

The Tellus Airborne Geophysical Survey and Results

Mike Young



The Tellus Conference, Belfast, 17/18 October 2007

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Geophysical surveying measures:

- Natural magnetic field
- Shallow electrical conductivity variations
- Surface radioactivity



- MAP surface and near-surface physical characteristics
- MODEL subsurface geological structure

We use the results for:

Exploration for Earth resources

- Shallow structural mapping
- Basin interpretation
- Geothermal sources

Environment management

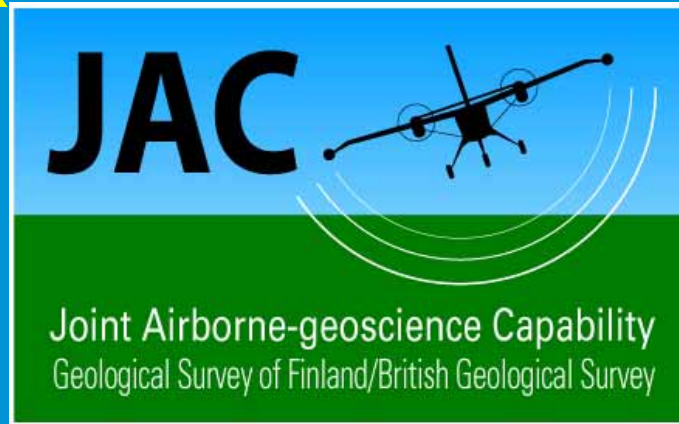
- Natural baselines
- Anthropogenic effects
- Hydrogeology
- Soil carbon and peat
- Radon



Geological Survey
of Finland



British Geological
Survey



Joint Airborne- geoscience Capability



Geological Survey
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BGS-GTK geophysical survey aircraft

Electromagnetic coil



Gamma-ray detector

Magnetometer



Aircraft systems

- Aircraft De Havilland Twin Otter
- Crew Pilot, co-pilot, navigator, engineer
- Navigation Visual + real-time differential GPS
- Position recovery DGPS + digital video
- Altimetry Radar and laser altimeter



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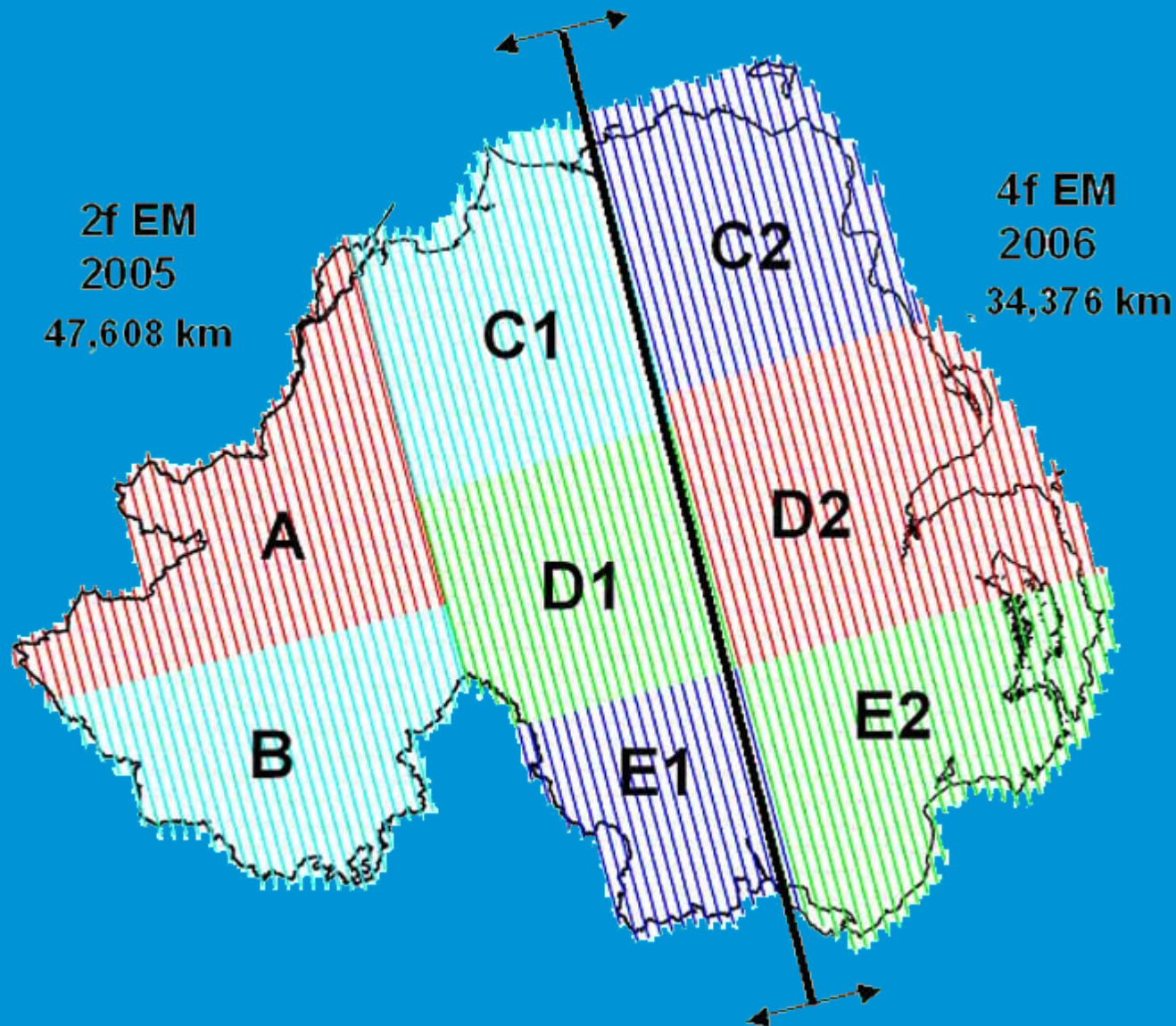
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Specification

Distance flown	81,000 km
Flying speed	~ 210 km/h
Flight direction	345 degrees
Flying height	56 m rural 250 m urban
Line spacing	200 m
Sampling:	- Magnetic 6 - 7 m - EM 15 - 17 m - Radiometric 60 - 70 m

Airborne Geophysical Survey



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New imagery

Magnetics

Electrical conductivity

Gamma radiation

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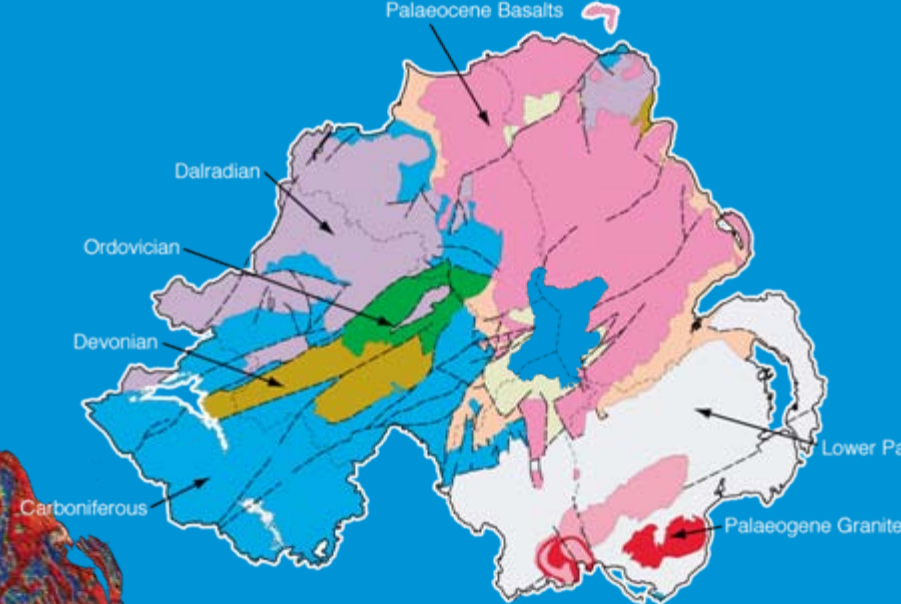
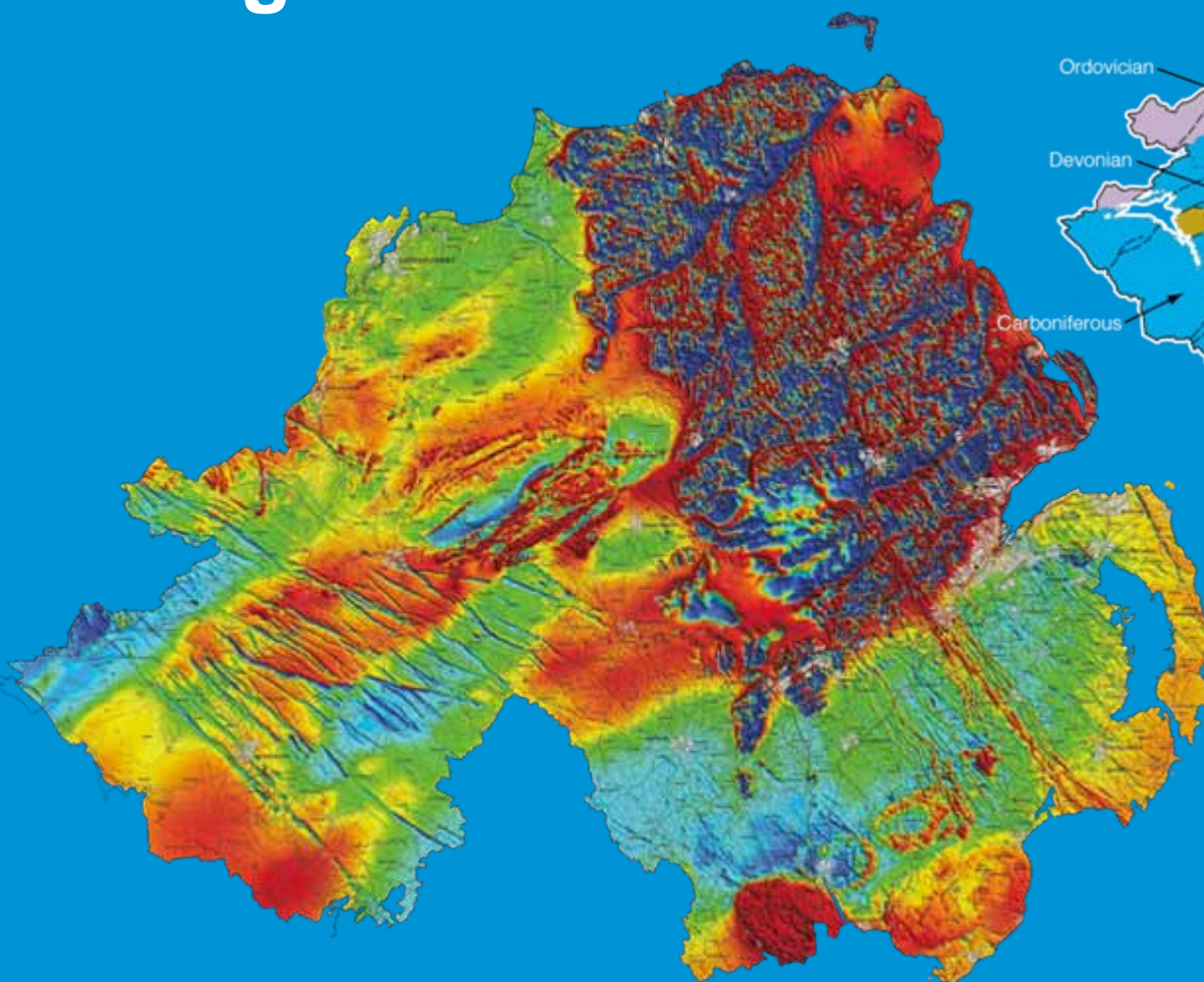
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Magnetic field



