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NEW Airborne Geophysical Data

TELLUS BORDER DATA LAUNCH 5th February 2013

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Outline

1. Survey Objectives
2. Airborne Data Acquisition
3. Data Merging
4. New Geophysical Data
5. Summary of Data Applications



1. Survey Objectives

- To make freely available seamless digital dataset and maps of magnetic field, electrical conductivity and natural radioactivity (U, K and Th).
- Value-added maps of radon risk and caesium-137
- Regional interpretation and integration with NI data
- Contributions to groundwater pollution plumes and soil-carbon research
- Assist in remapping geological boundaries and structures

2. Airborne Data Acquisition

Three geophysical methods;

- (1) Magnetic field – sensors measure variations in Earth's magnetic field
- (2) Electrical conductivity – measurement of EM induced currents in ground
- (3) Radioactivity – detection of naturally emitting radioactive gamma-rays – K, Th and U



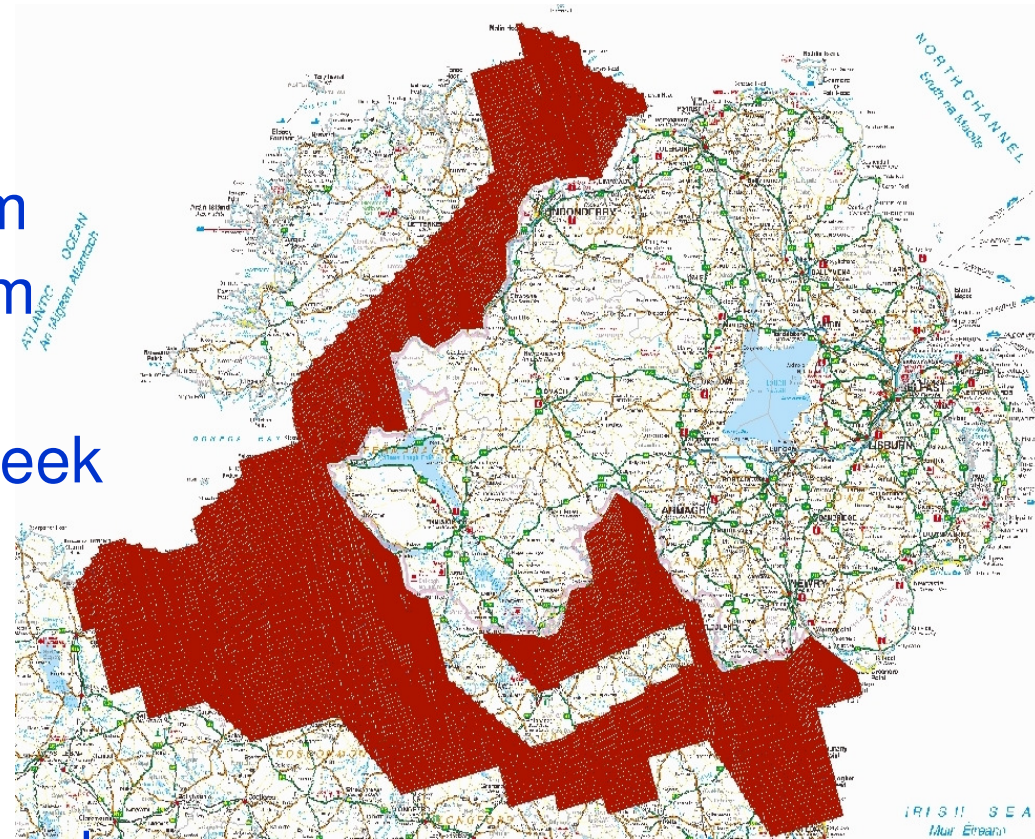
Airborne Data Acquisition

Survey Aircraft: De Havilland Twin Otter (C-GSGF)



