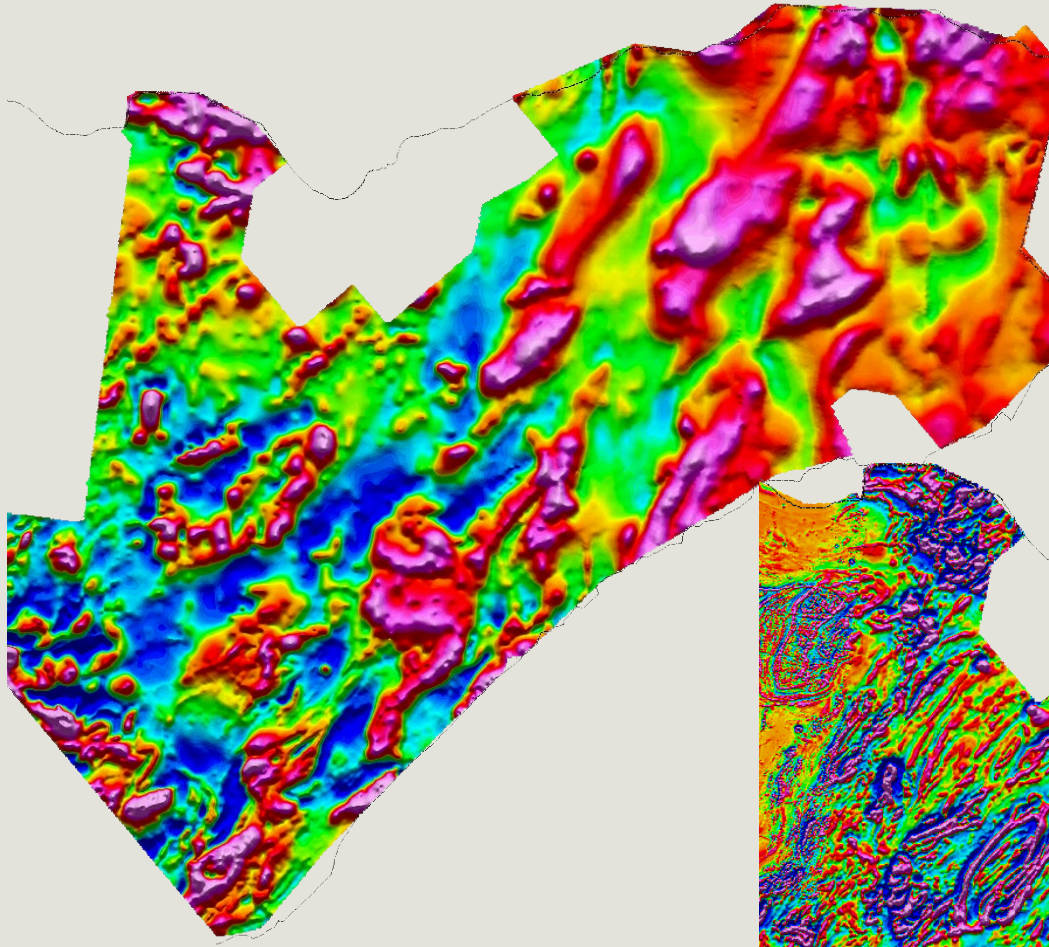
New Data
Total Magnetic Field



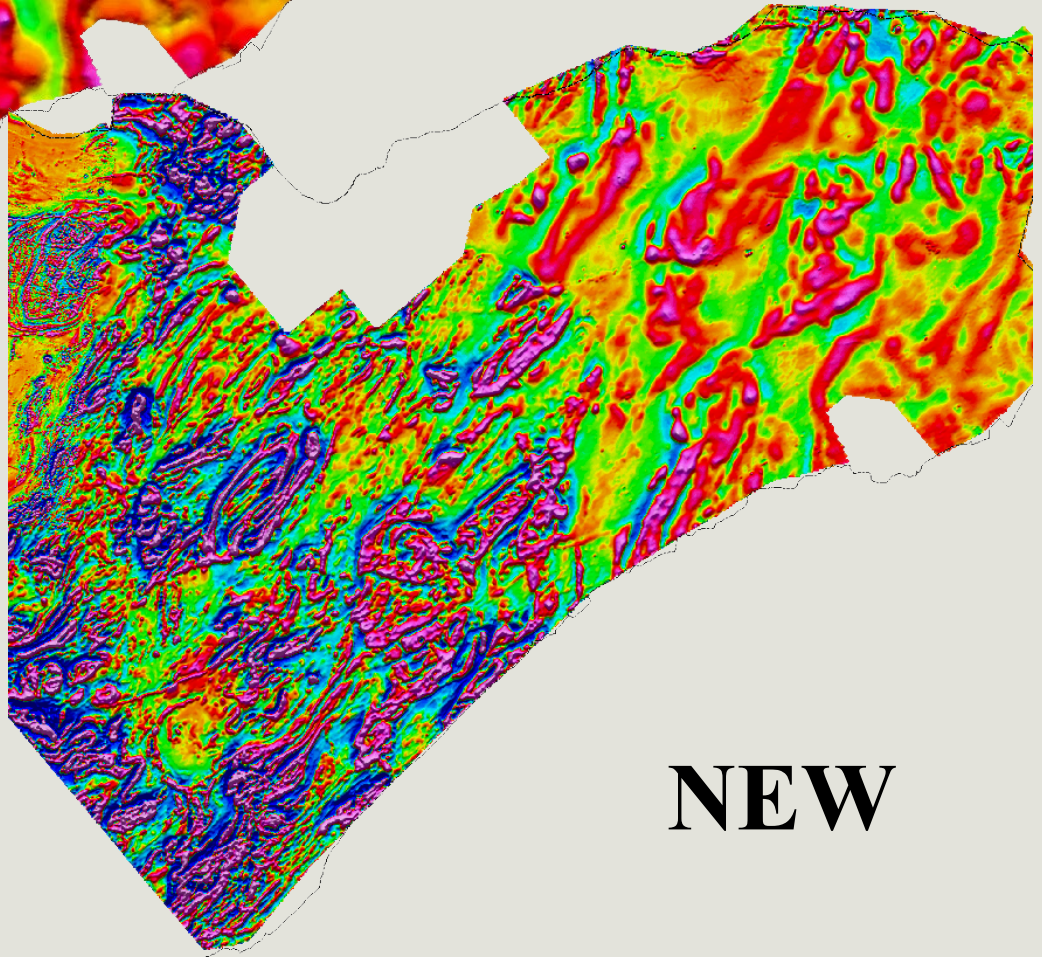
**New Data
Total Magnetic Field
Including Renfrew Survey**