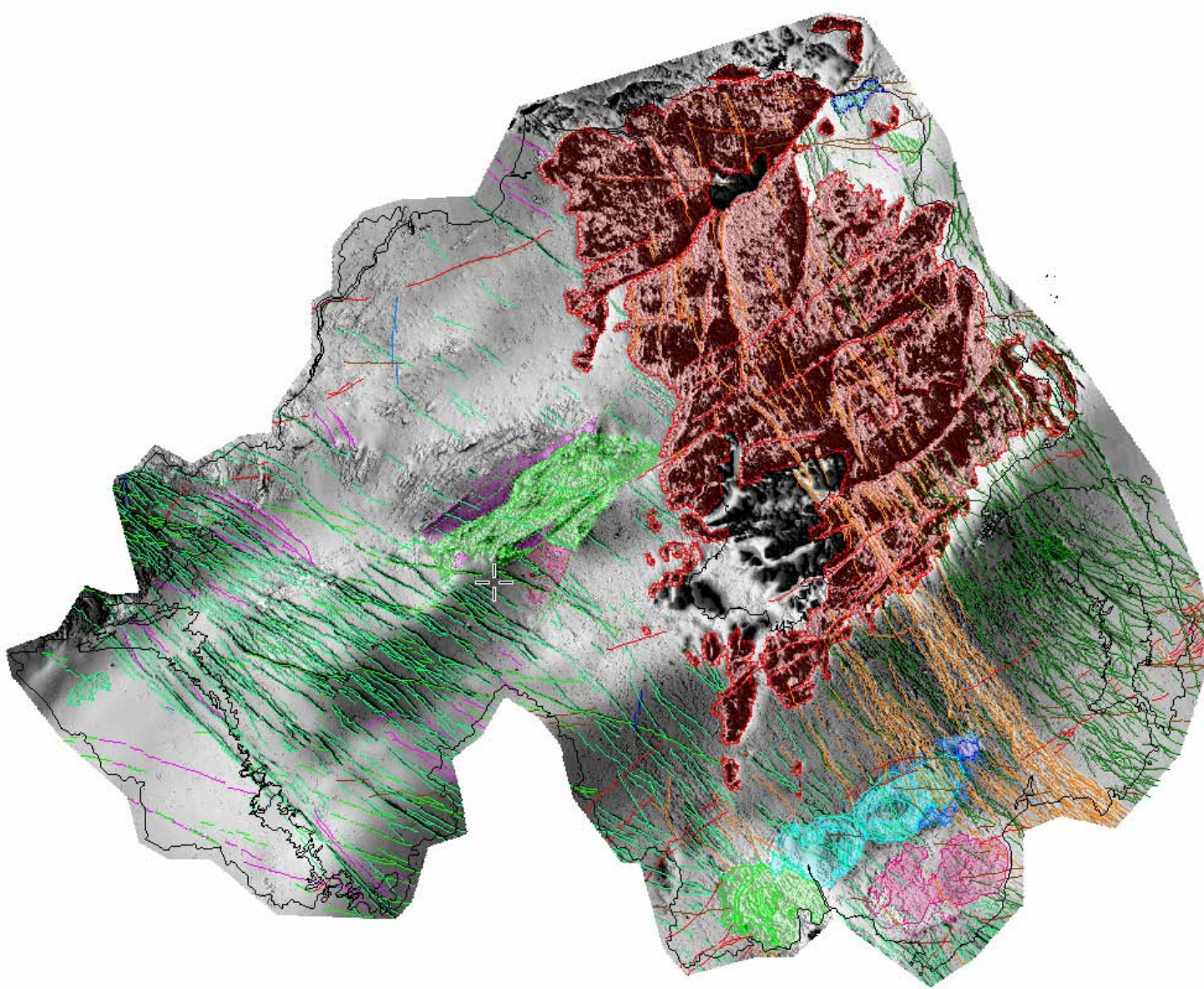
Geological mapping

Structural mapping

Regional geology and
tectonics

Basin studies

Igneous rocks



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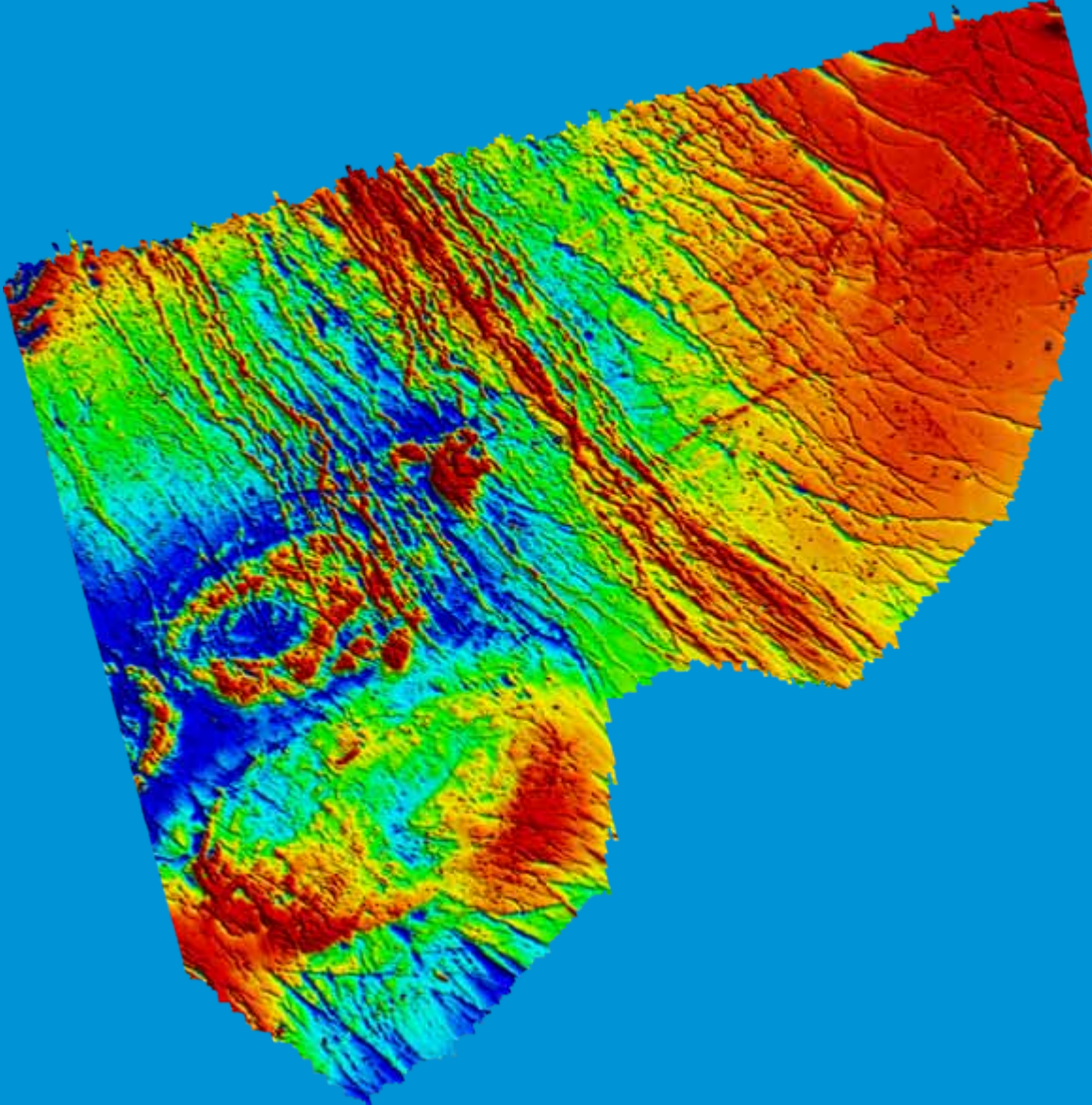
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Magnetic intensity



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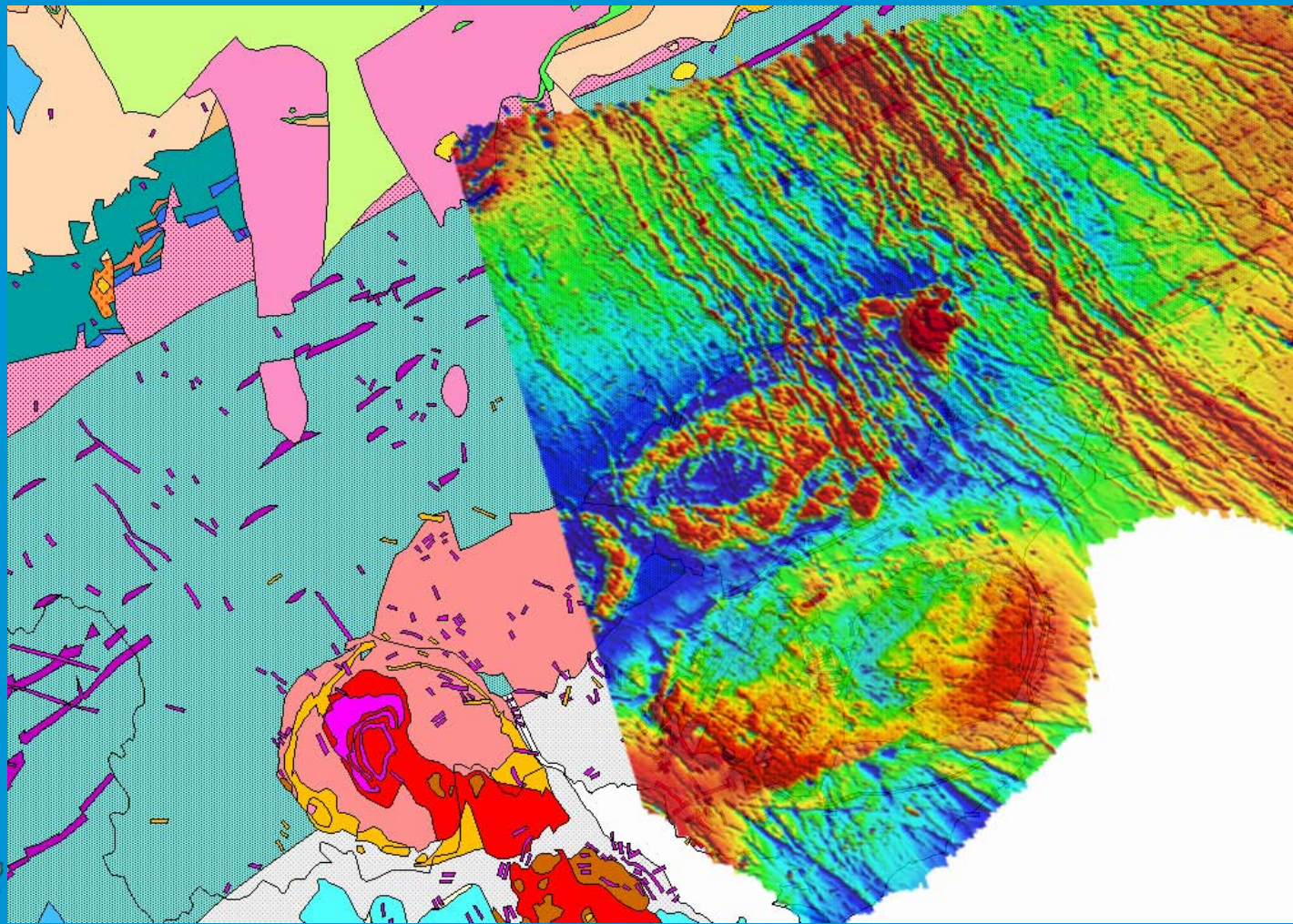
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Improving quality of mapping



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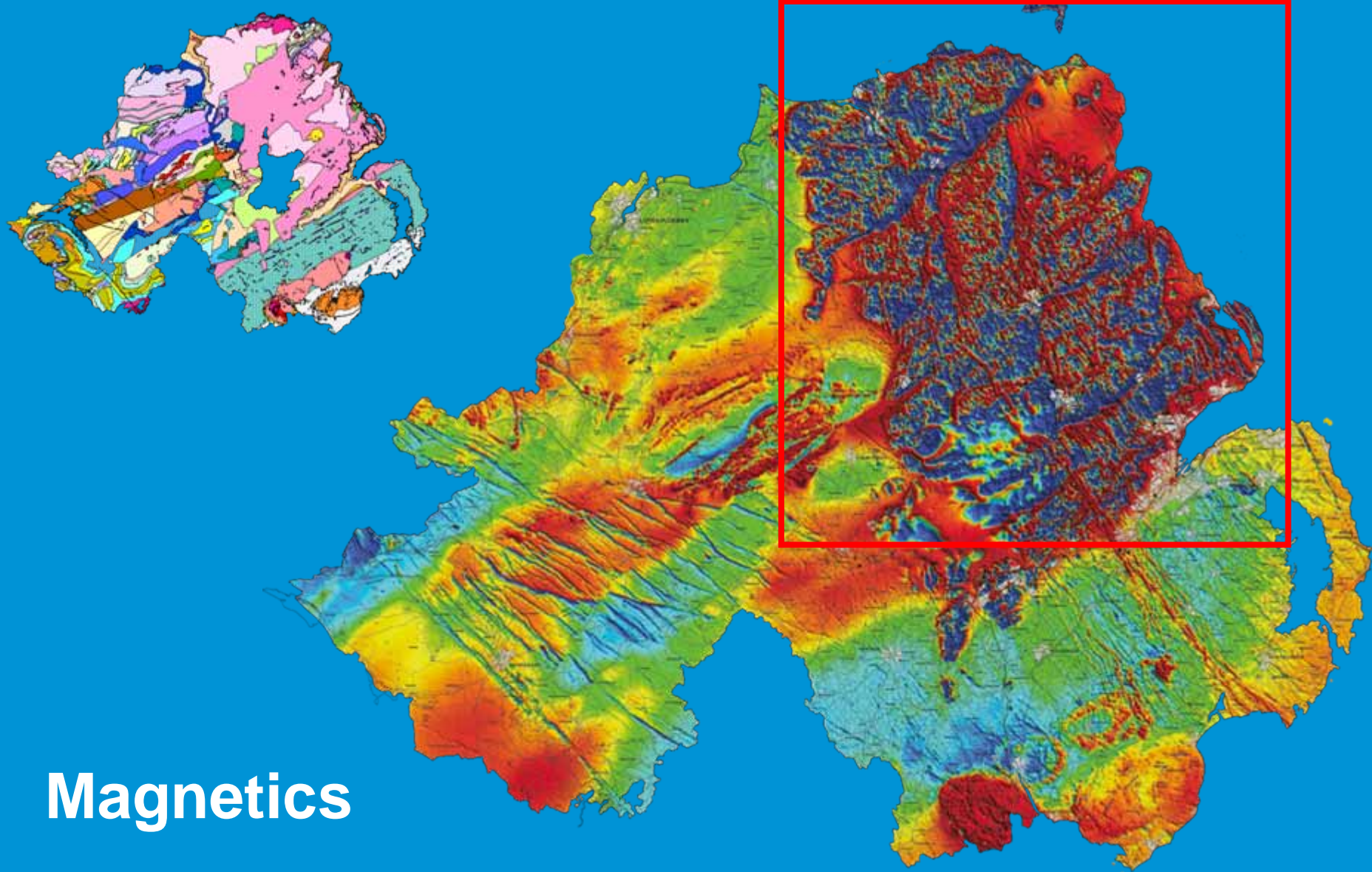


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Magnetics

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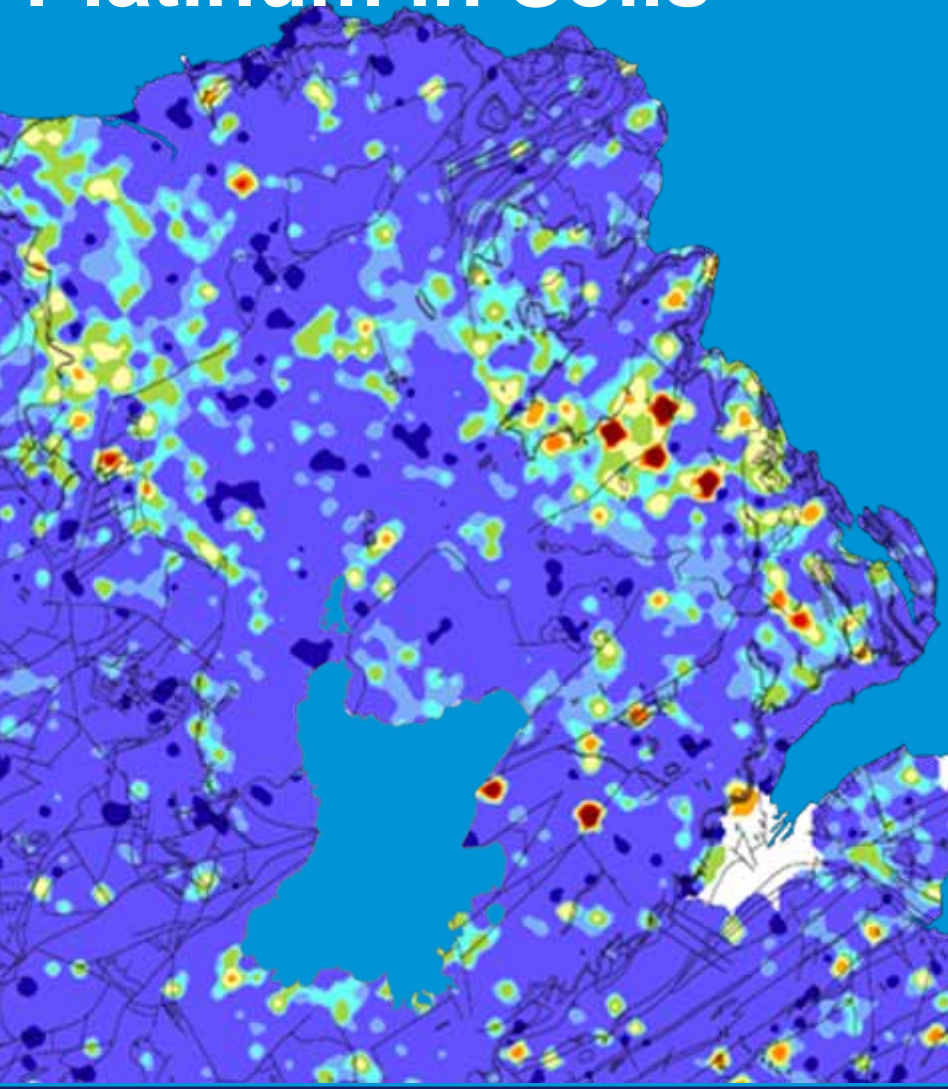
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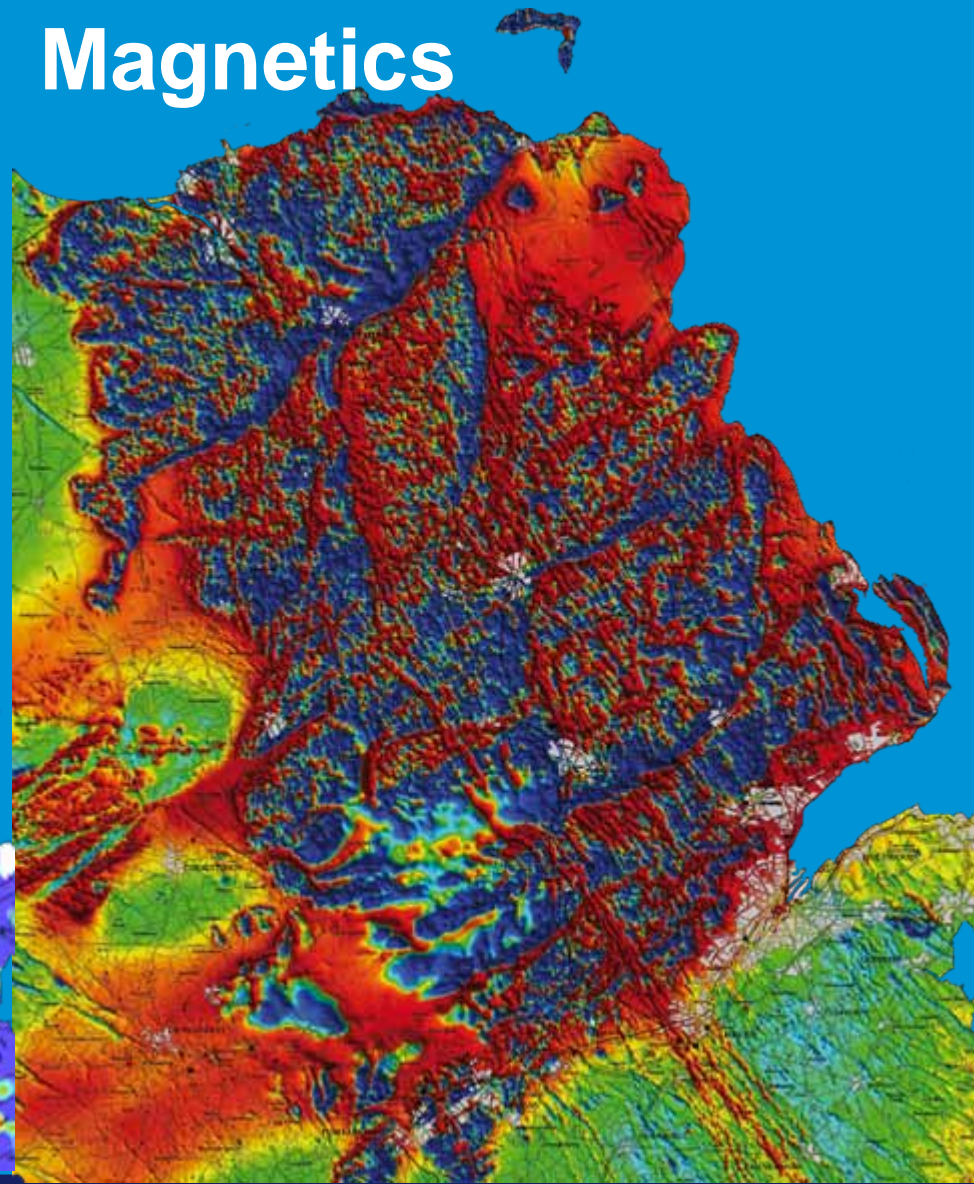
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Platinum in Soils



