



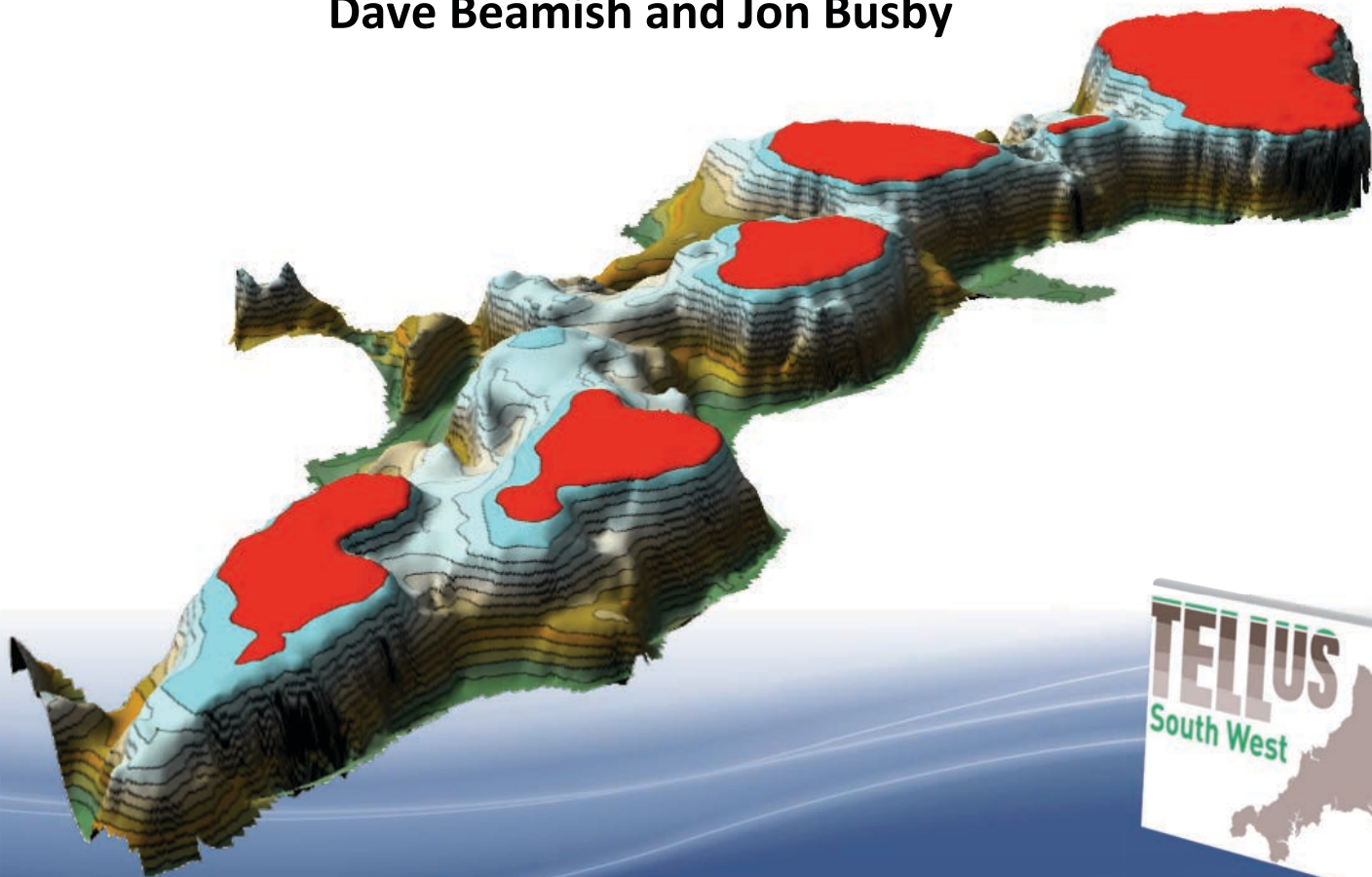
British
Geological Survey

NATURAL ENVIRONMENT RESEARCH COUNCIL

Gateway to the Earth

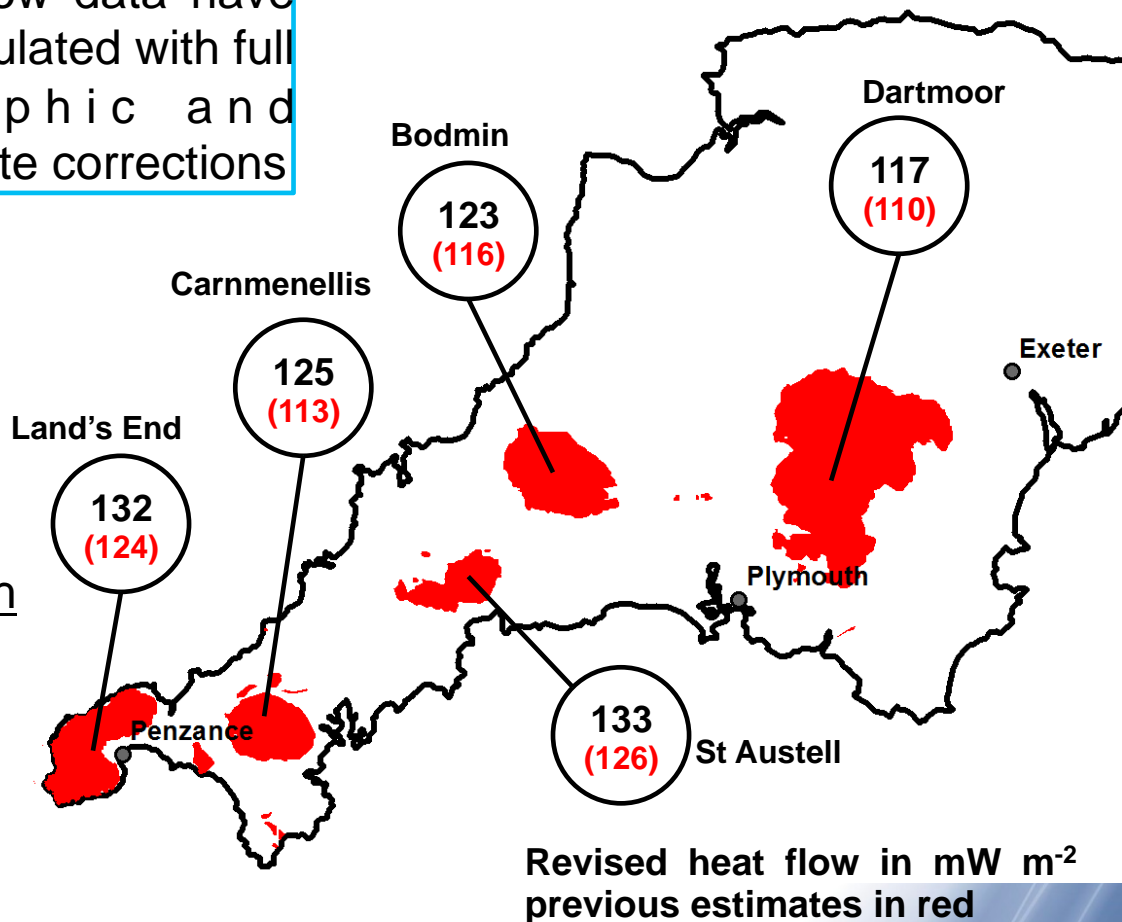
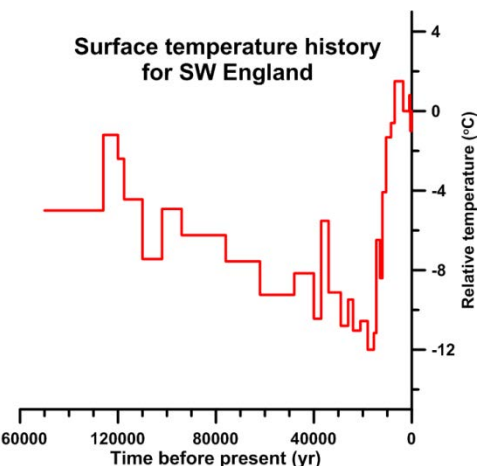
The TellusSW airborne geophysical data: insights into heat production and deep structure in SW England

Dave Beamish and Jon Busby



It has been suggested (Westaway & Younger 2013) that lack of consistent palaeoclimate corrections has led to an underestimate of SW England heat flow

The heat flow data have been recalculated with full topographic and palaeoclimate corrections



Revised temperatures at 5 km depth

(exponential decrease with depth of heat production and a temperature dependent thermal conductivity)

Land's End	208°C	(8% increase)
Carnmenellis	203°C	(12% increase)
St Austell	223°C	(7% increase)
Bodmin	201°C	(7% increase)
Dartmoor	188°C	(8% increase)

So, the SW geothermal province is warmer than we thought!