**Previous Data
First Vertical Derivative of
the Total Magnetic Field**



OLD



NEW

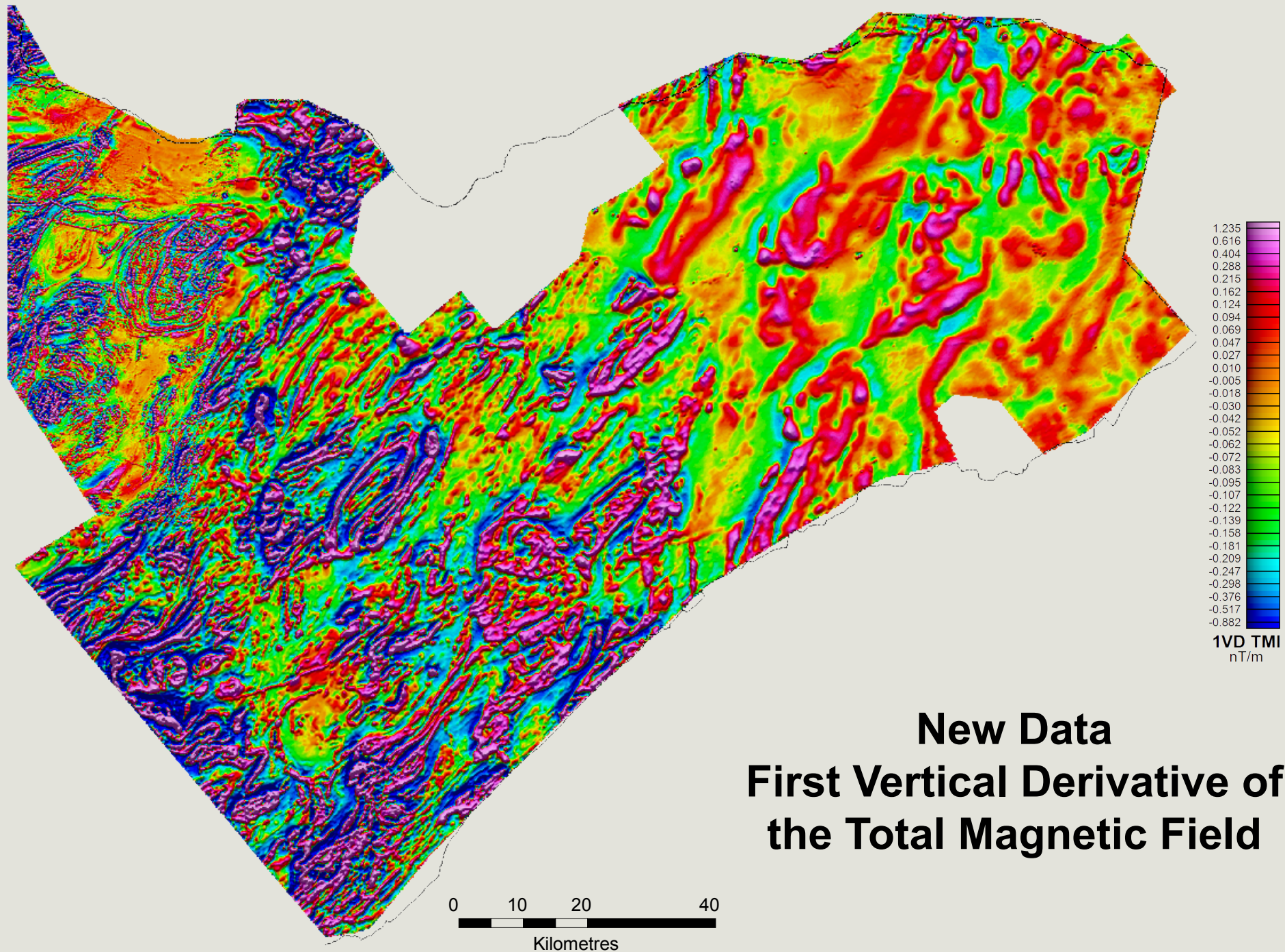
PALEOZOIC GEOLOGY

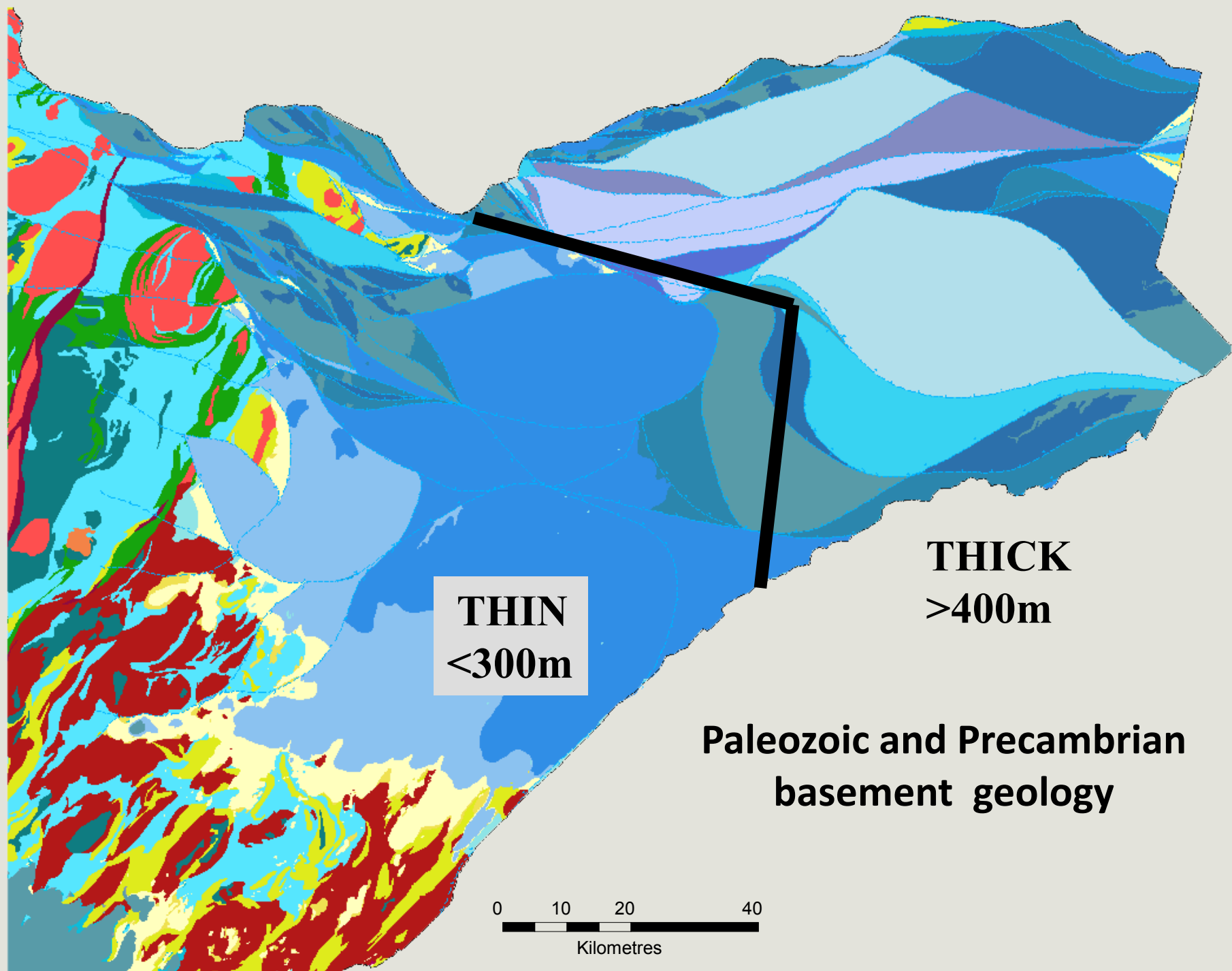