Magnetics



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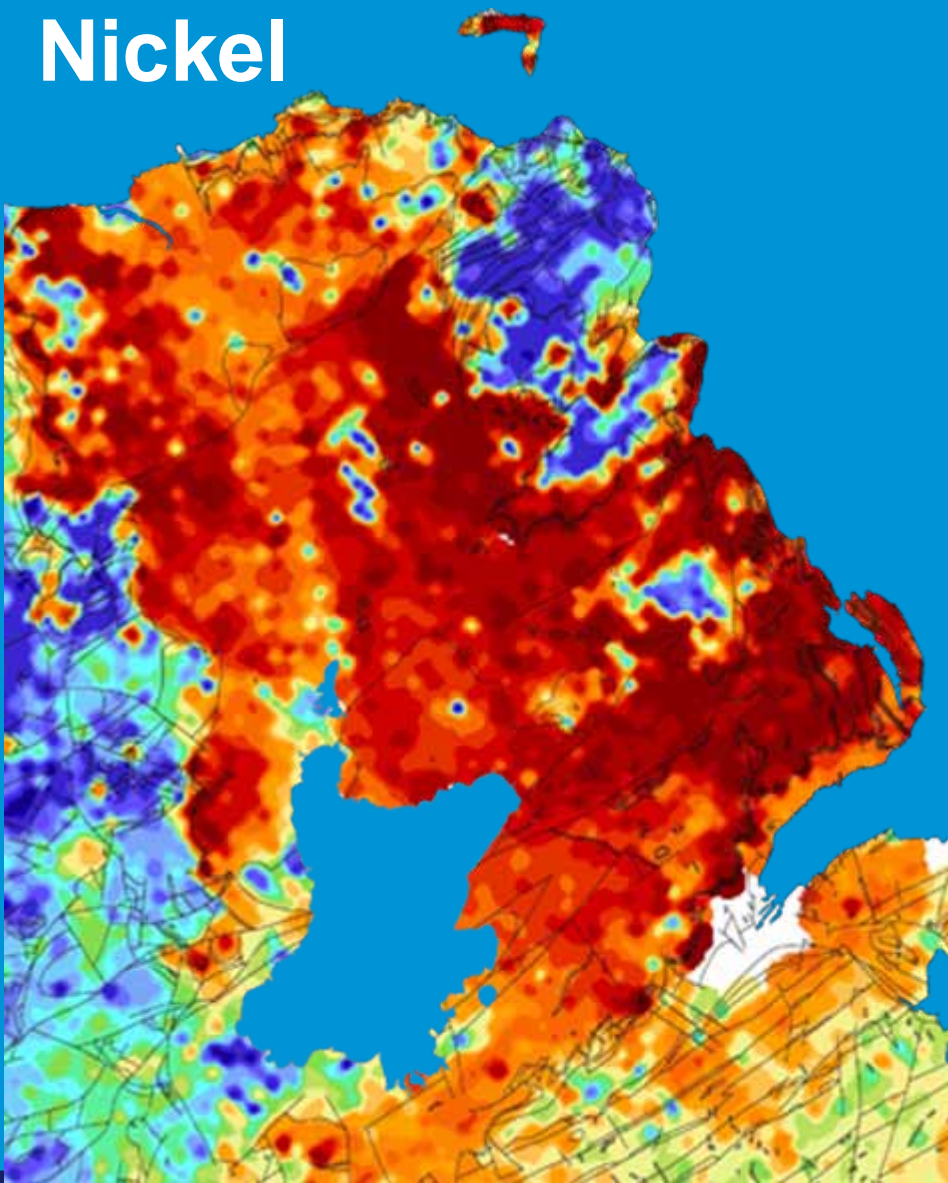
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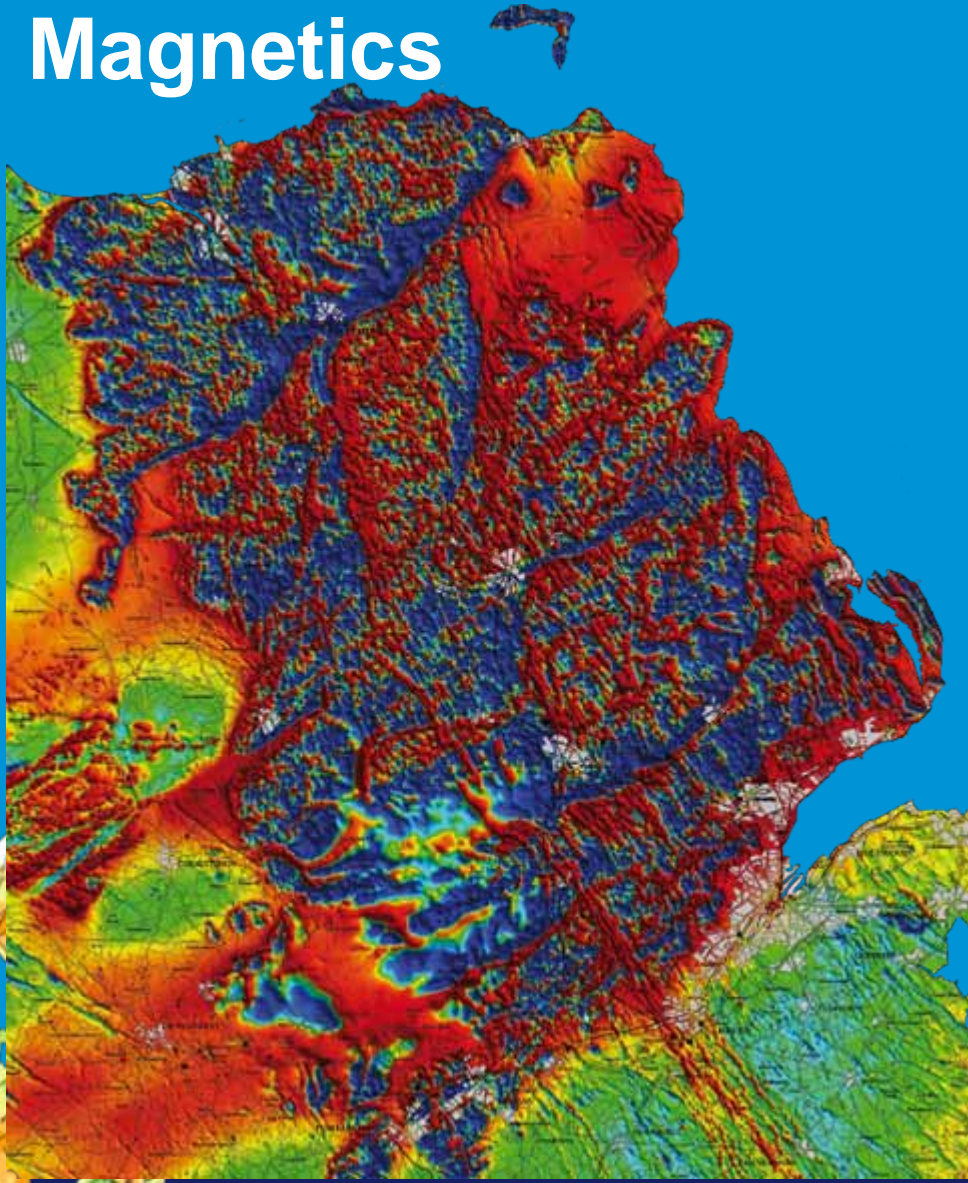
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Nickel



Magnetics



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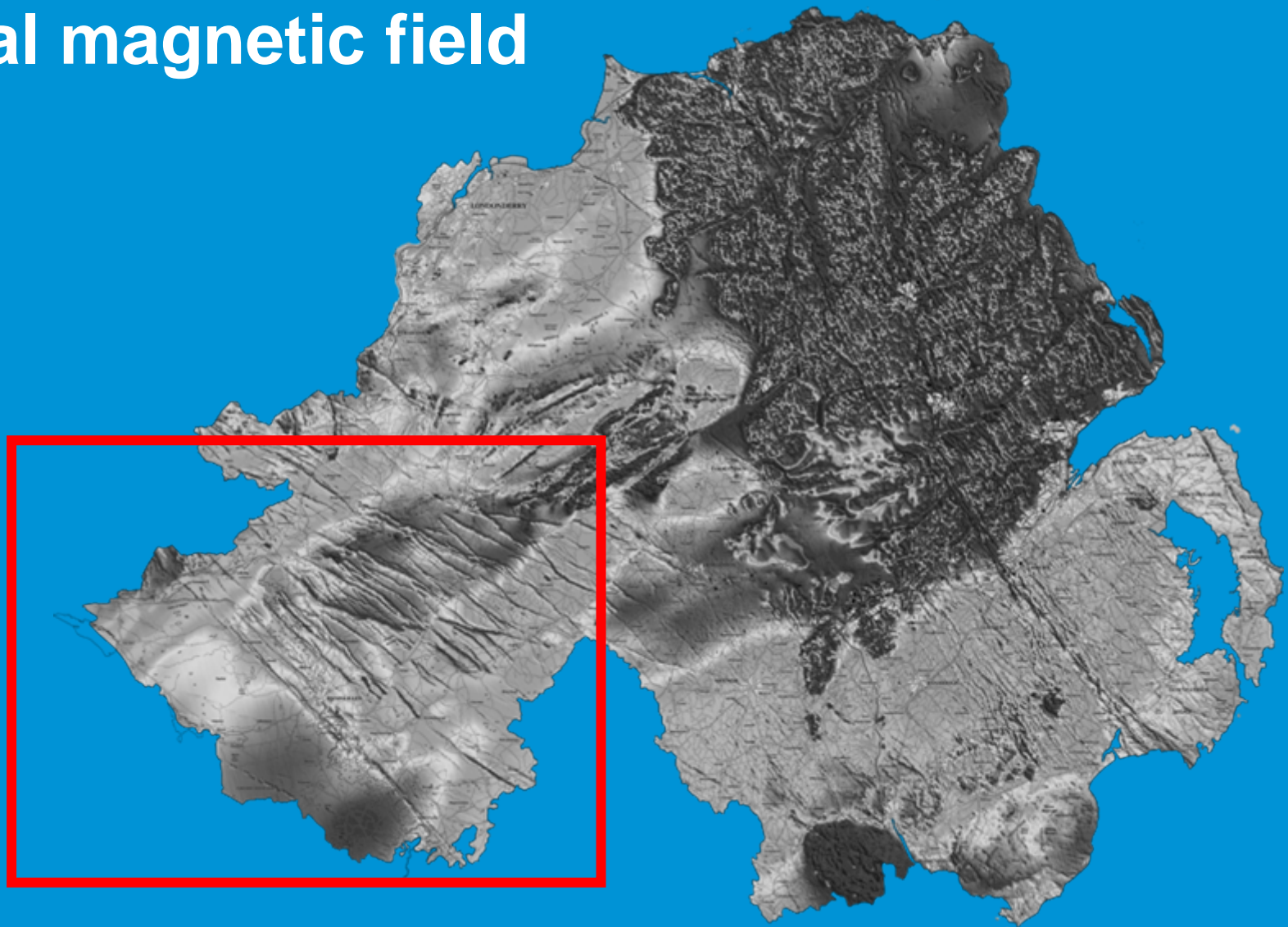
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Total magnetic field