Airborne Survey Specifications & Design

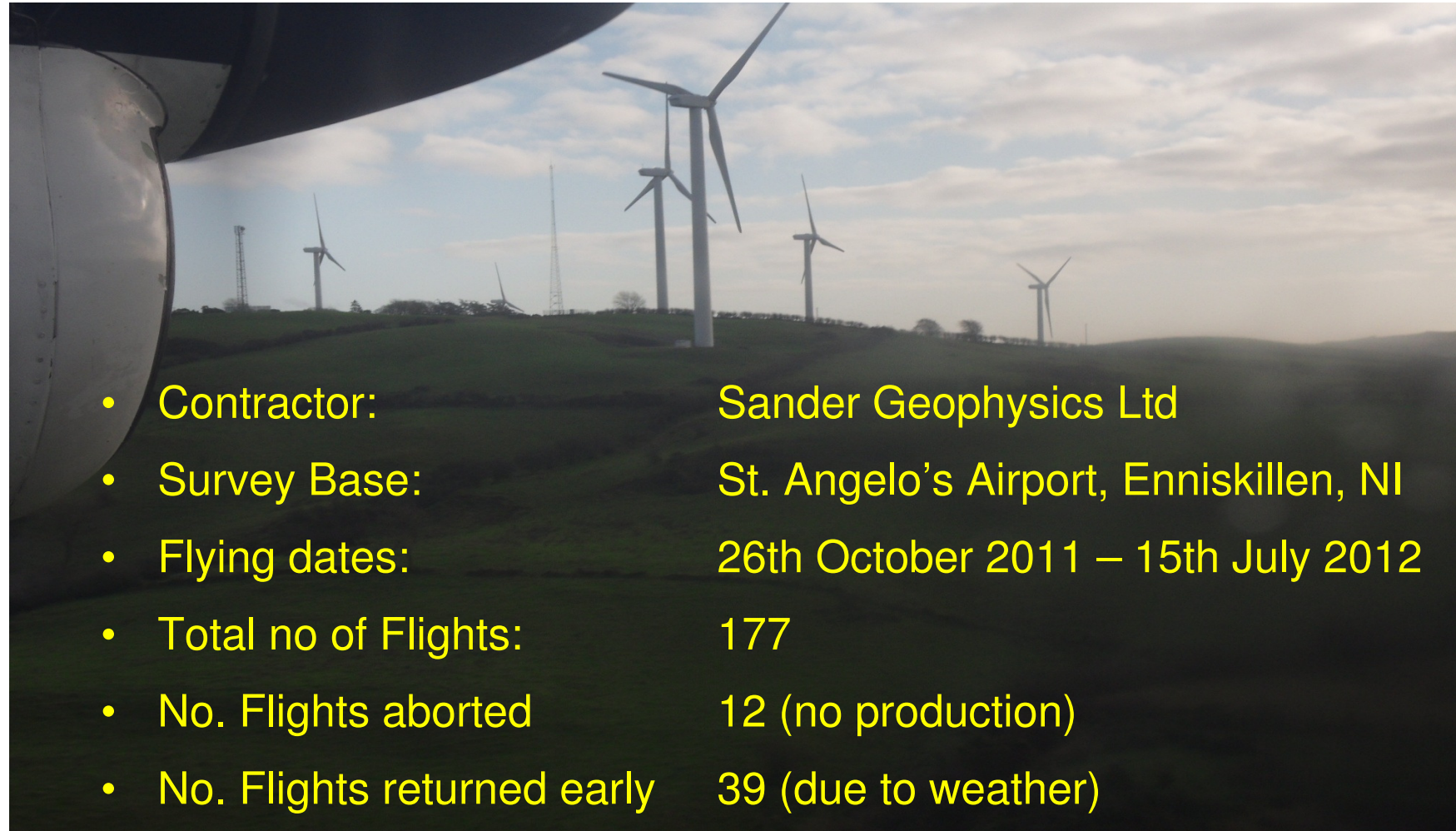
- Altitude 59m
- Flight line spacing 200m
- Tie Line spacing 2000m
- Line Orientation 345°
- Operation 7 days per week
- Design to include line overlaps with previous surveys
- Same Specs as Tellus
- NW Donegal missing due to funding



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Airborne Survey Overview



- Contractor: Sander Geophysics Ltd
- Survey Base: St. Angelo's Airport, Enniskillen, NI
- Flying dates: 26th October 2011 – 15th July 2012
- Total no of Flights: 177
- No. Flights aborted 12 (no production)
- No. Flights returned early 39 (due to weather)



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Airborne Survey Statistics

Total Survey production: 57,681 Line Km

No. Magnetic data points: ~9.8 Million
Magnetometer sample rate: 10Hz / 0.1 sec

No. Radiometric points: 983,688 per channel (TC, K, Th, U)