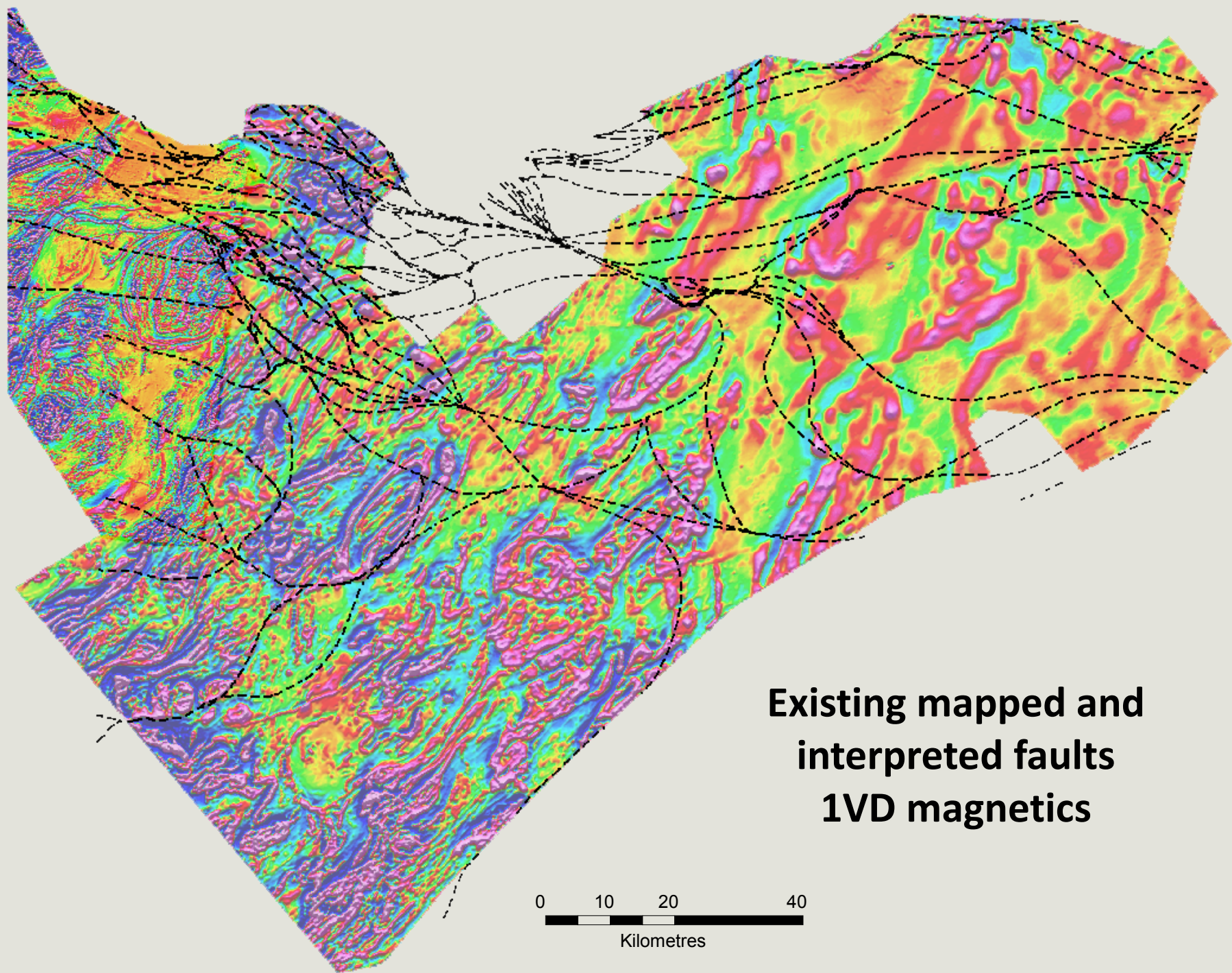
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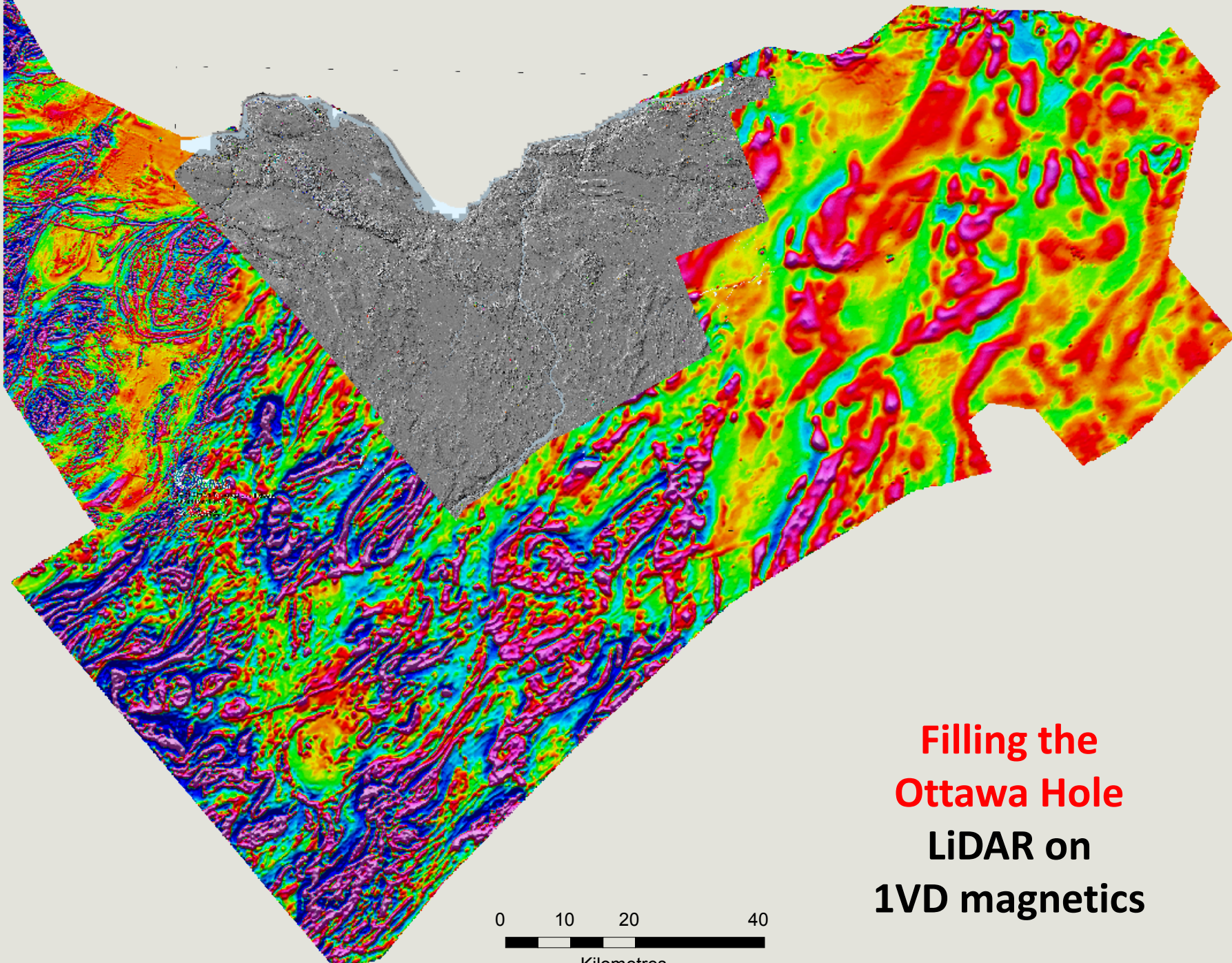