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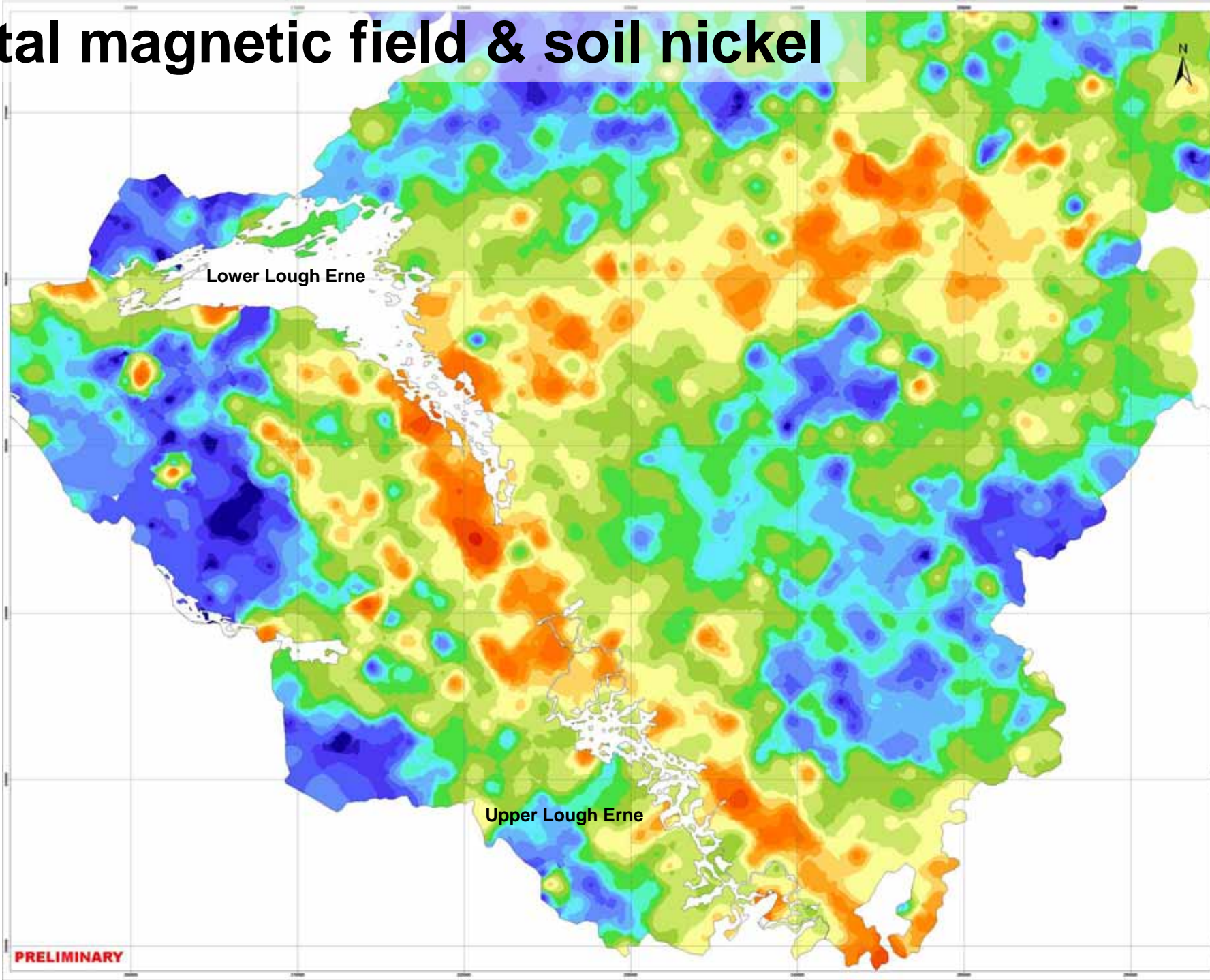
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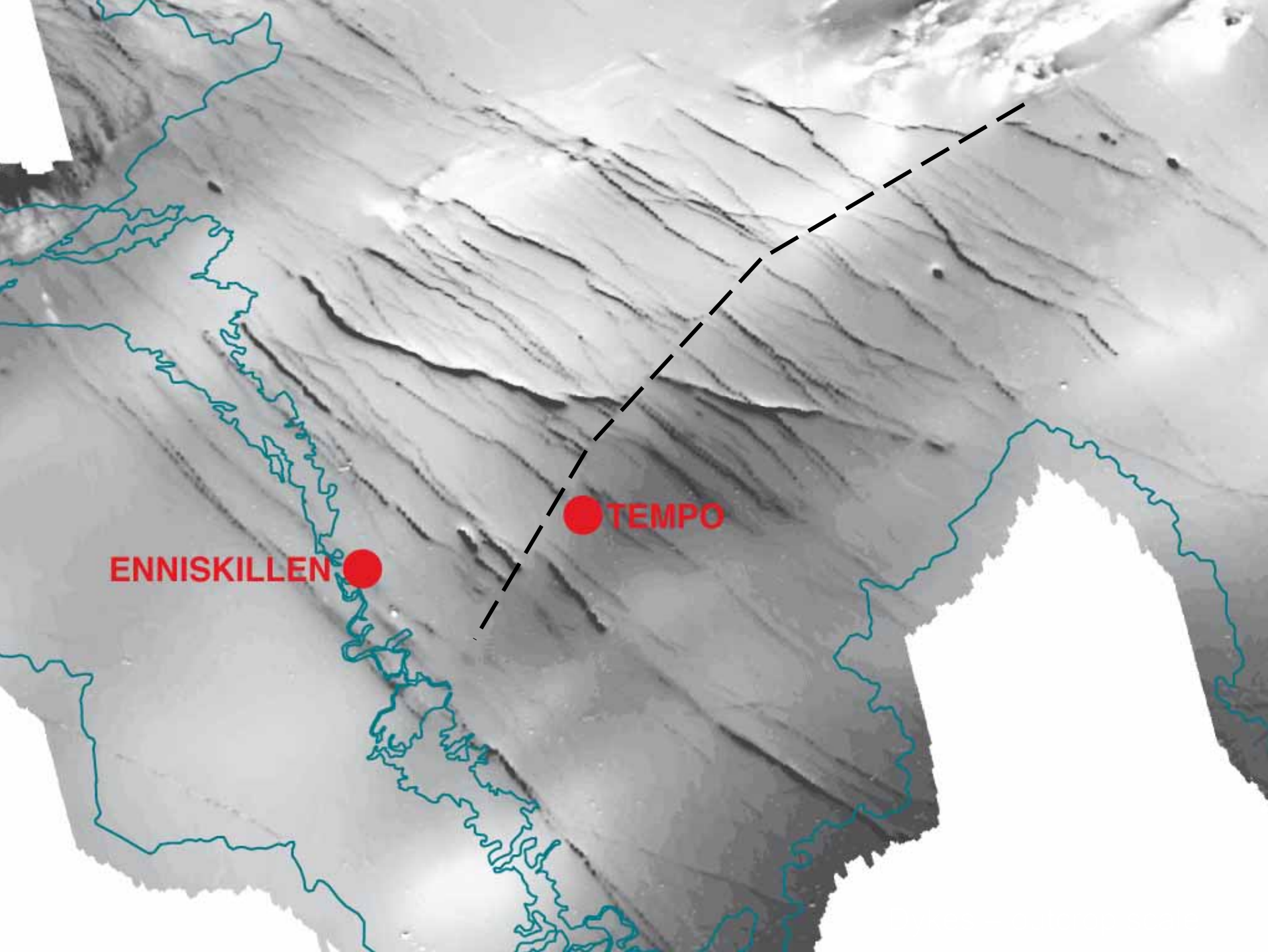


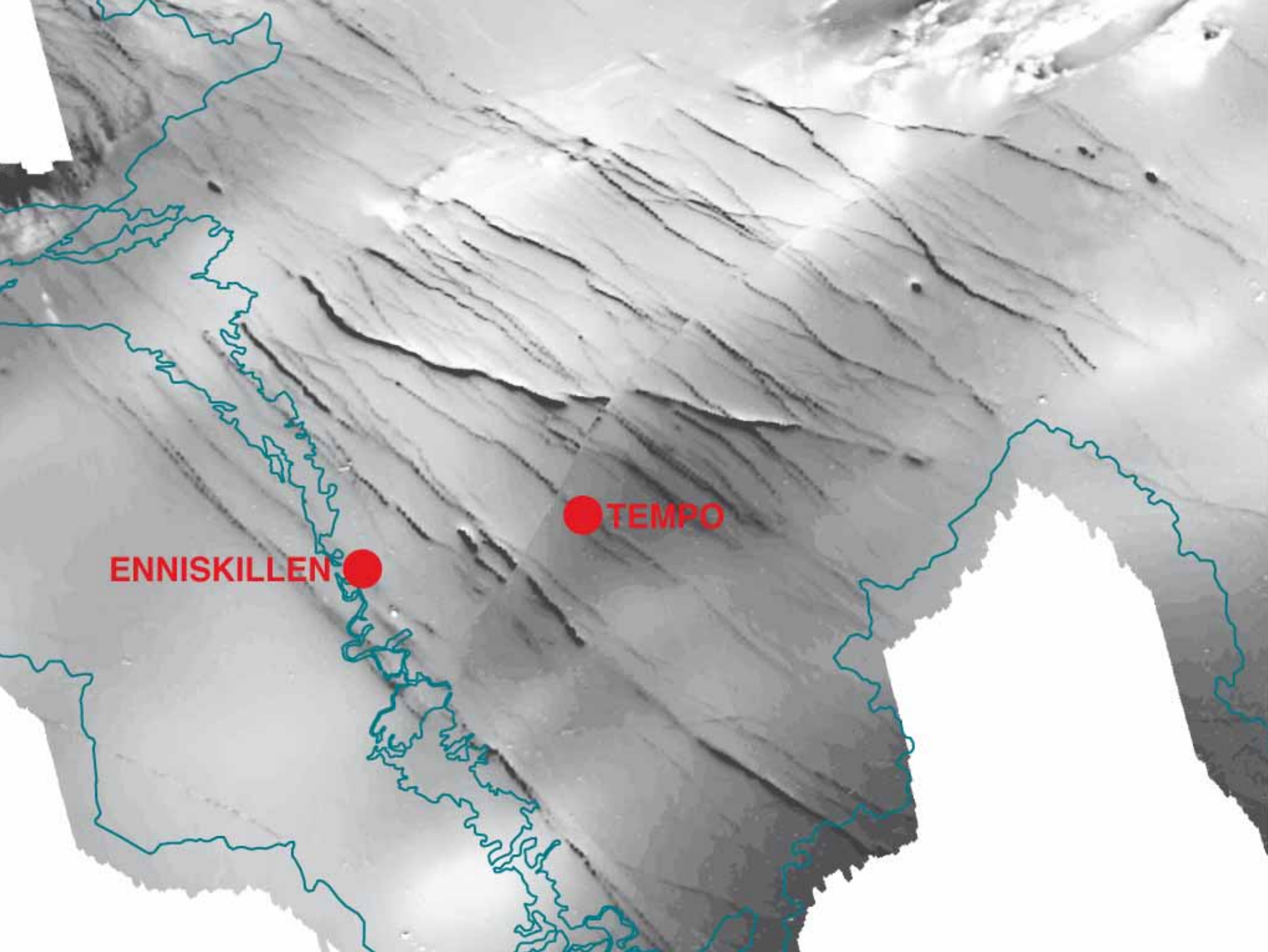
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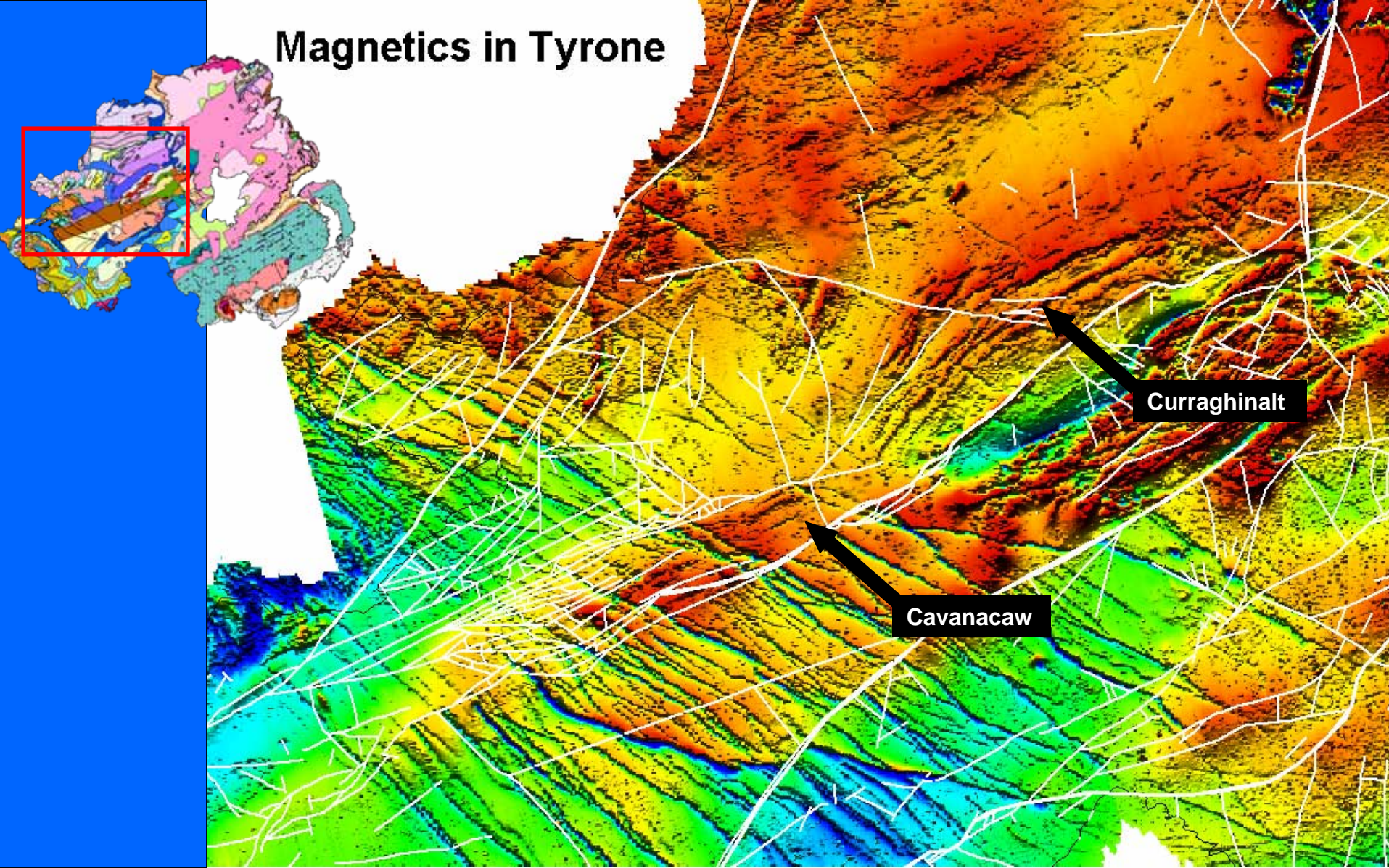
Total magnetic field & soil nickel







Magnetics in Tyrone



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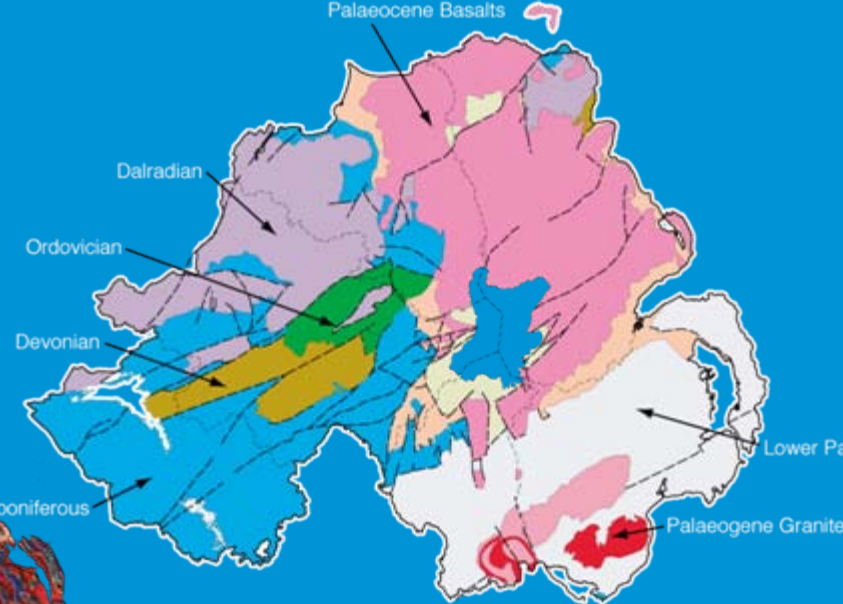
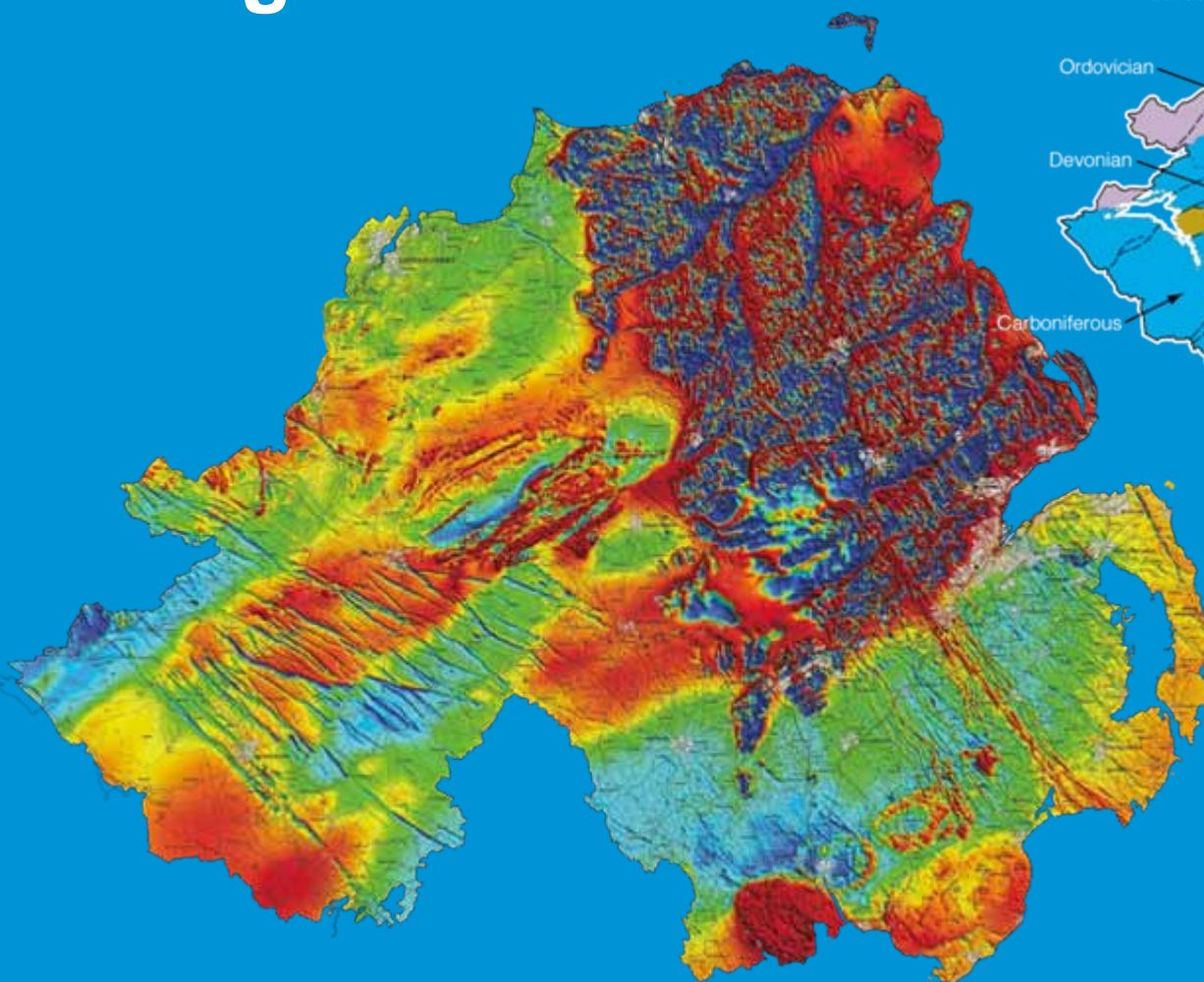
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Magnetic field