Radiometric sample rate: 1Hz / 1 sec

No. EM data points: ~9.8 Million per frequency channel
EM sample rate: 10Hz / 0.1 sec



Plus... laser / Radar / Video data

Airborne Survey Outreach and Issues

Outreach

- Over 220,000 fliers
- Database to identify landholdings requesting high fly zones
- PR – radio interviews, newspaper articles, TV features
- Telephone hotline
- IFA Text messages
- Awarding winning

Issues

- High Fly Zones (towns, farms, M1)
- Wind farms
- Rain, Rain, Rain
- Low cloud



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Data QC & Processing

Data QA/QC carried out during data acquisition
– chief concern high altitudes

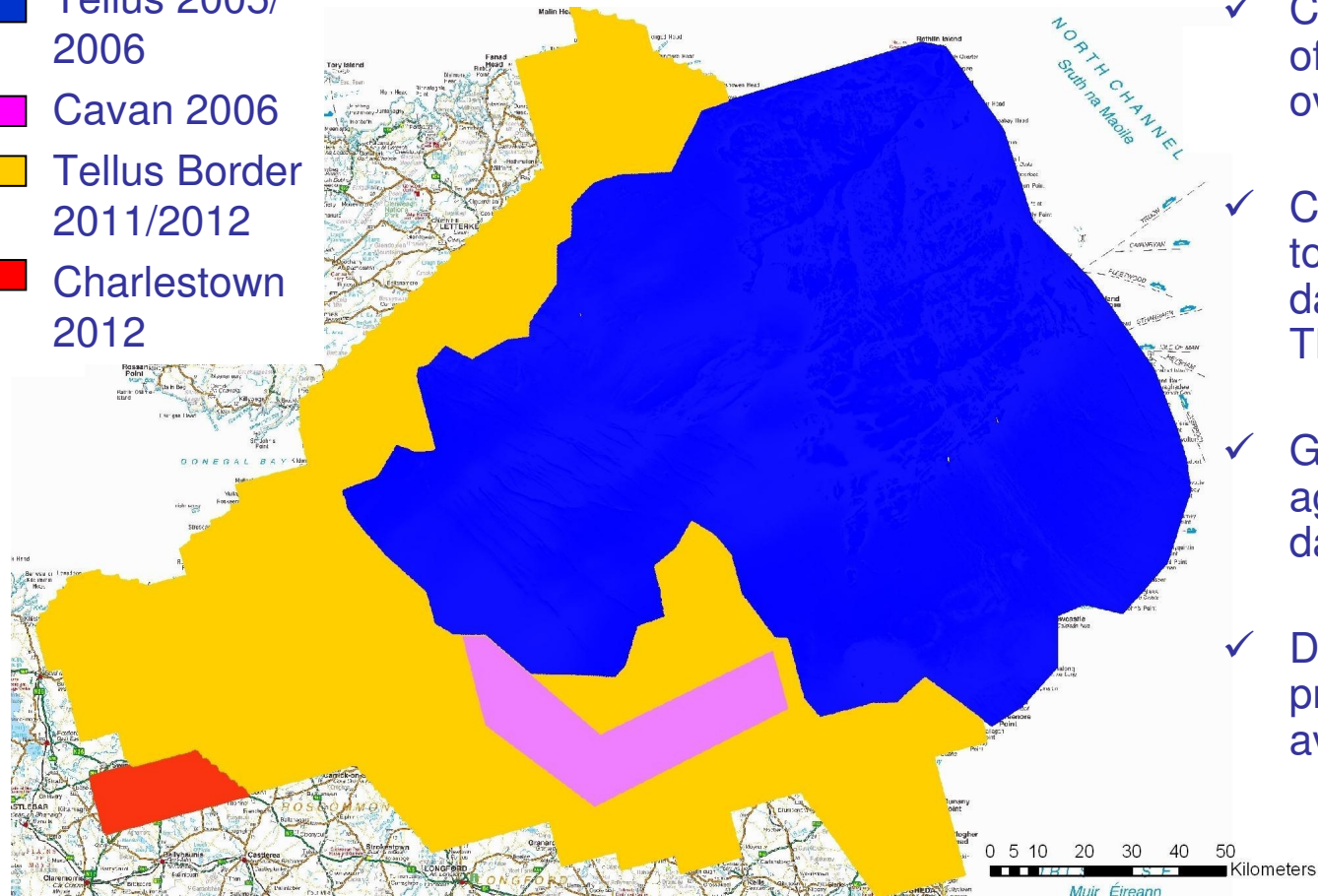
- Standard airborne geophysical levelling applied to all data
- Some micro-levelling applied but no additional filtering applied to allow user to carry out own processing