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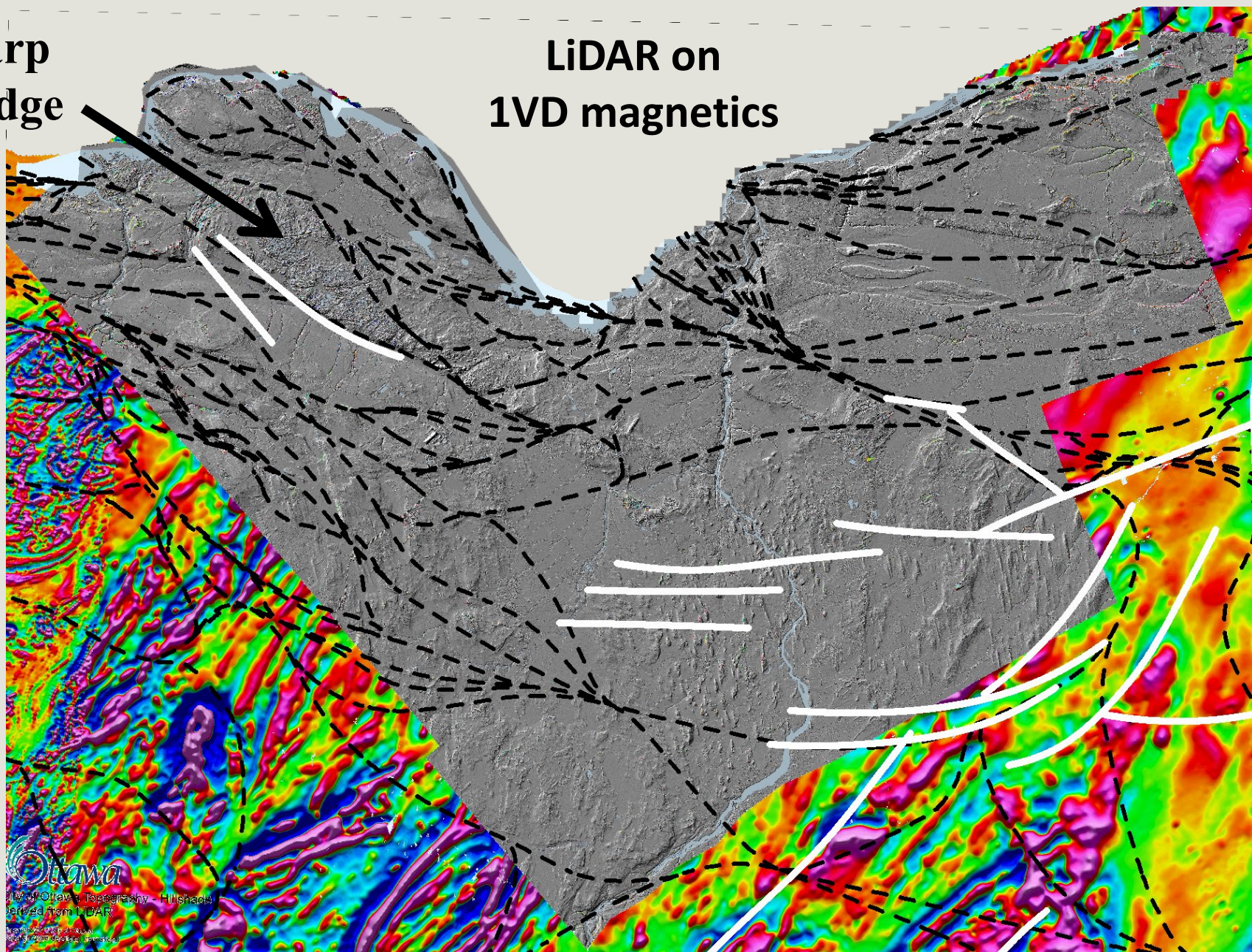