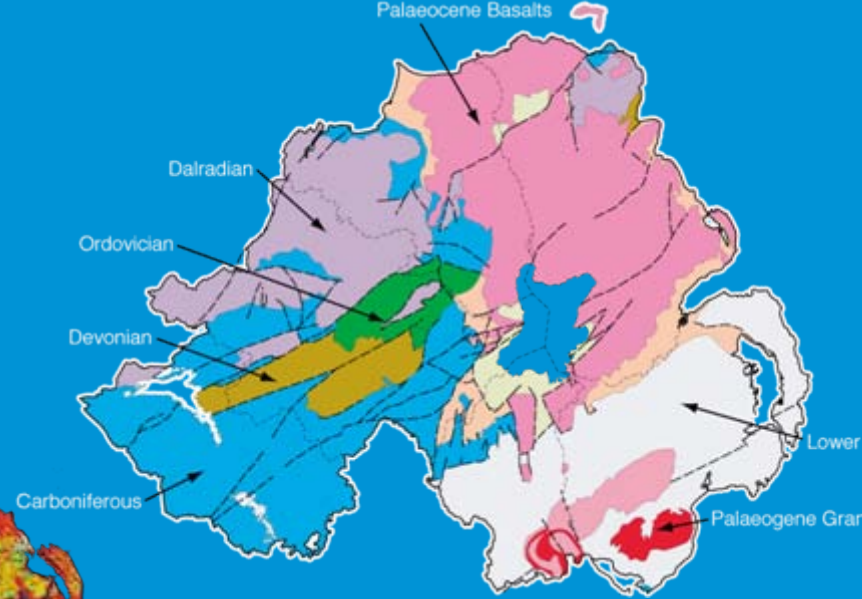
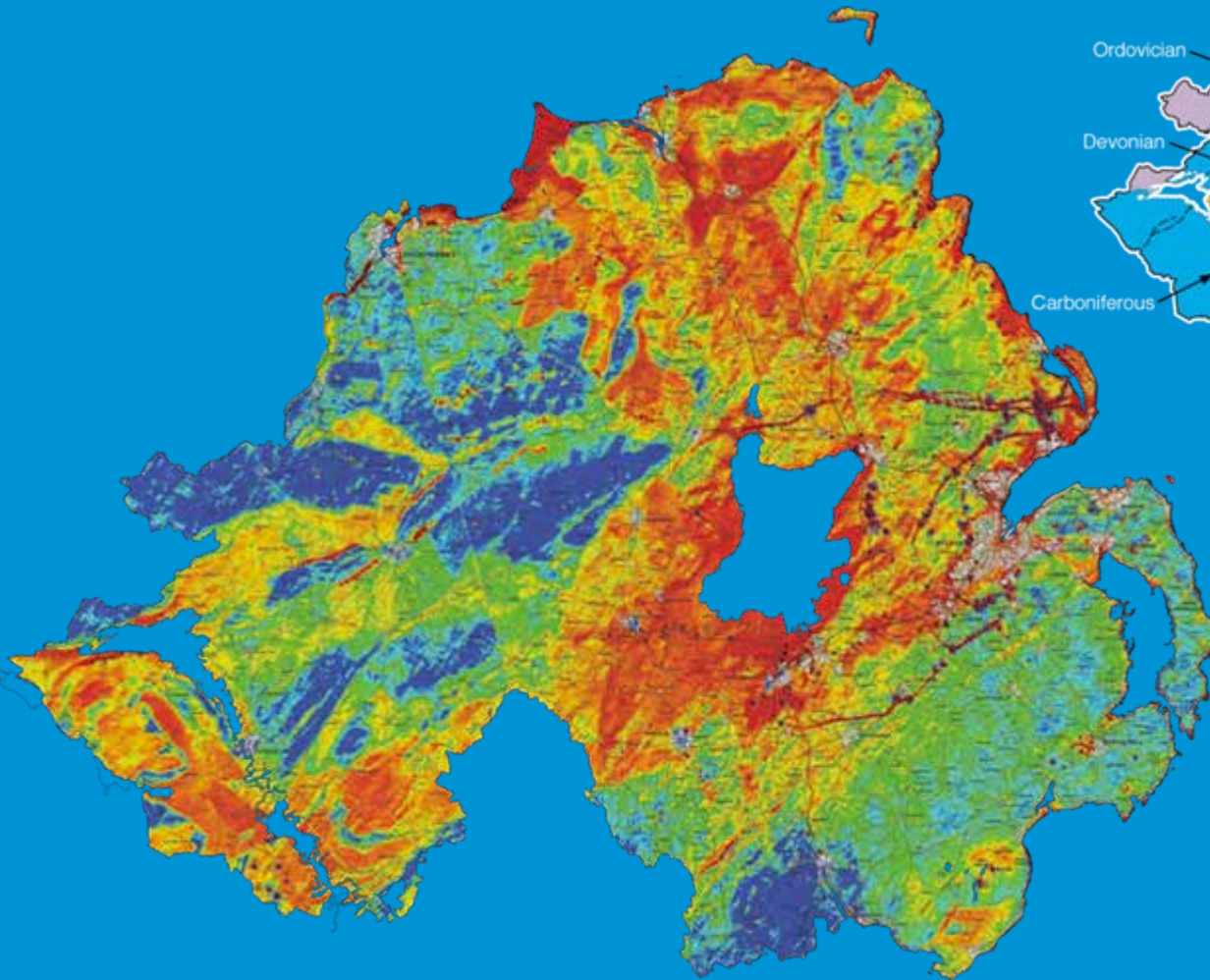
Geological mapping

Structural mapping

Regional geology and
tectonics

Basin studies

Electrical conductivity



Geological mapping

Characterising soils
and glacial material

Salinity

Pollution plumes

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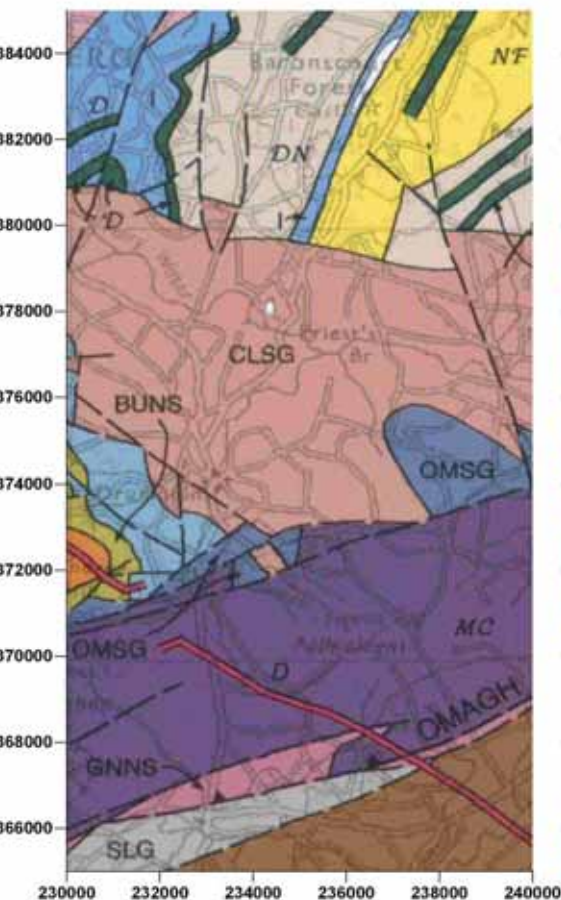
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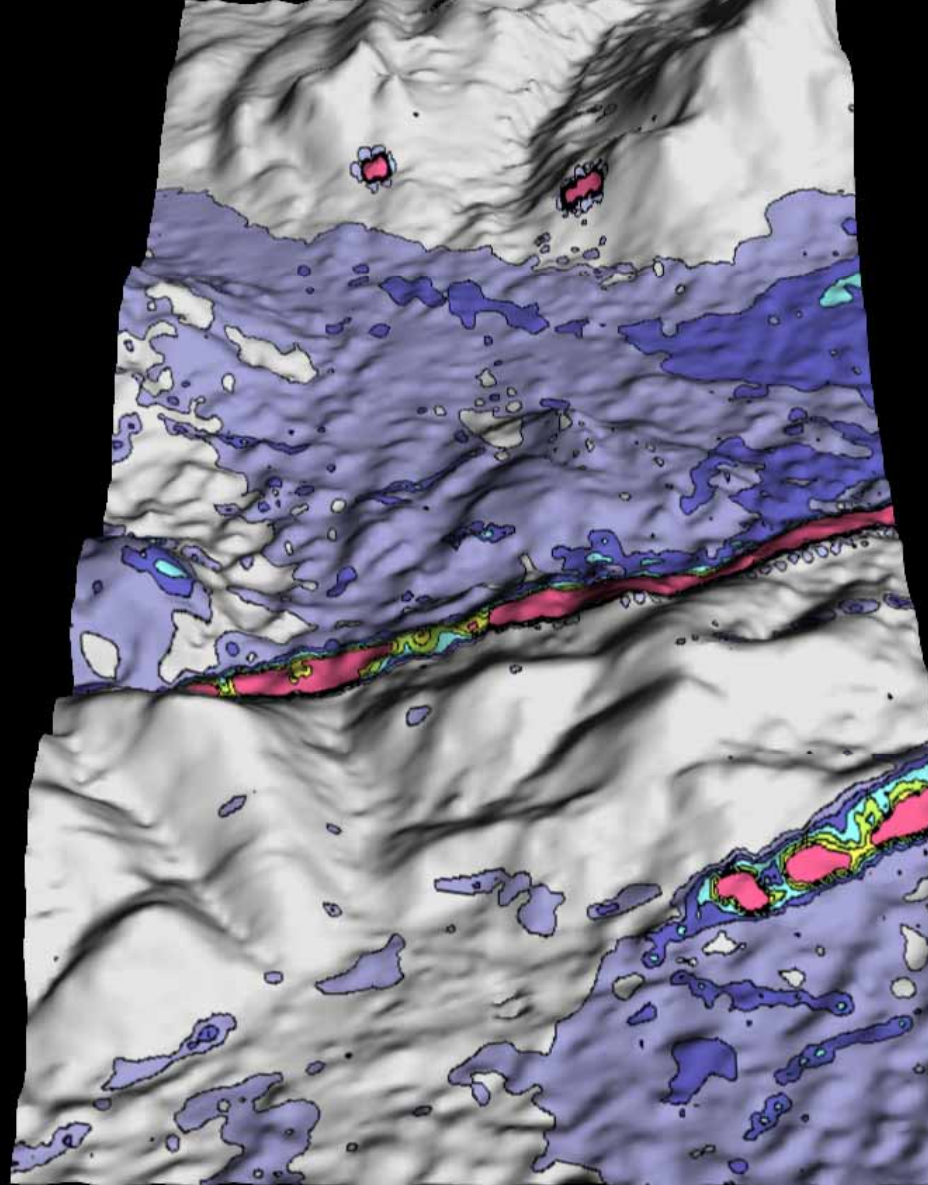
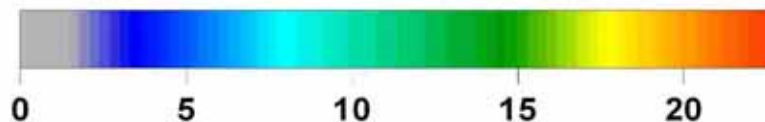
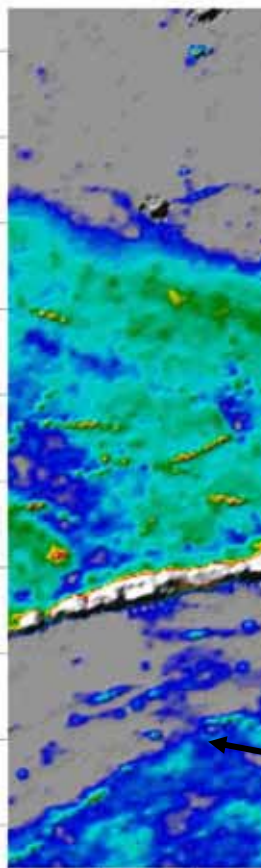
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250k Solid Geology



3 kHz
Apparent Conductivity
(mS/m)



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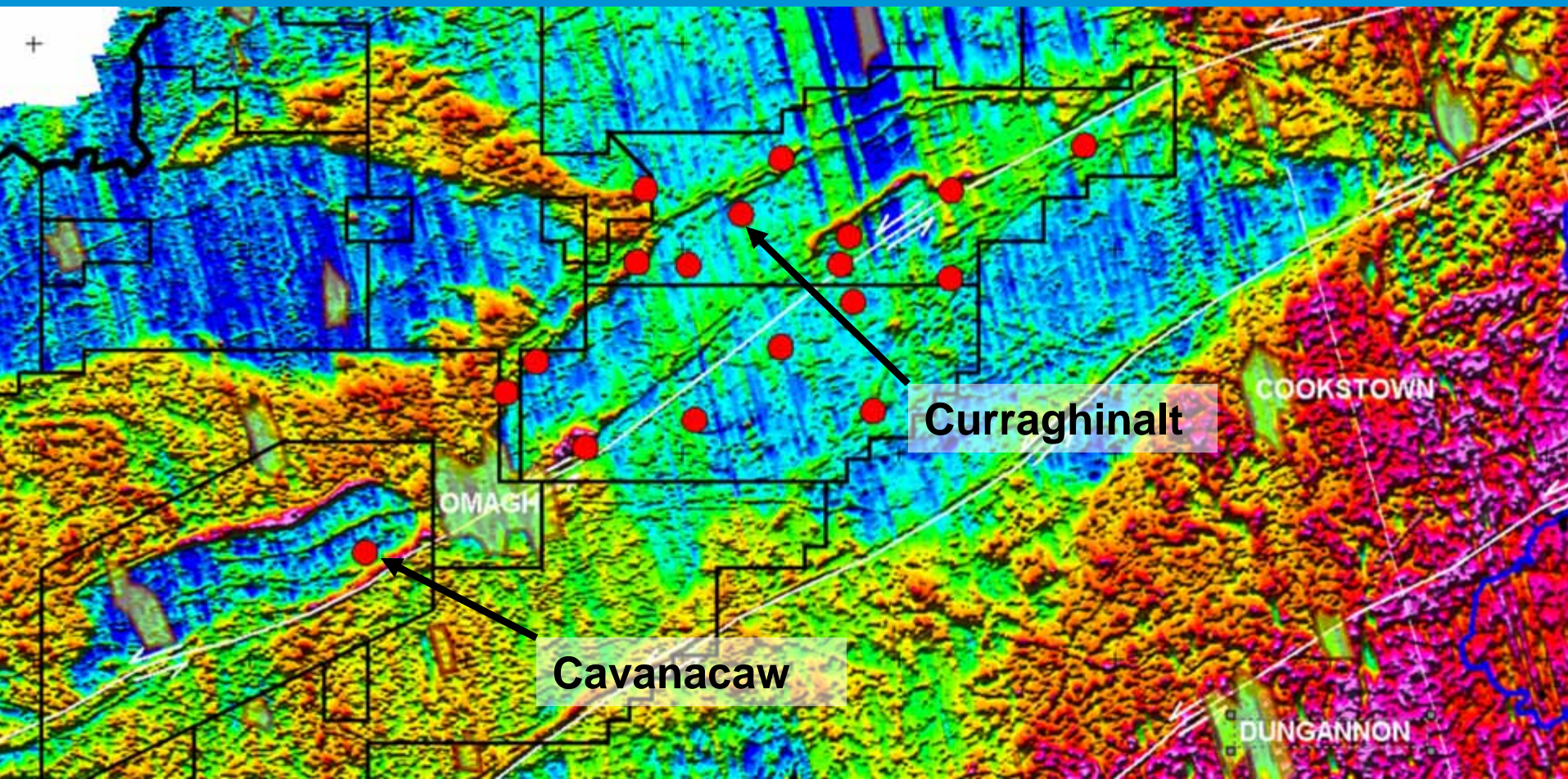