➤ Full details of all processing carried out contained in processing report available on website (downloadable pdf)



3. Data Merging

-  Tellus 2005/2006
-  Cavan 2006
-  Tellus Border 2011/2012
-  Charlestown 2012



- ✓ Correction / levelling of data based on overlap zones
- ✓ Corrections applied to Tellus and Cavan data to bring up to TB level
- ✓ Generally good agreement between datasets
- ✓ Details contained in processing report available on website

4. New Geophysical Data

Available now to download at www.tellusborder.eu

1. **Magnetics** – Total Field, Magnetic Anomaly

2. **Radiometrics** – K, Th, U and Total Count



Available soon

3. **Apparent Conductivity** (2 frequencies)

Applications & Benefits of Geophysics

See beneath the soil....

Radiometric data (Shallow)

- Radon Risk mapping
- Geological mapping – geological boundaries, magmatic differentiation
- Agriculture – Soil mapping / Peat mapping – thickness and extent

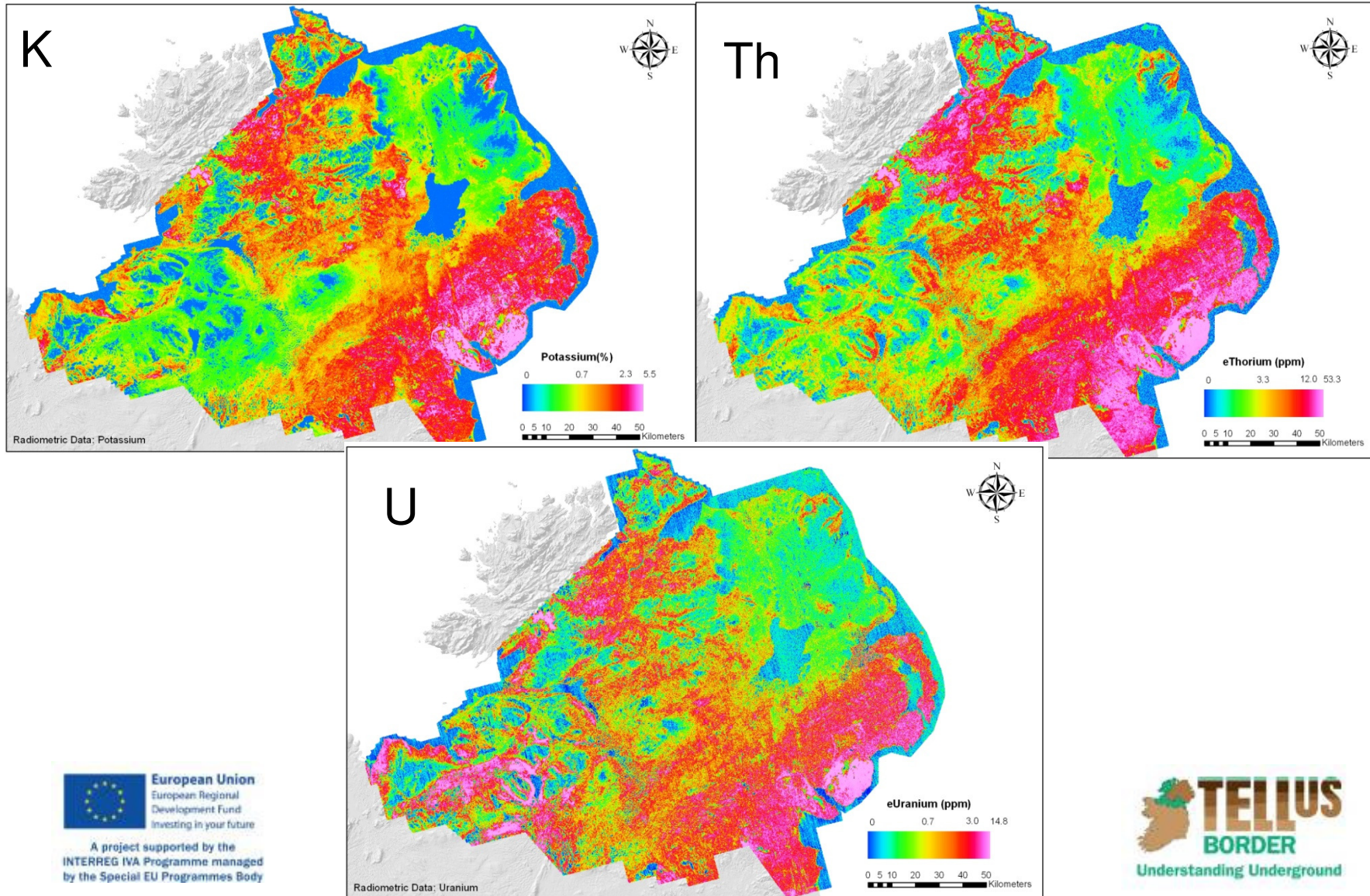
Magnetic data (Shallow – Deep)