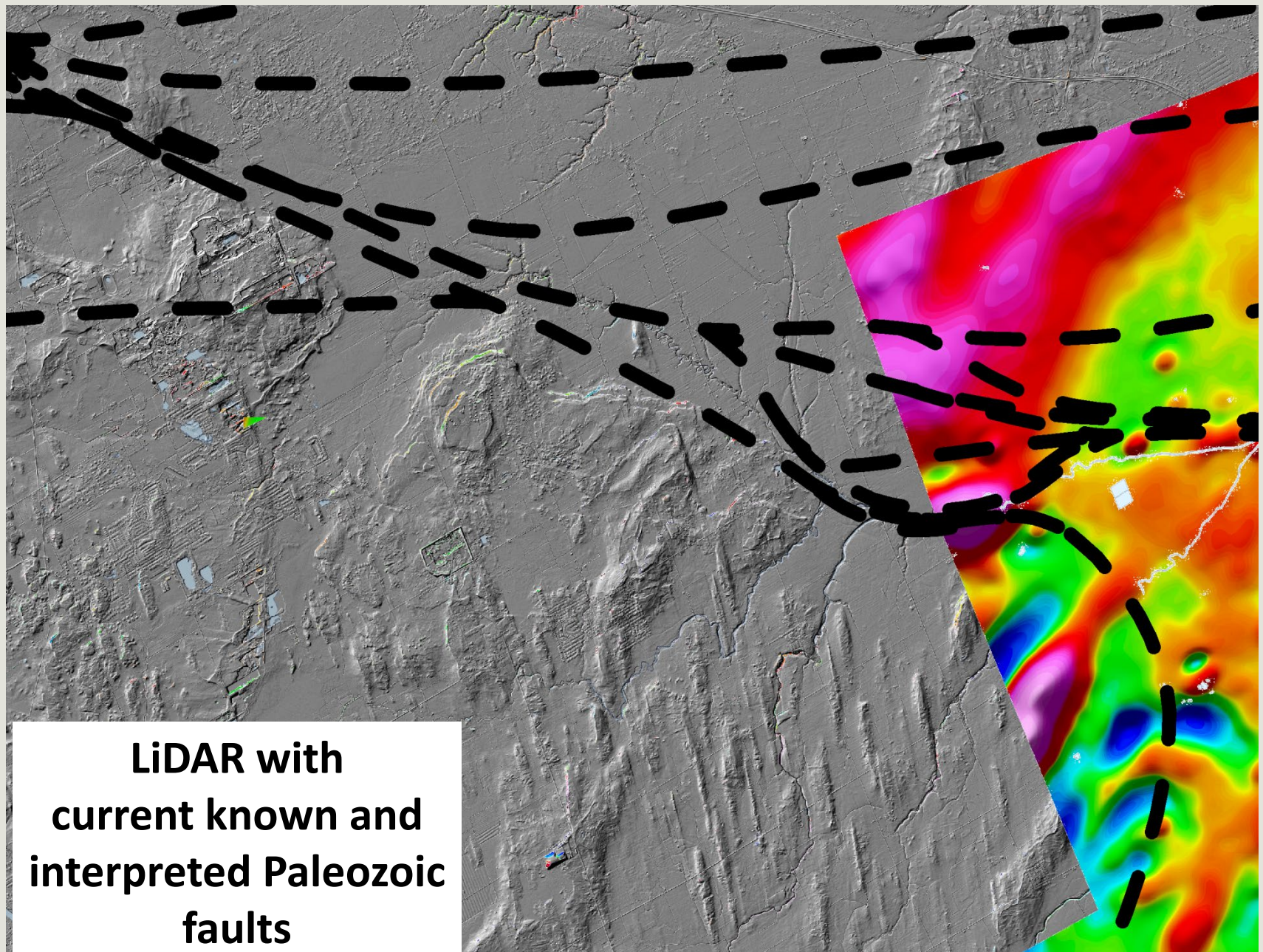


**Filling the
Ottawa Hole
LiDAR on
1VD magnetics**

Carp
Ridge

LiDAR on
1VD magnetics





**LiDAR with
current known and
interpreted Paleozoic
faults**

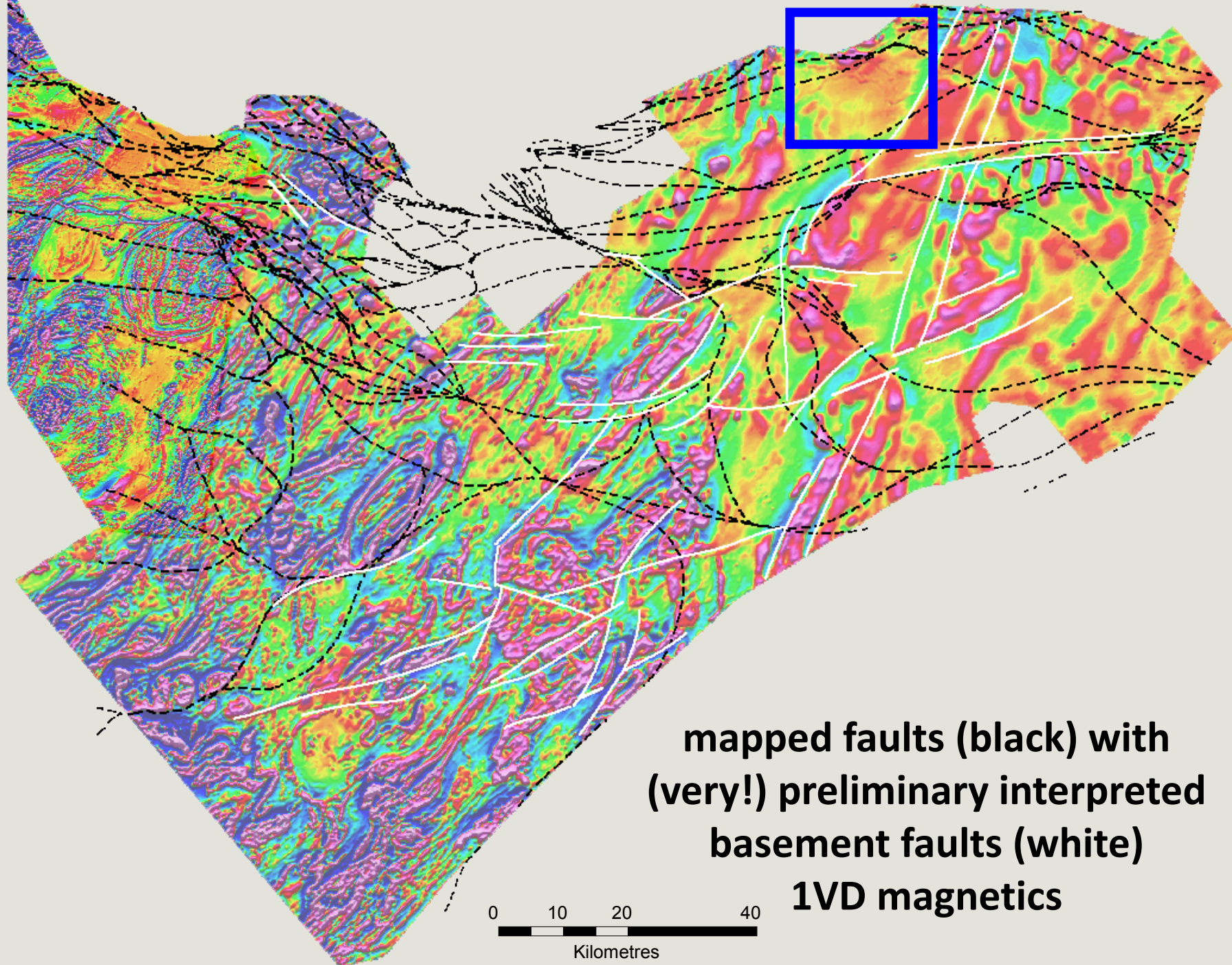