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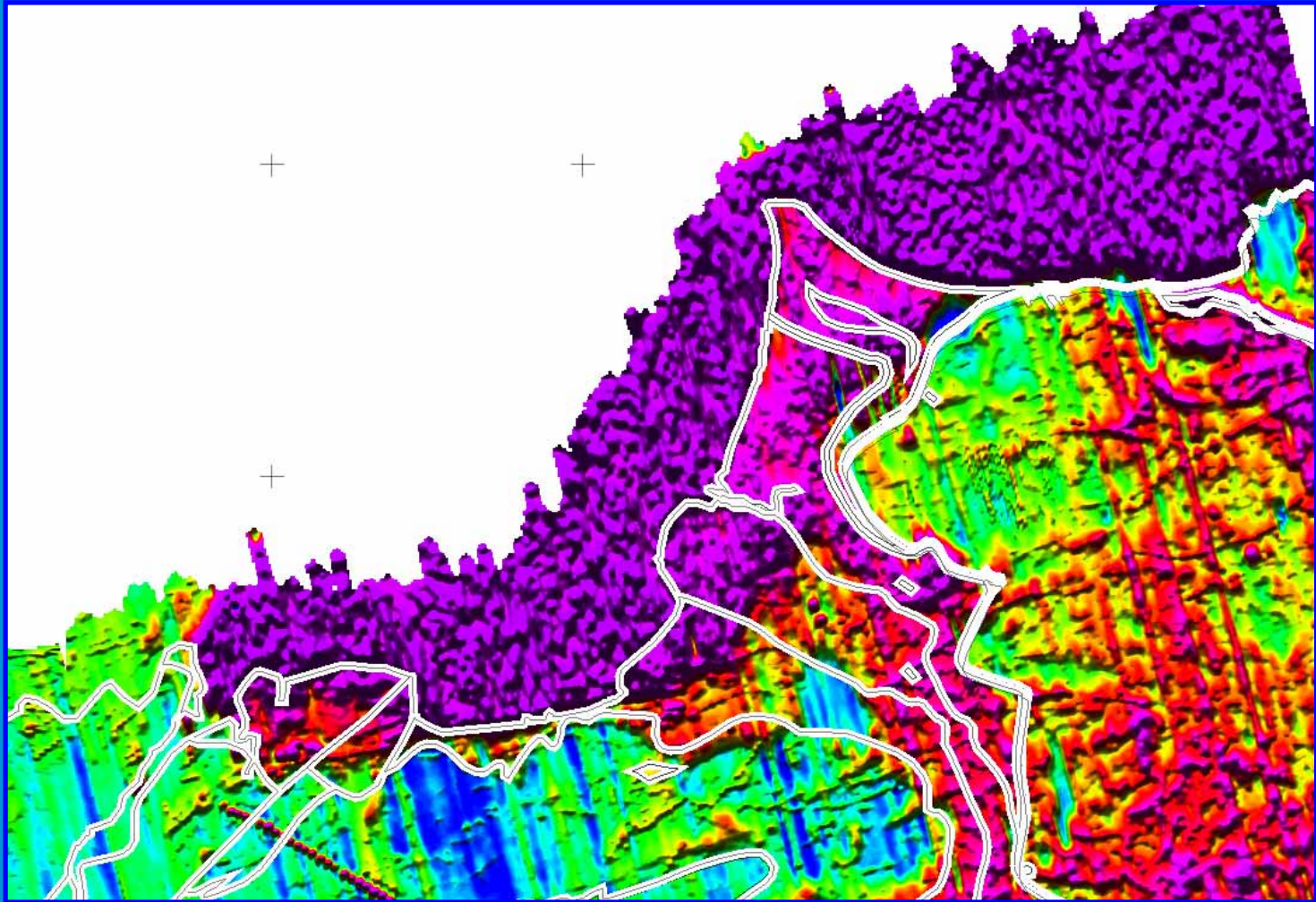
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Electrical conductivity and gold occurrences in Co. Tyrone



Coastal salinity – Magilligan strand



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Electrical conductivity – west of Strabane

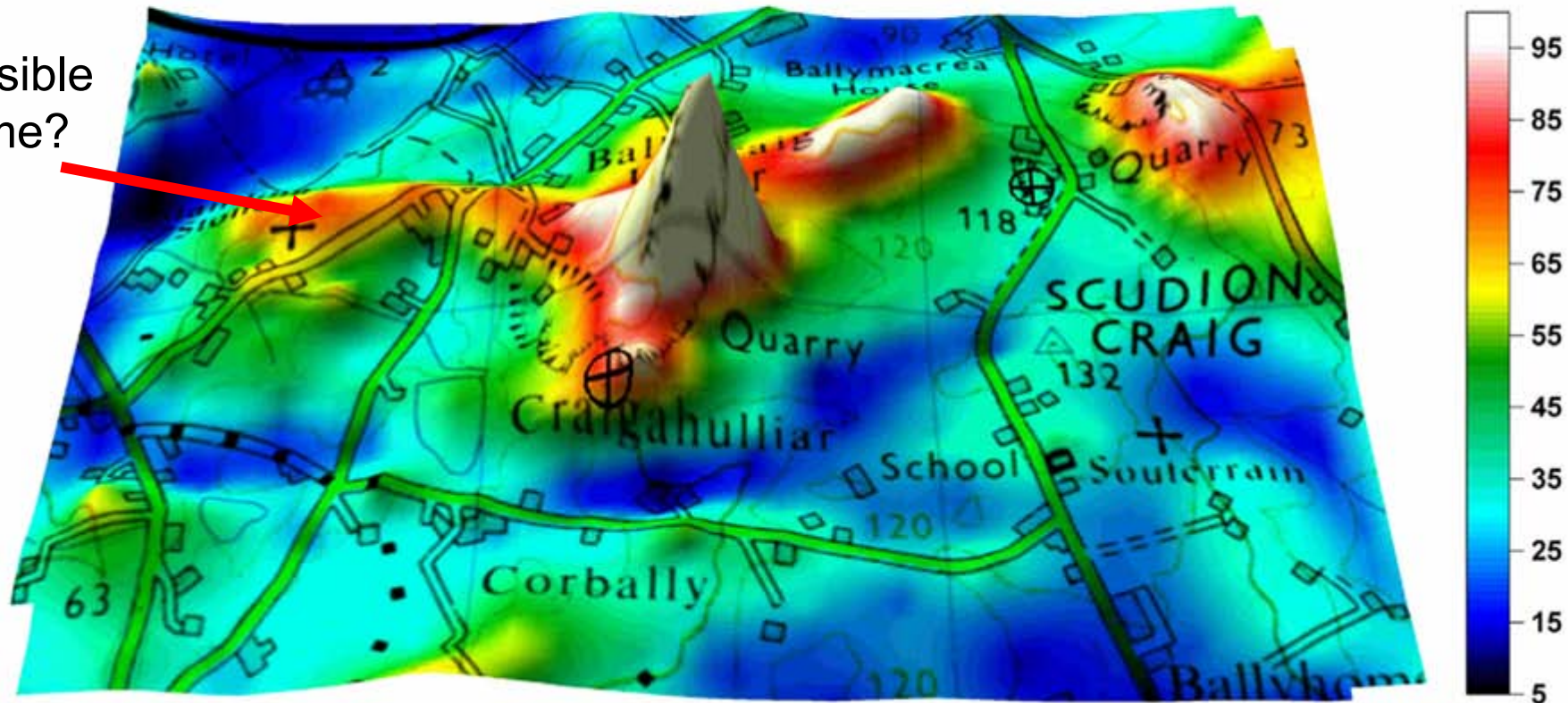


BLK C2 2 Landfill/Quarries (25,26)

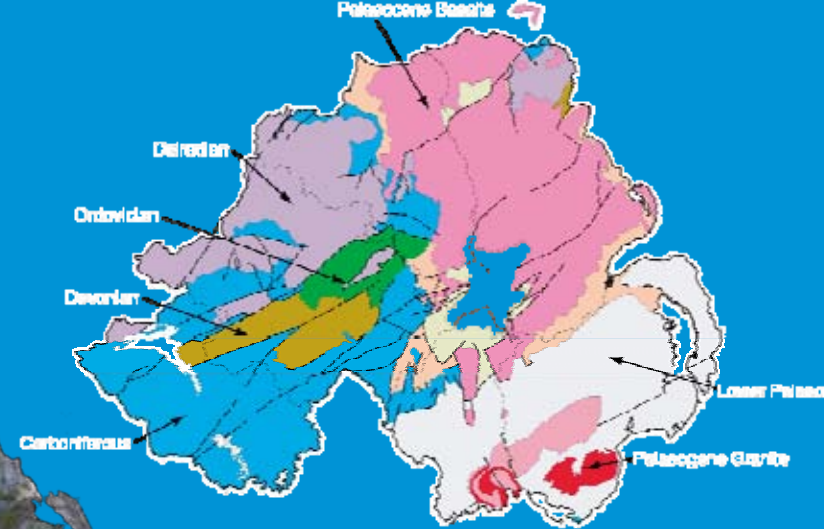
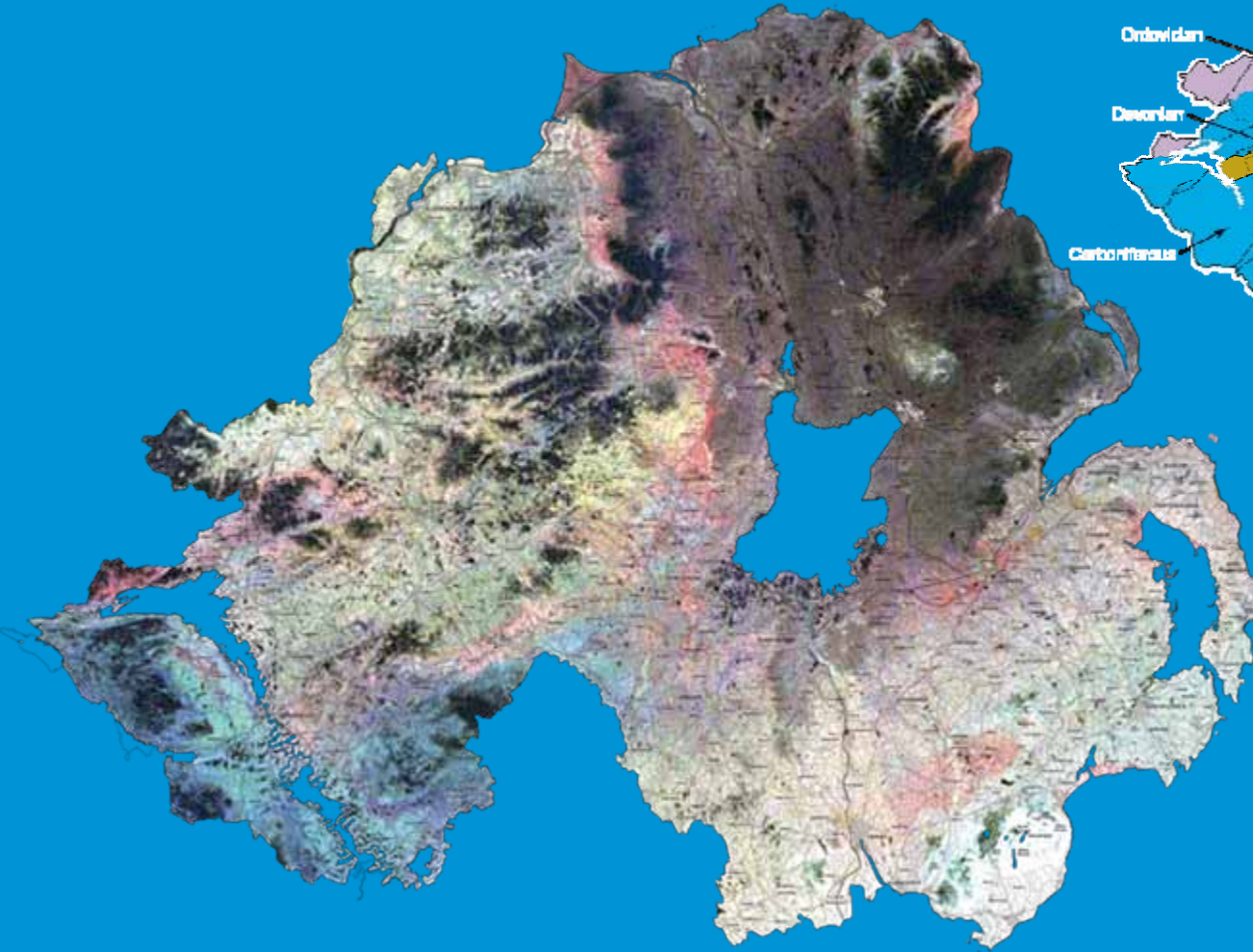
3 x 2 km Apparent conductivities (mS/m)

12 kHz (shallow), perspective view

Possible
plume?