- Geological mapping – geological boundaries, fault mapping, structures local to regional scale for mineral exploration, aquifer mapping, anomaly detection

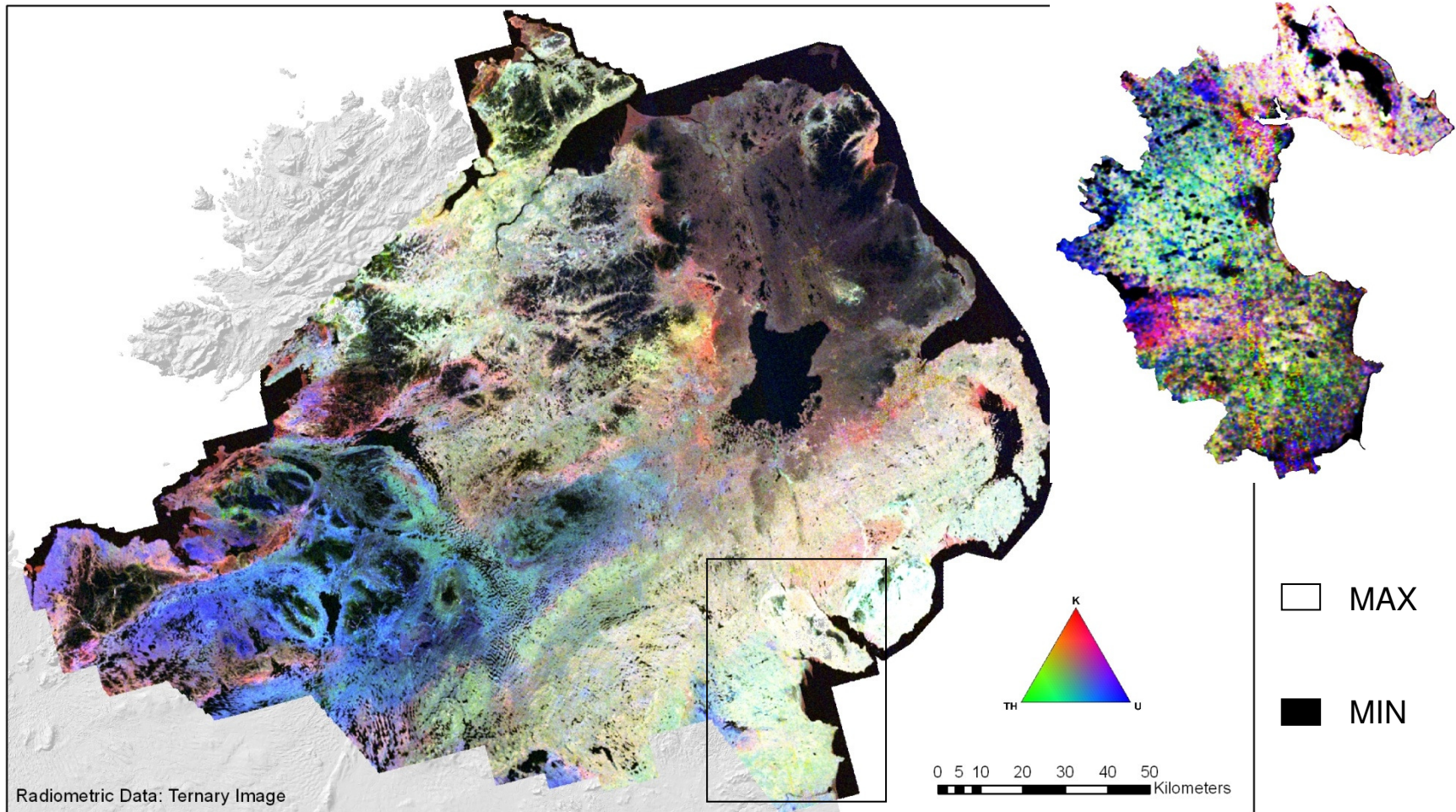
Conductivity data (Medium)

- Saline intrusion – effects on wetland habitats, groundwater aquifers
- Groundwater pollution plumes / contaminated land– assist in identification
- Geological mapping – mineral exploration – sulphide deposits / aggregates