QUATERNARY GEOLOGY



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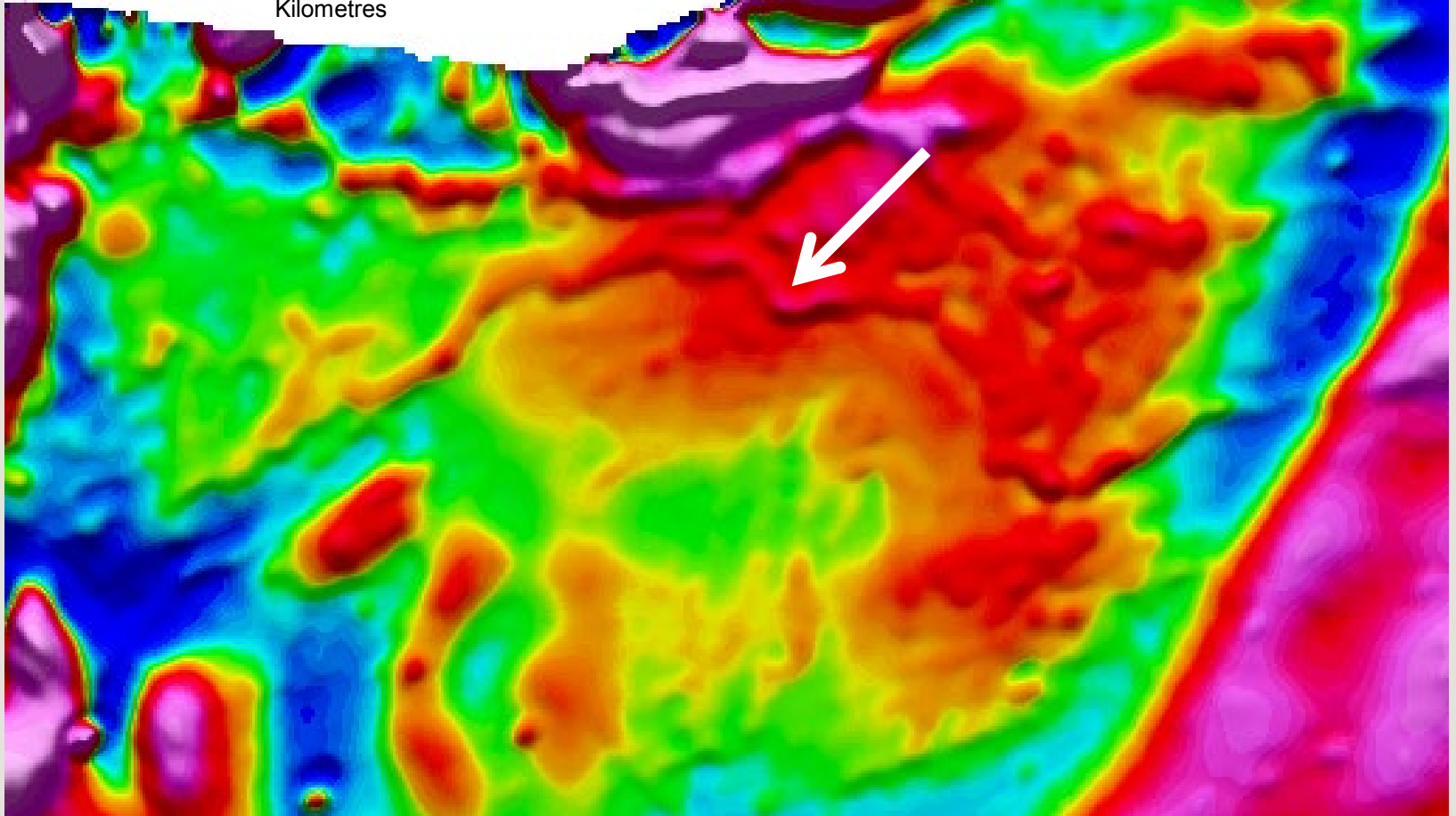
**mapped faults (black) with
(very!) preliminary interpreted
basement faults (white)
1VD magnetics**