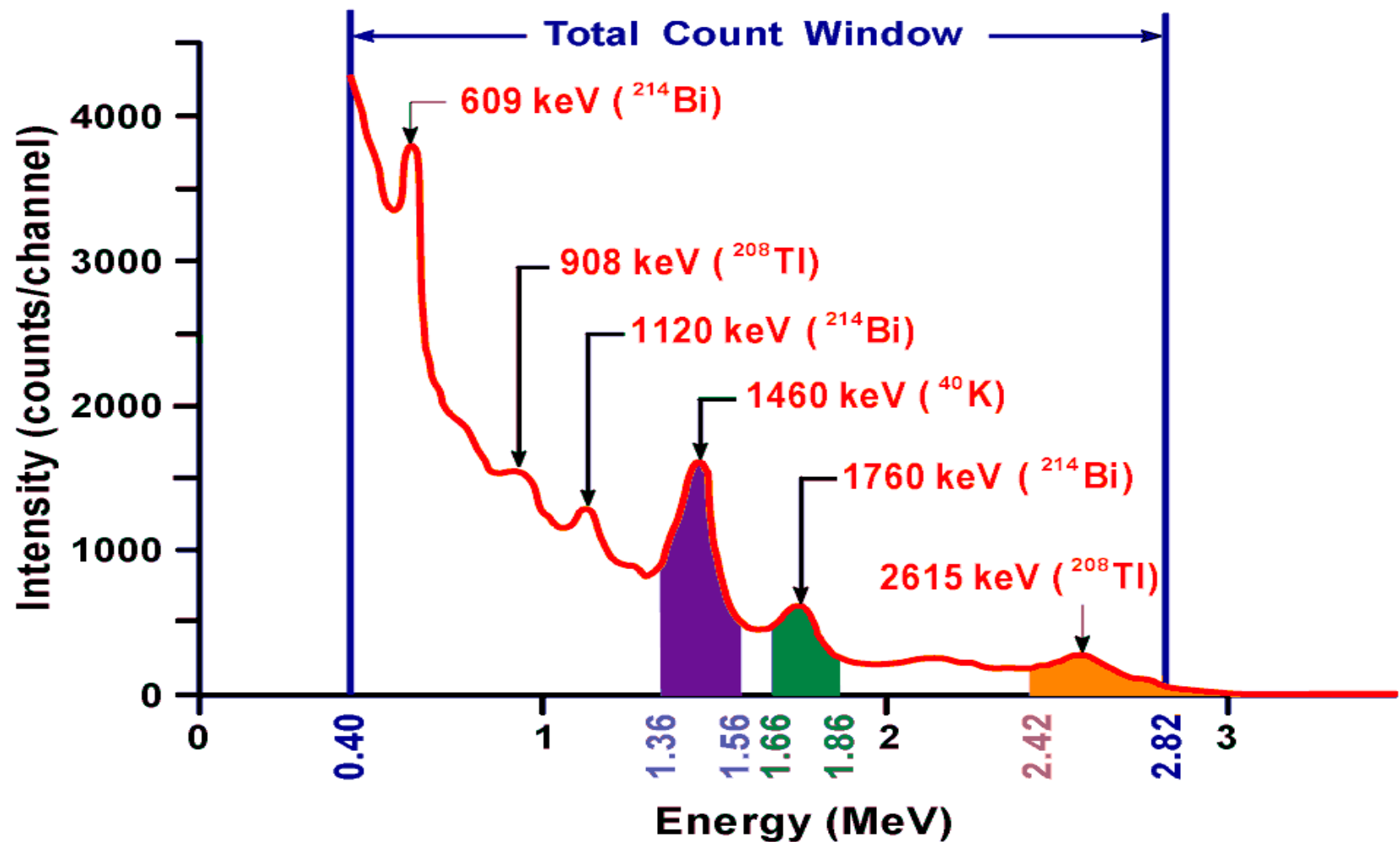


Gamma radiation



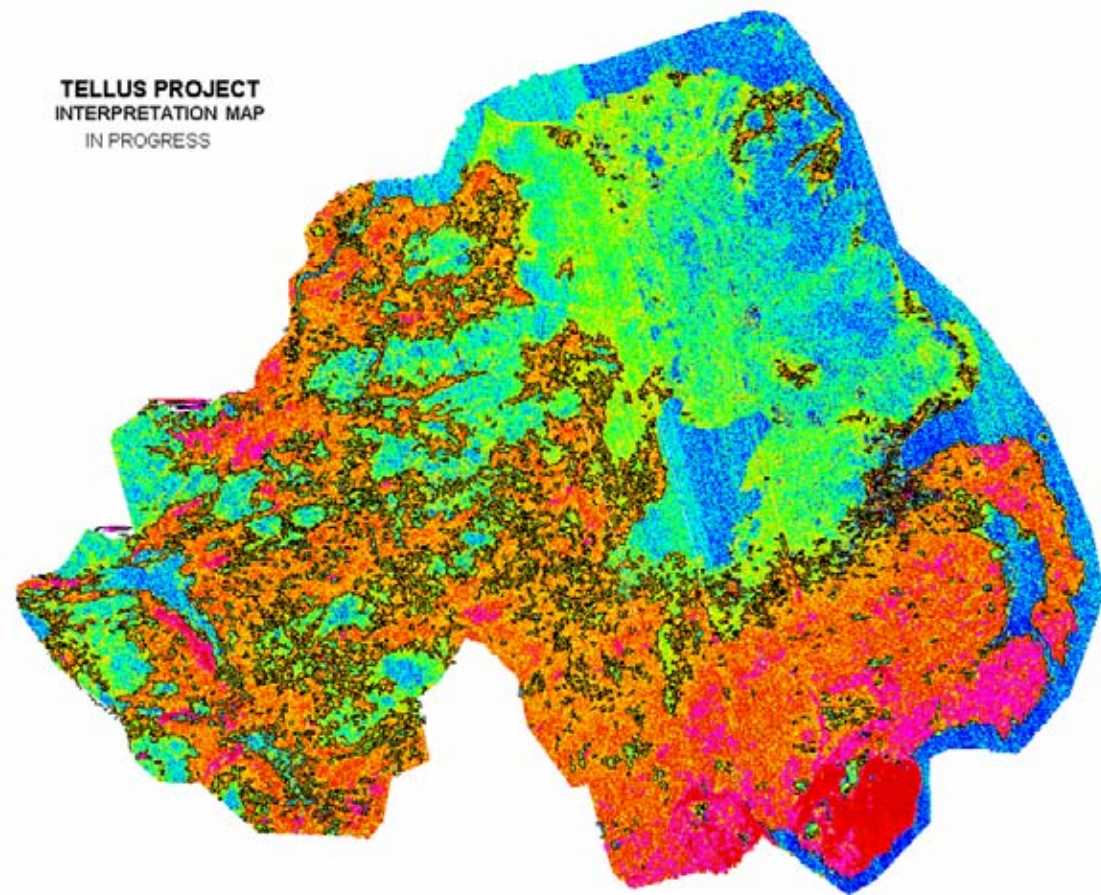
Geological mapping
Soil characterisation
Radioactivity baseline
Radon
Hot rock geothermal

Typical Gamma-Ray Spectrum



Uranium gamma-ray

TELLUS PROJECT
INTERPRETATION MAP
IN PROGRESS



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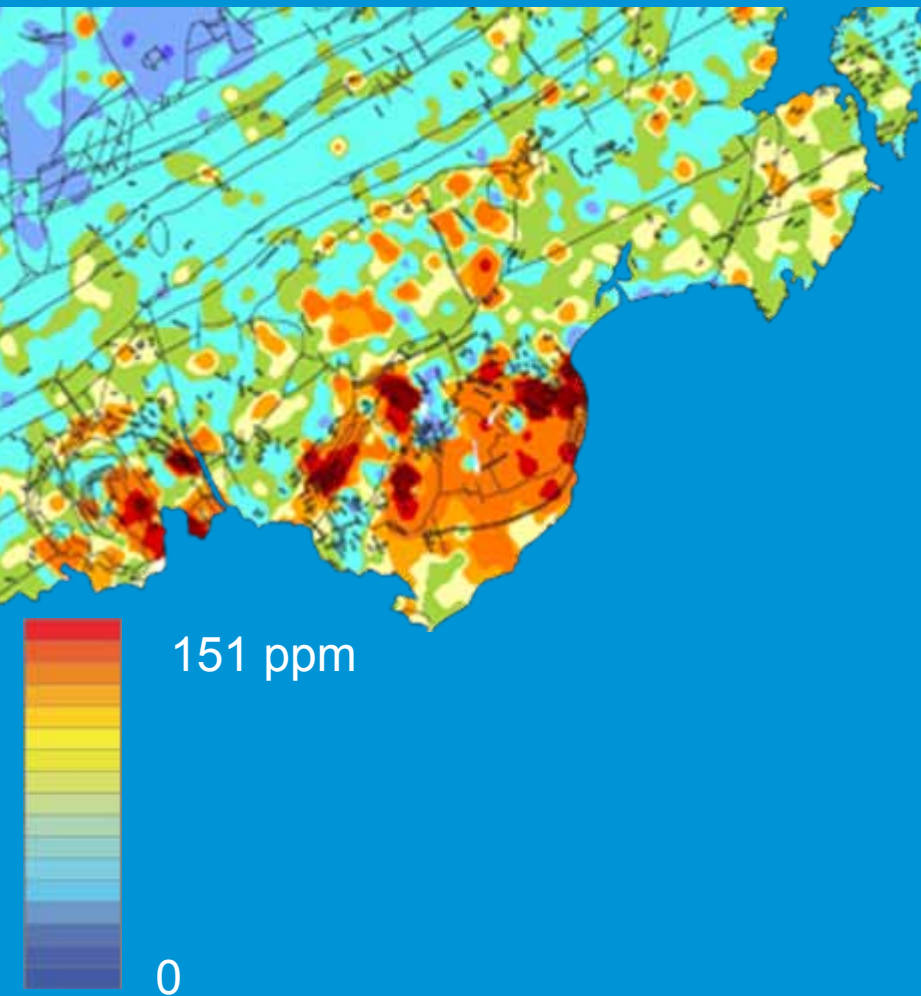
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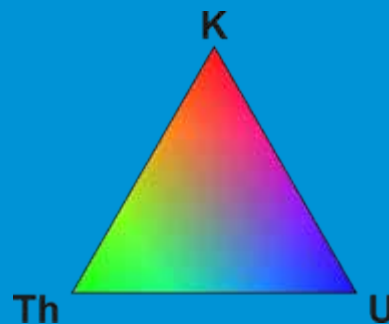
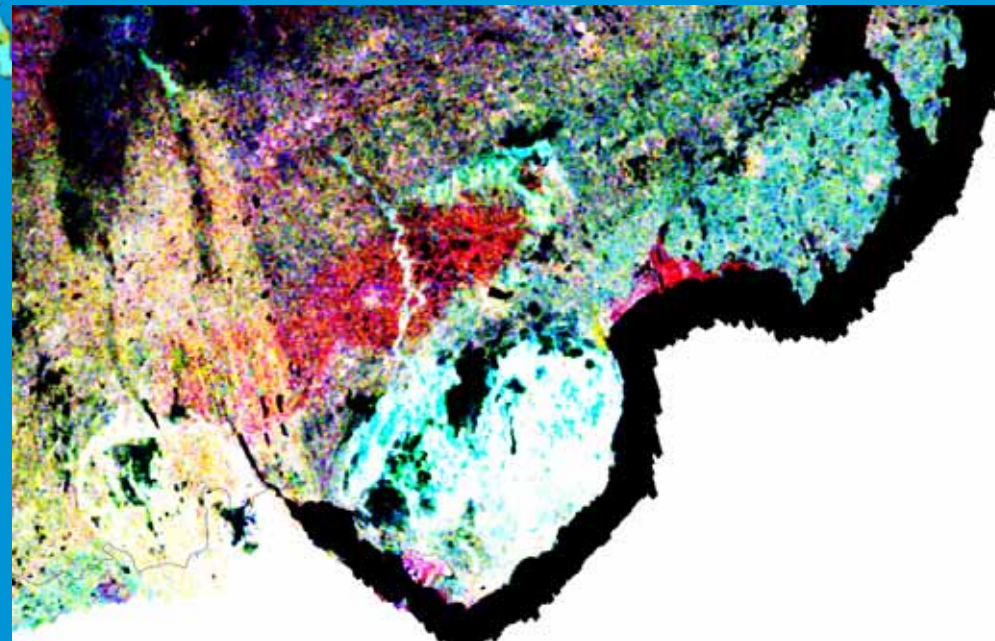
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Uranium soil geochemistry



Gamma radiation - Ternary



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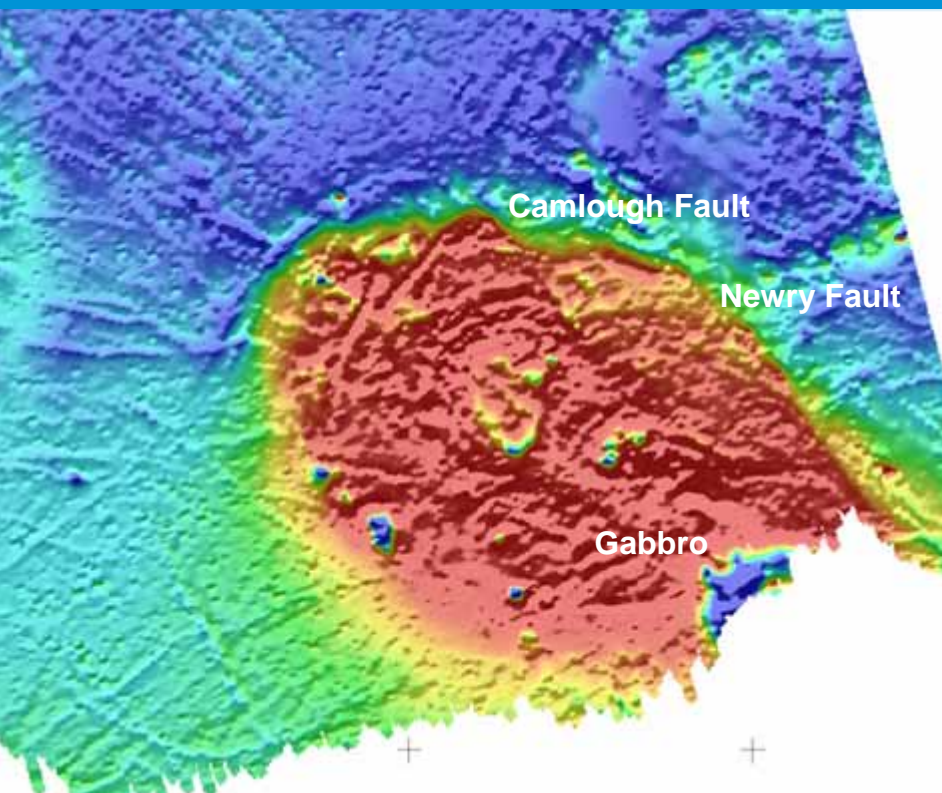
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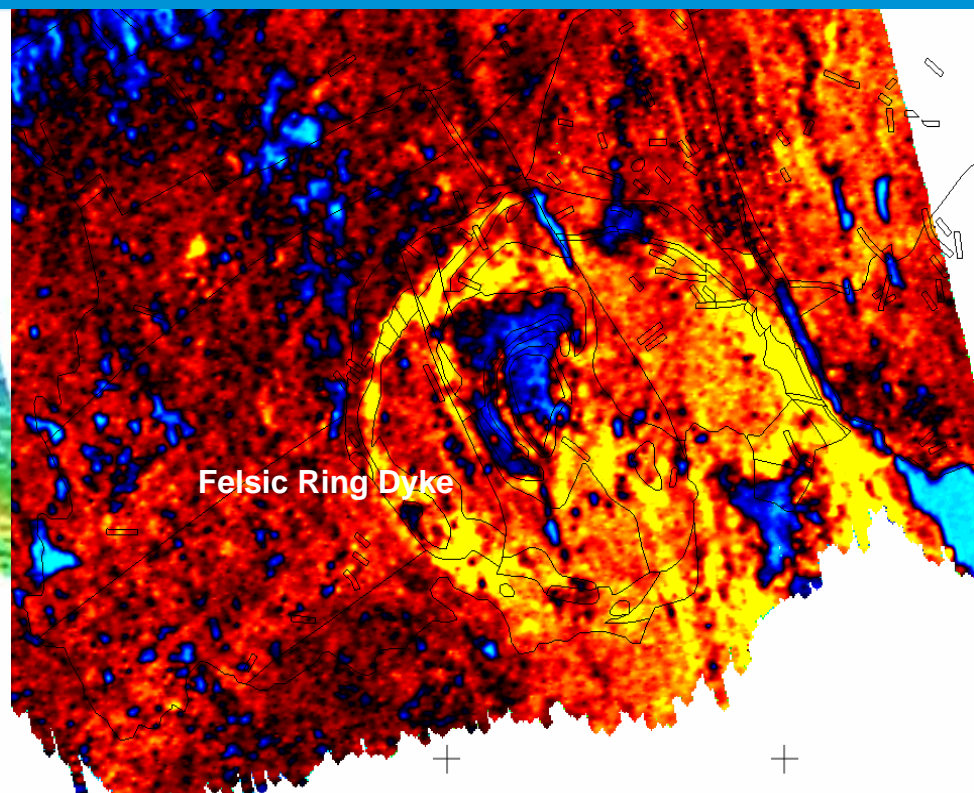
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Magnetic and gamma-ray anomalies Slieve Gullion