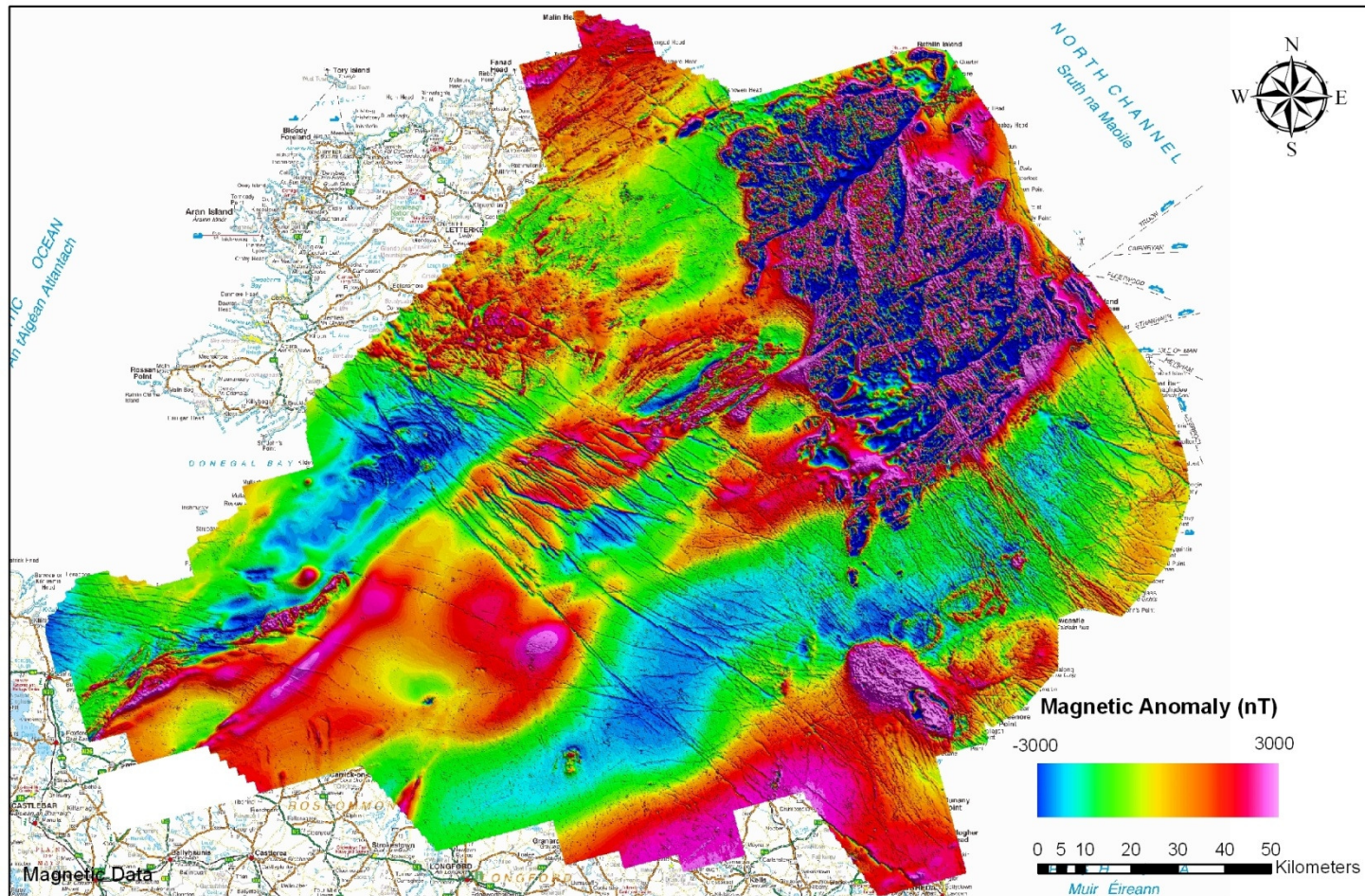
New Data: Radiometrics



New Data: Ternary Image



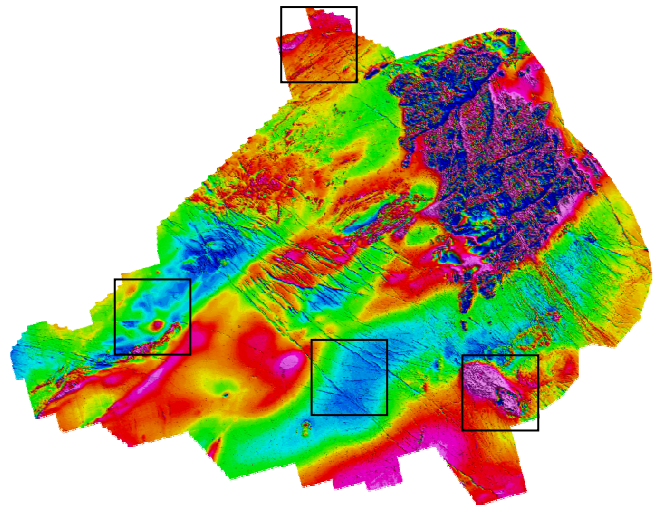
New Data: Magnetic Anomaly



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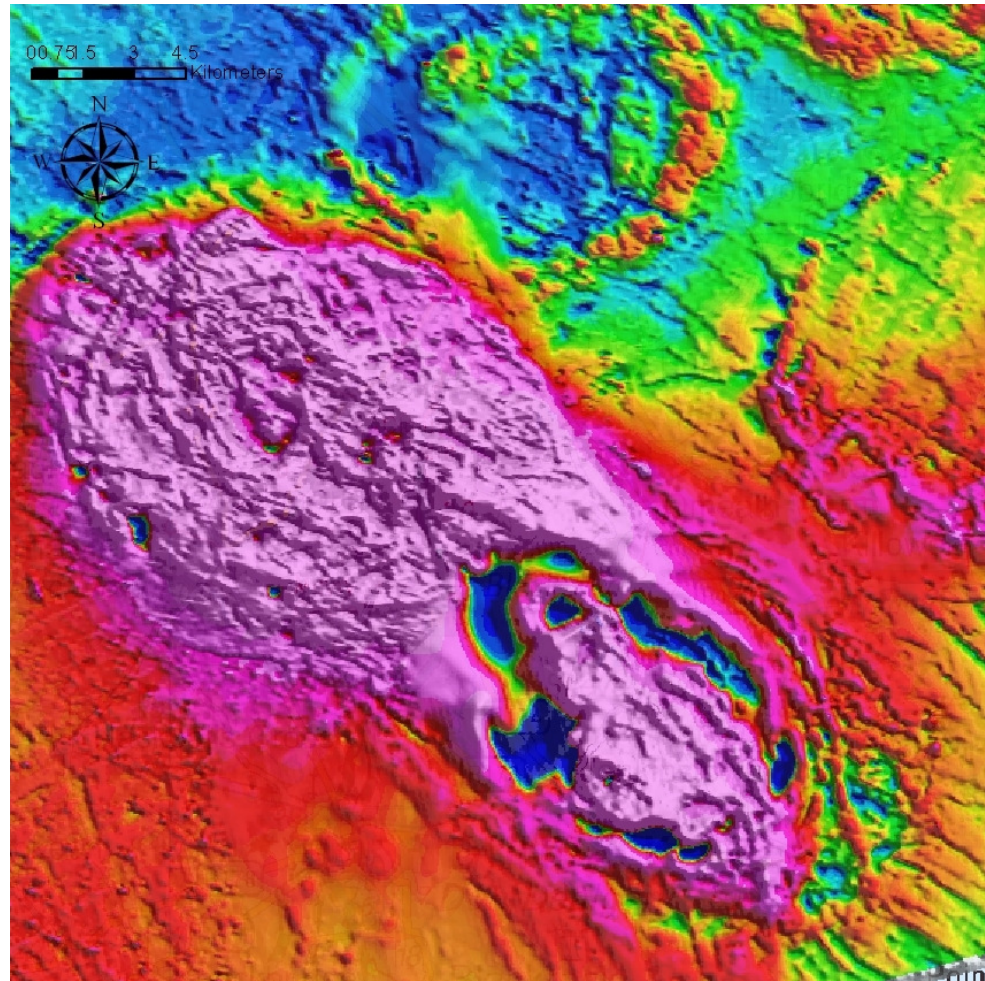
Magnetic Data