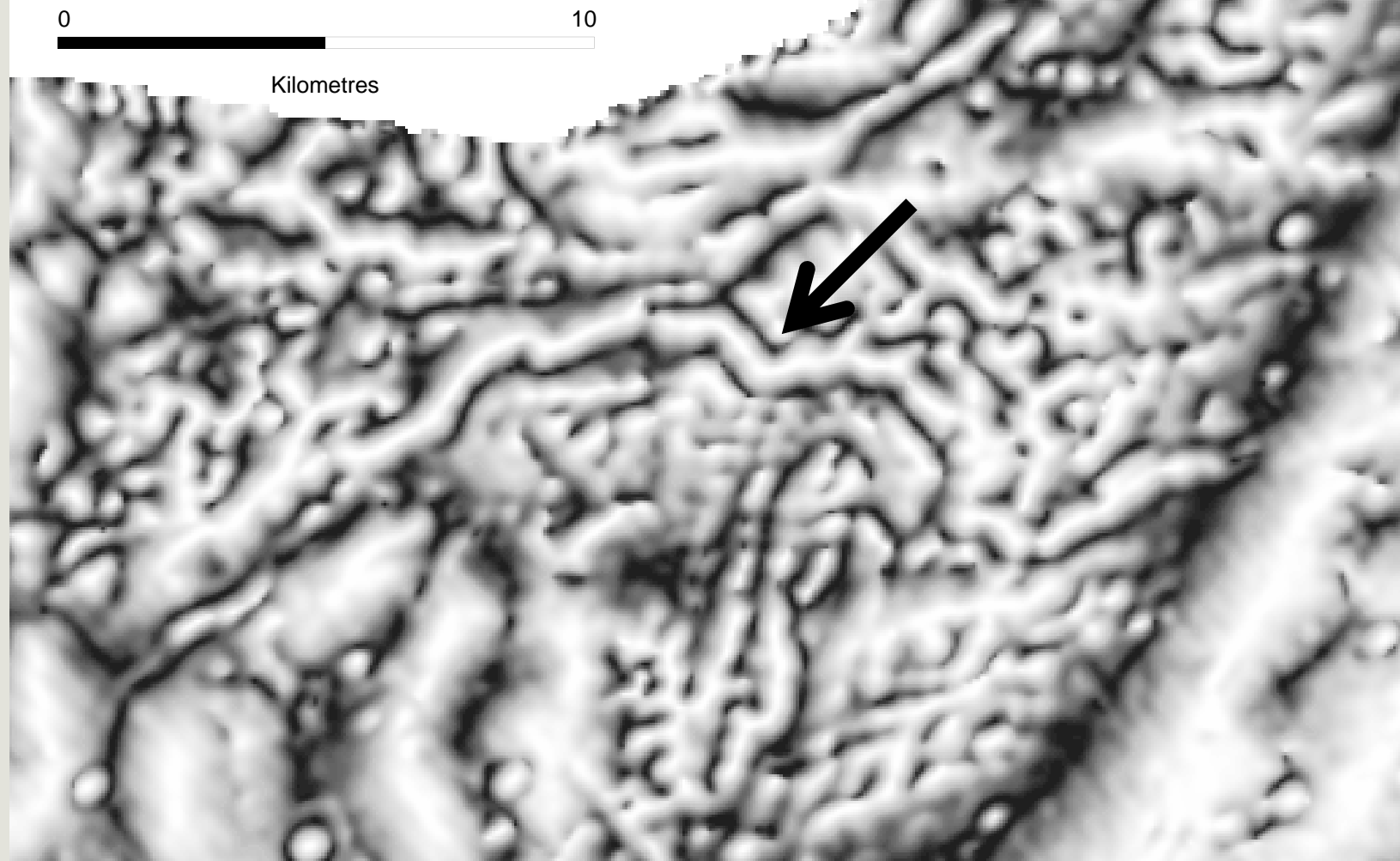
Paleochannel 1VD magnetic field

0 10

Kilometres



Paleochannel 1VD tilt derivative



Next Steps

- use data in production of bedrock geology maps in the Renfrew area
 - P3783, P3784 – released
 - Brudenell, Cobden, Chenaux gabbro – in progress
 - Mud Lake and Black Donald areas – in progress
- in Eastern Ontario
 - interpretation of basement geology resulting in a 1:100 000 scale compilation map (next presentation)
 - incorporation of LiDAR data (planned)
 - lineament analysis (proposed)