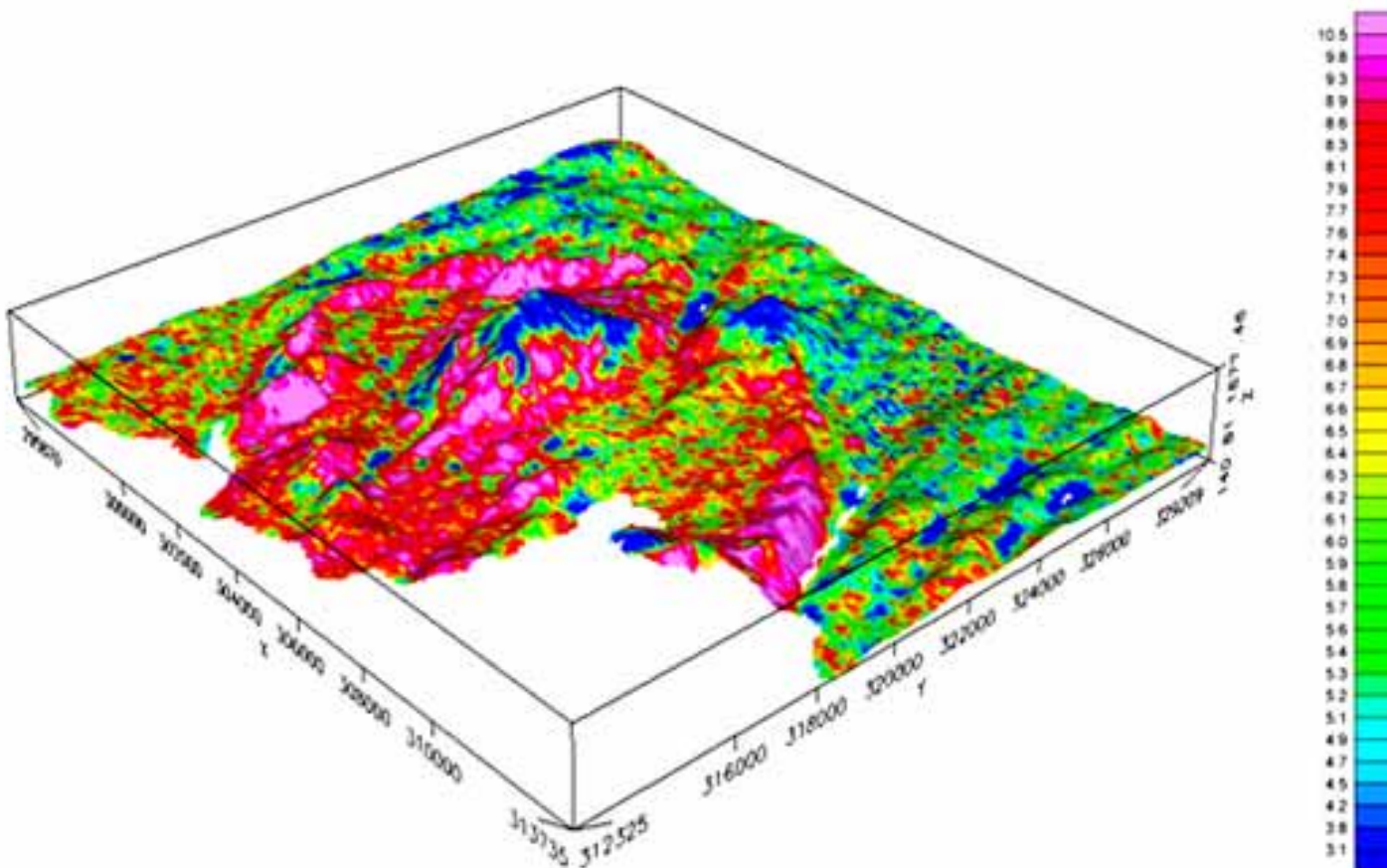


Magnetic

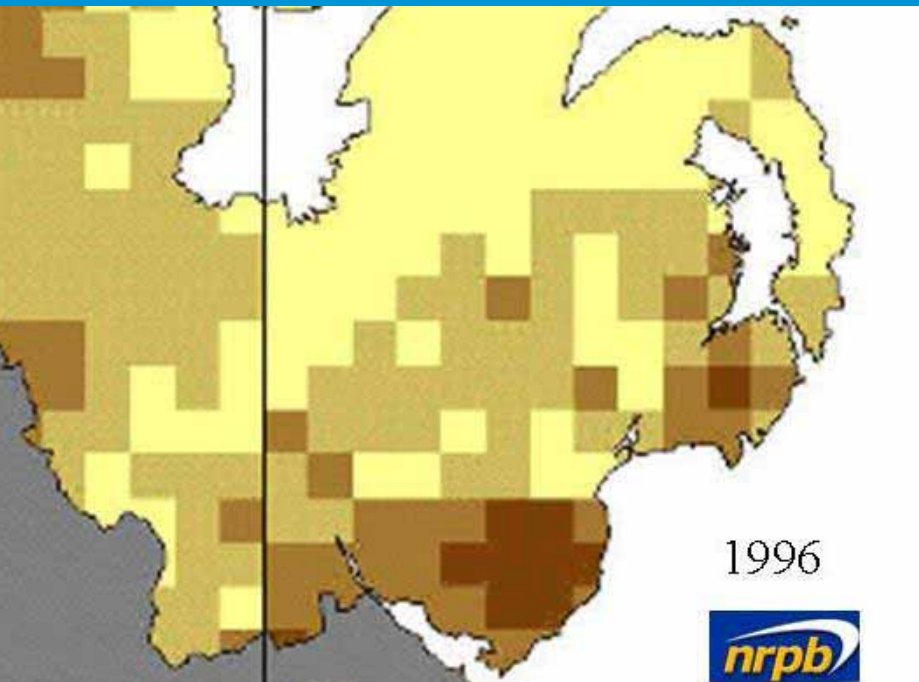


Gamma-ray: Potassium-40

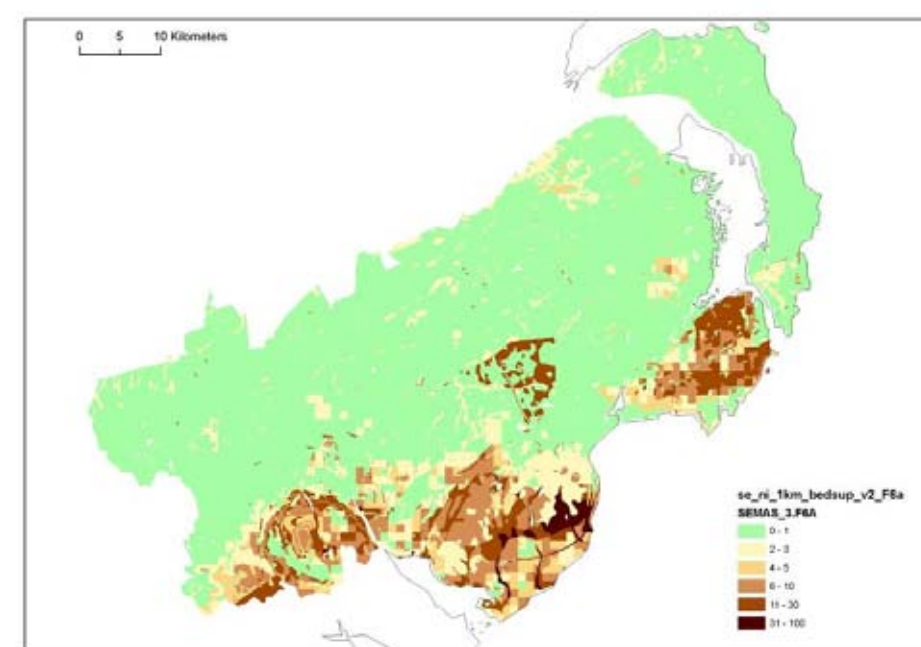
Slieve Gullion – from the southeast



In-house radon estimation

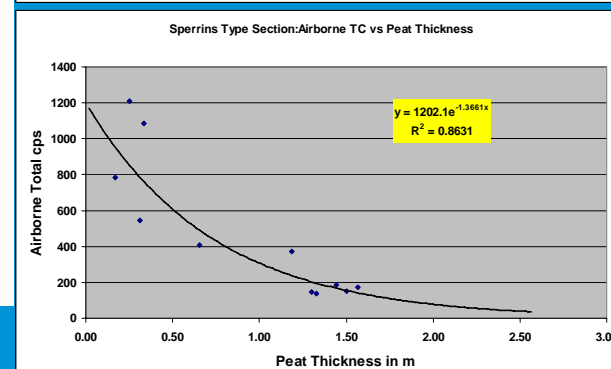
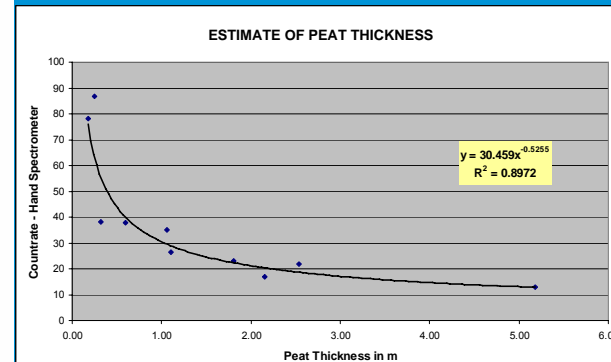
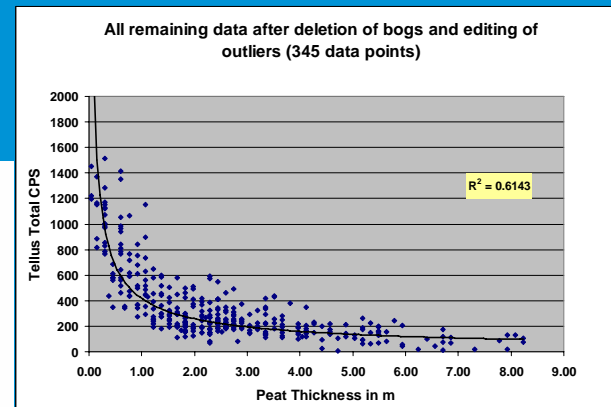
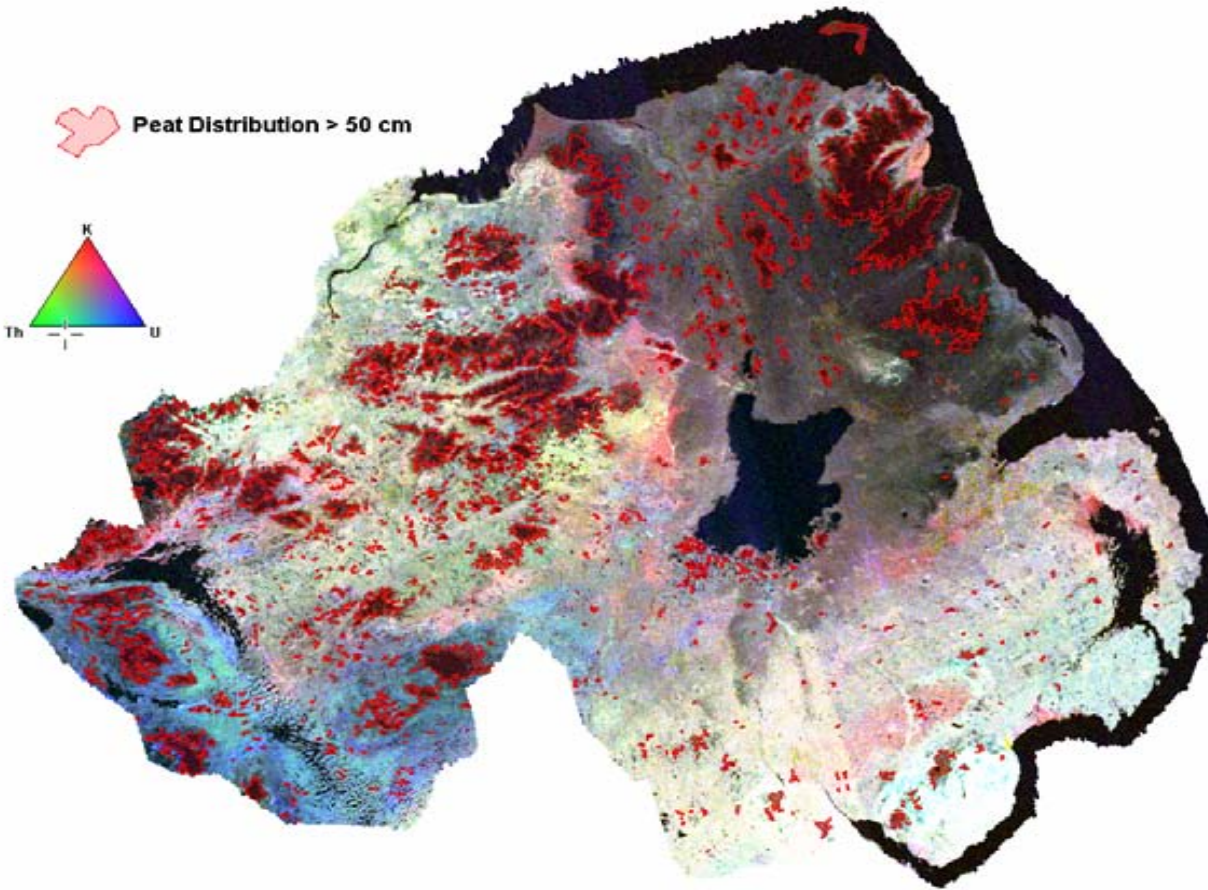


5 Km grid – in-house records



Multi-variate analysis

Peat extent and thickness



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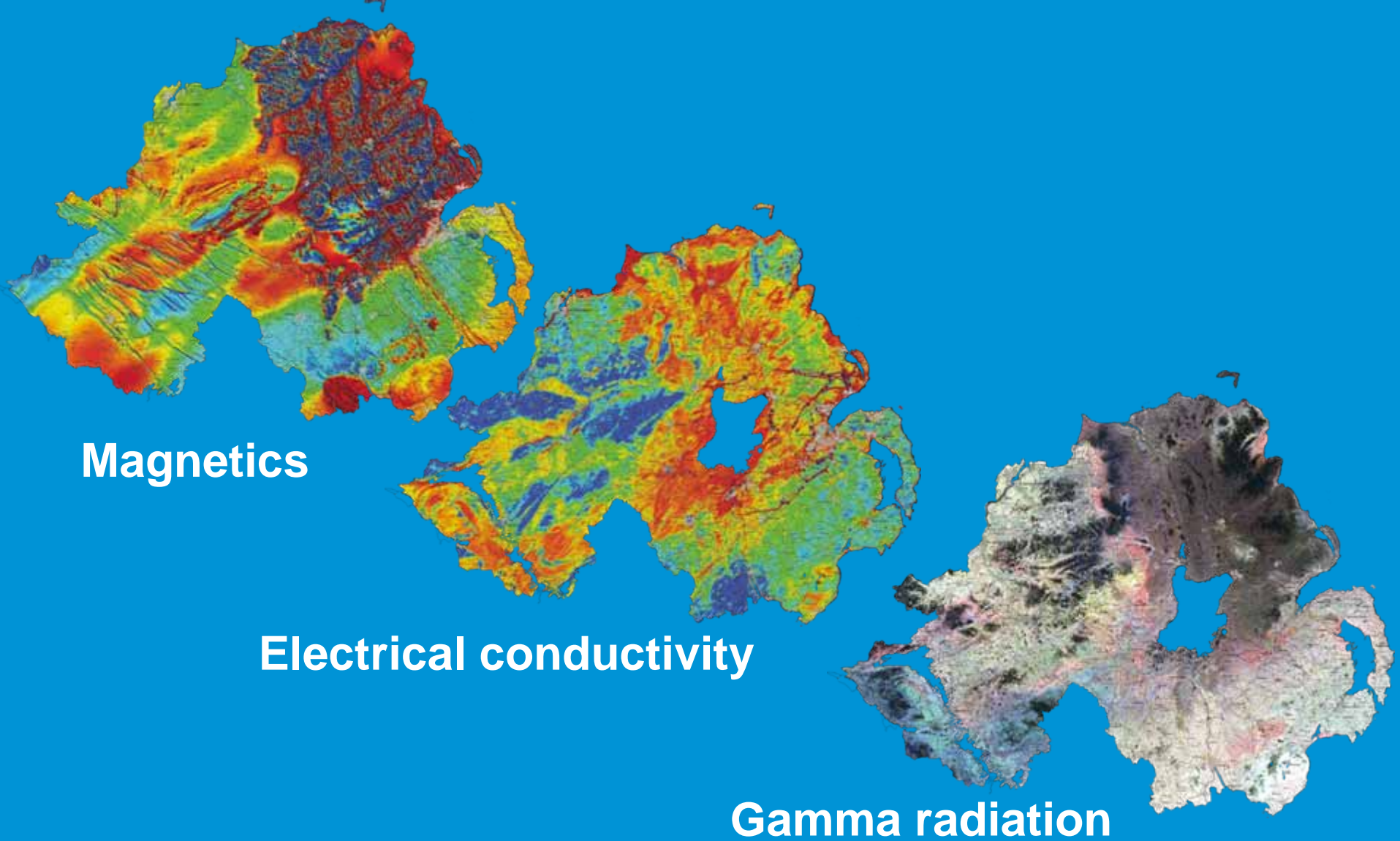


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- Interpretation by Chris van Dam, Baz Chacksfield, Adrian Walker, Don Appleton, David Jones, Barry Rawlins and Cathy Scheib



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