Magnetic Anomaly (nT)

Low

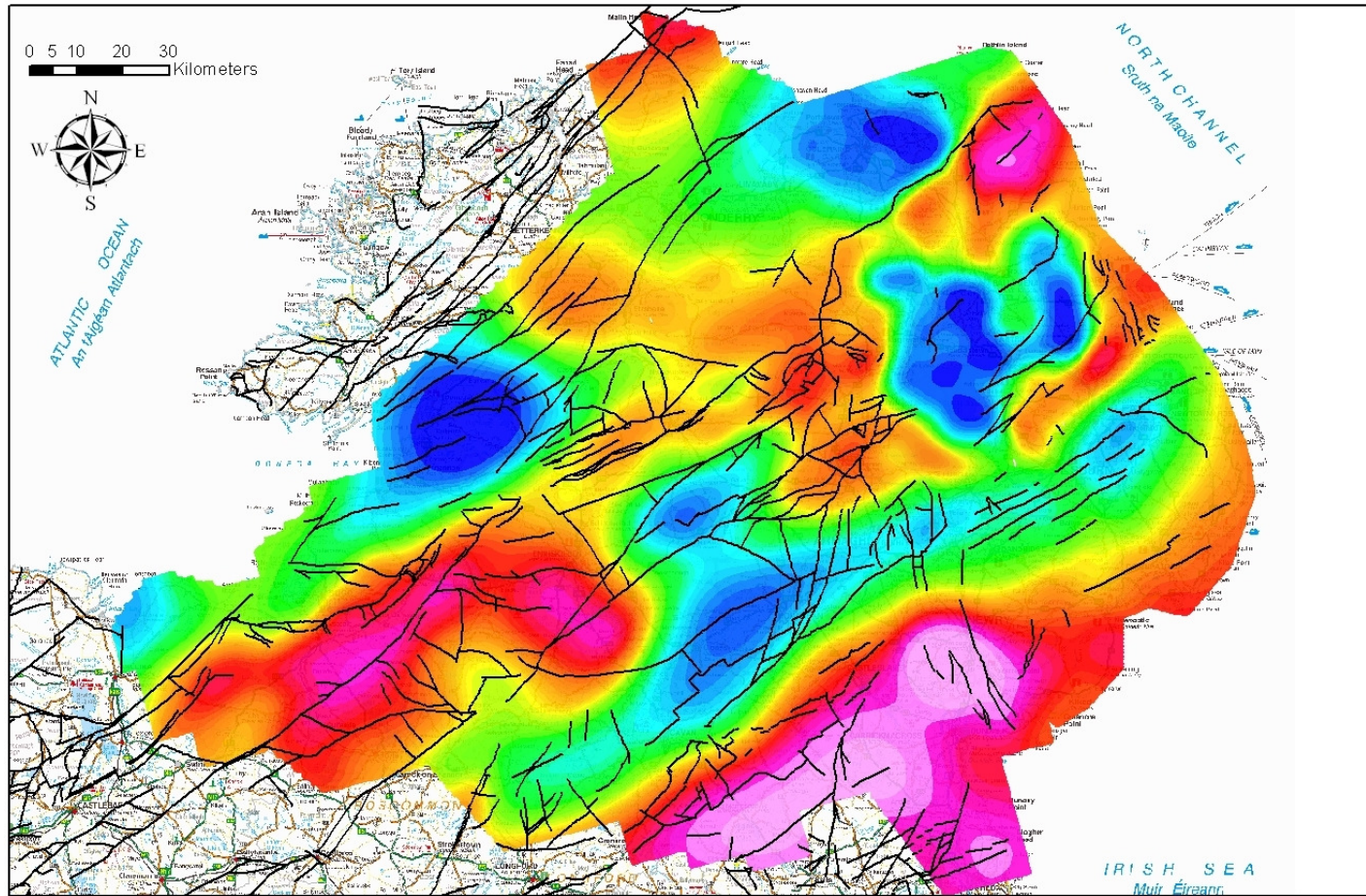
High



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Magnetic Data Faults



Faults
shown as
black lines

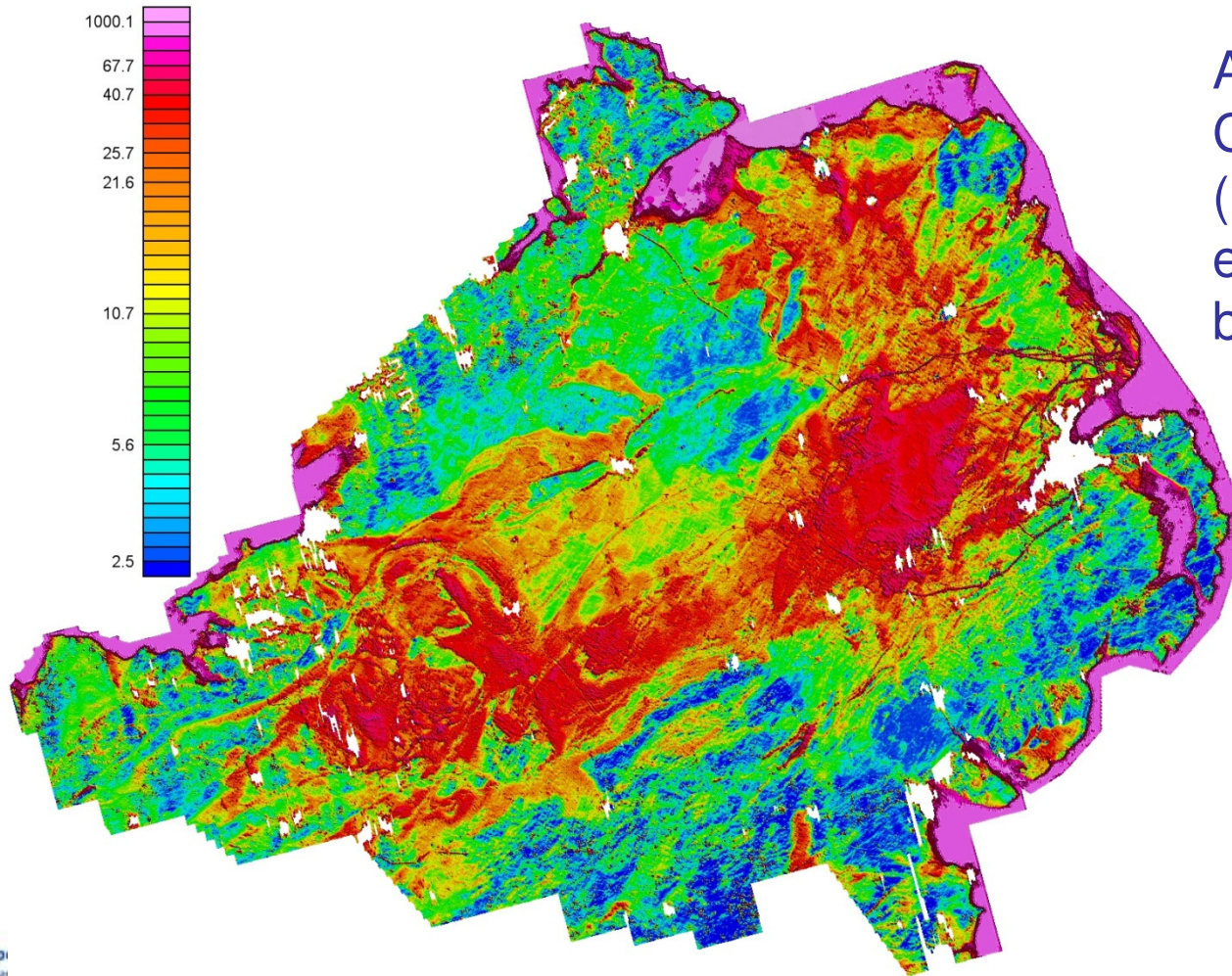
Magnetic Anomaly (nT)

Low



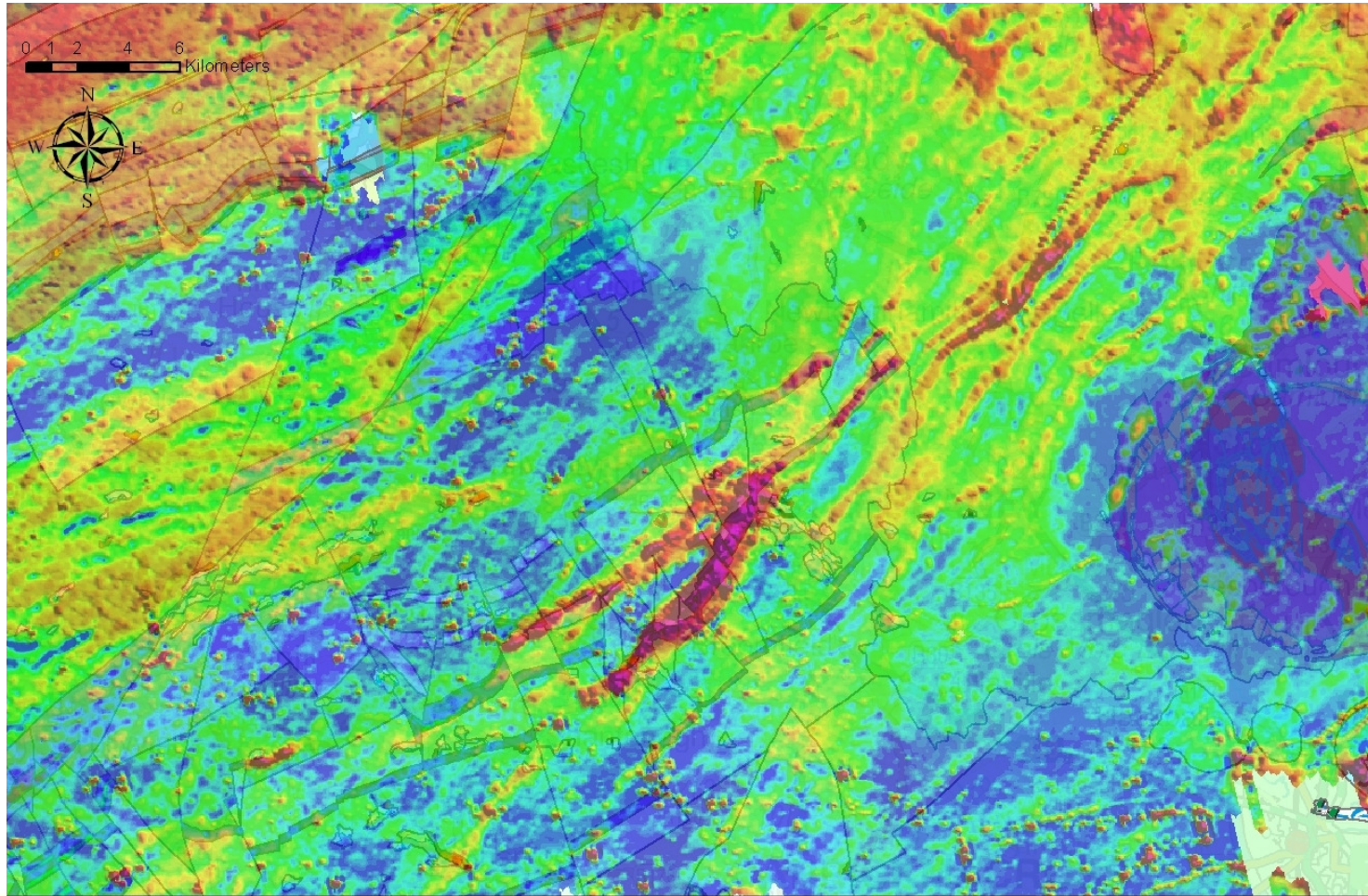
High

EM Conductivity Data



Apparent
Conductivity
(mS/m) at
elevations
below 180 m

Conductivity Detail



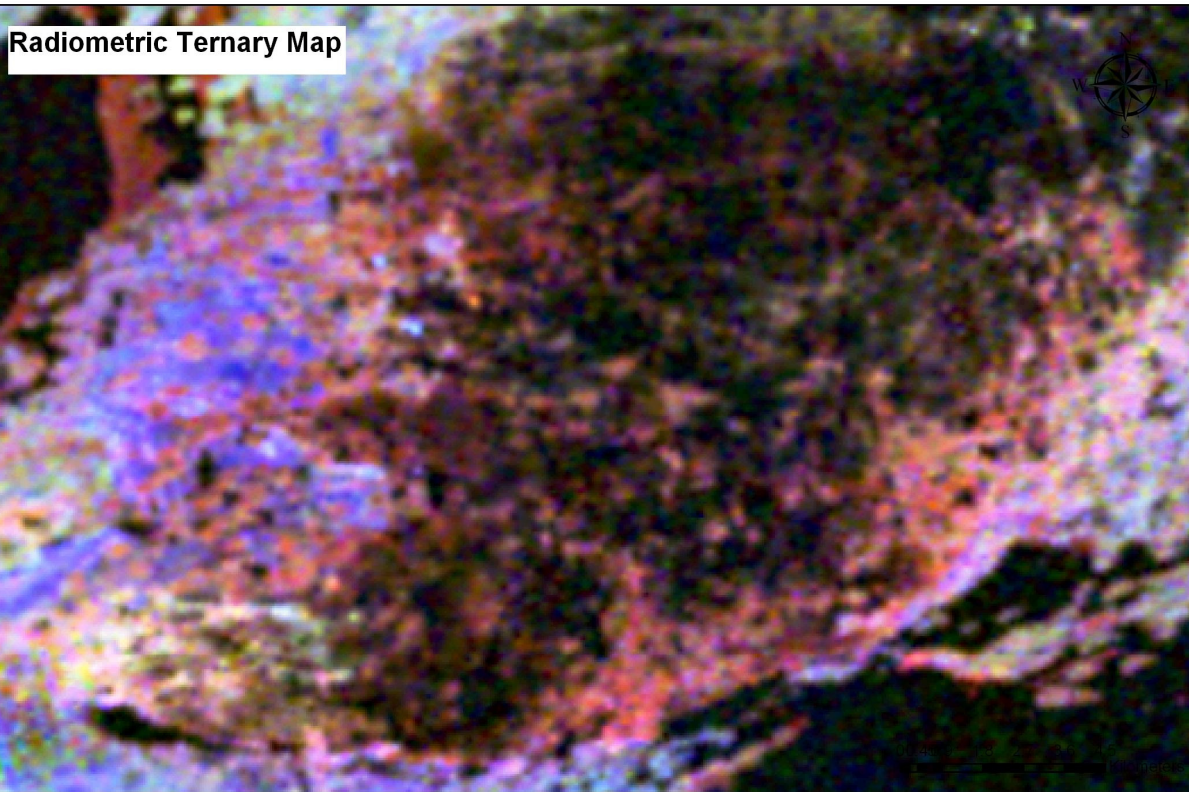
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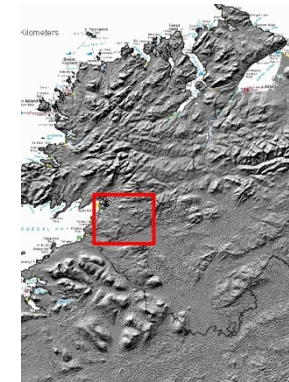
Low  High

 **TELLUS**
BORDER
Understanding Underground

Detailed Example: Slishwood Division



Slishwood Division: Radiometric Ternary



5. Summary of Data Applications

- **Bedrock Mapping** – mineral exploration, update geology maps, fault mapping
- **Environmental Investigations** – saline intrusion, pollution plumes, peat thickness & extent
- **Health** – radon risk potential mapping, Cs-137 investigation
- **Other** - soil mapping assistance, geothermal applications, aquifer investigations, drumlins

... I have experienced many instances of being obliged, by better information or fuller consideration, to change opinions, even on important subjects, which I once thought right but found to be otherwise.

Benjamin Franklin

www.tellusborder.eu

Thank You



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Department of
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**Geological Survey
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Queen's University
Belfast



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