TellusSW airborne collected Magnetic and Radiometric (gamma-ray spectroscopy) data



- 61,500 line-km of data
- Using 200 m (N-S) lines

- Magnetics (MAG)– almost entirely bedrock focused (structural/minerals/petrographic). > **17 M data samples**
- Radiometrics (RAD)– much more diverse: connects bedrock, superfcials and soils. > **855 k data samples**

RAD sampling ~70 m along line

MAG sampling ~3.5 m along line

Radiometric Ternary image across the SW

Amplitudes are Total Count

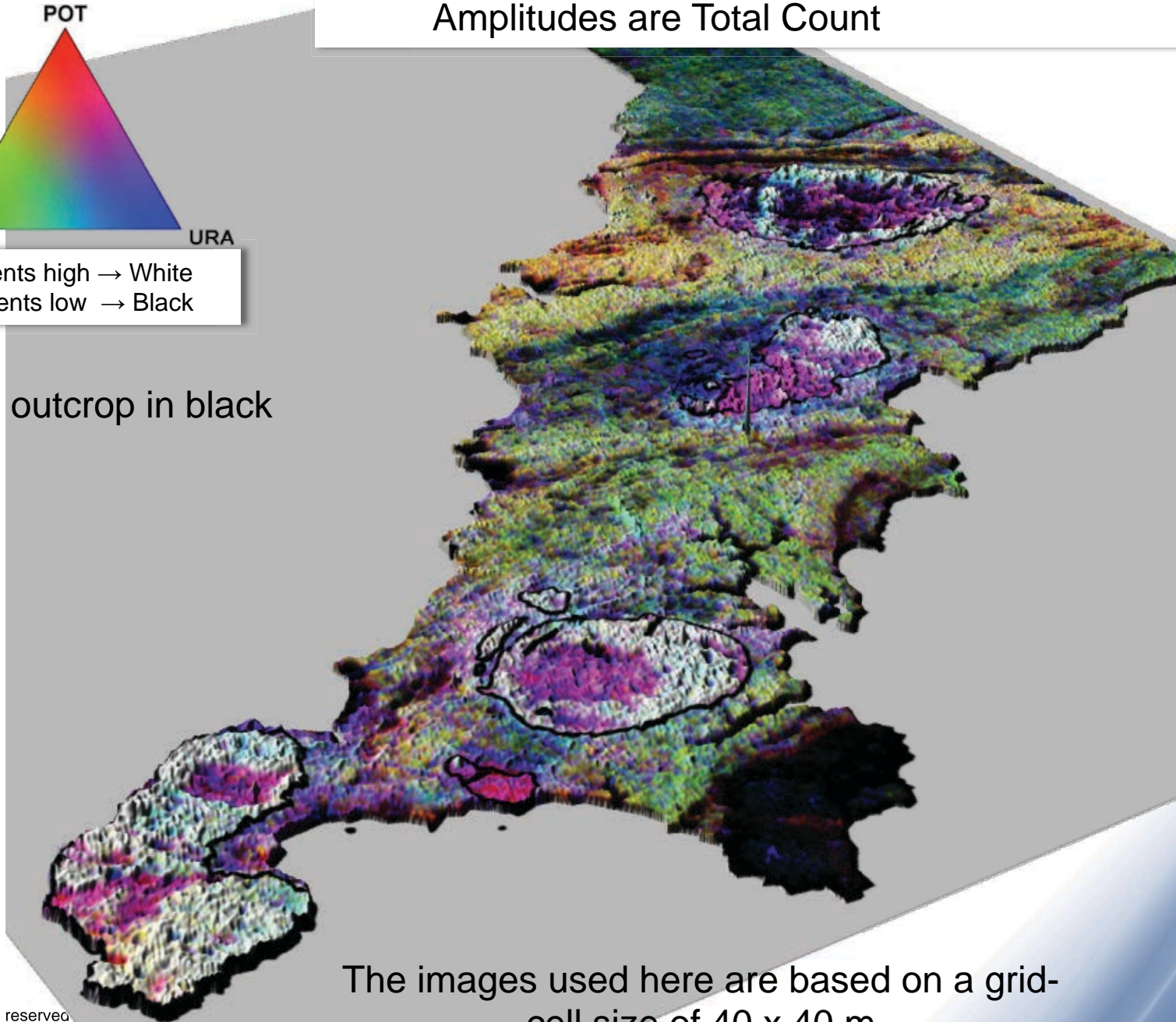
POT

THO

URA

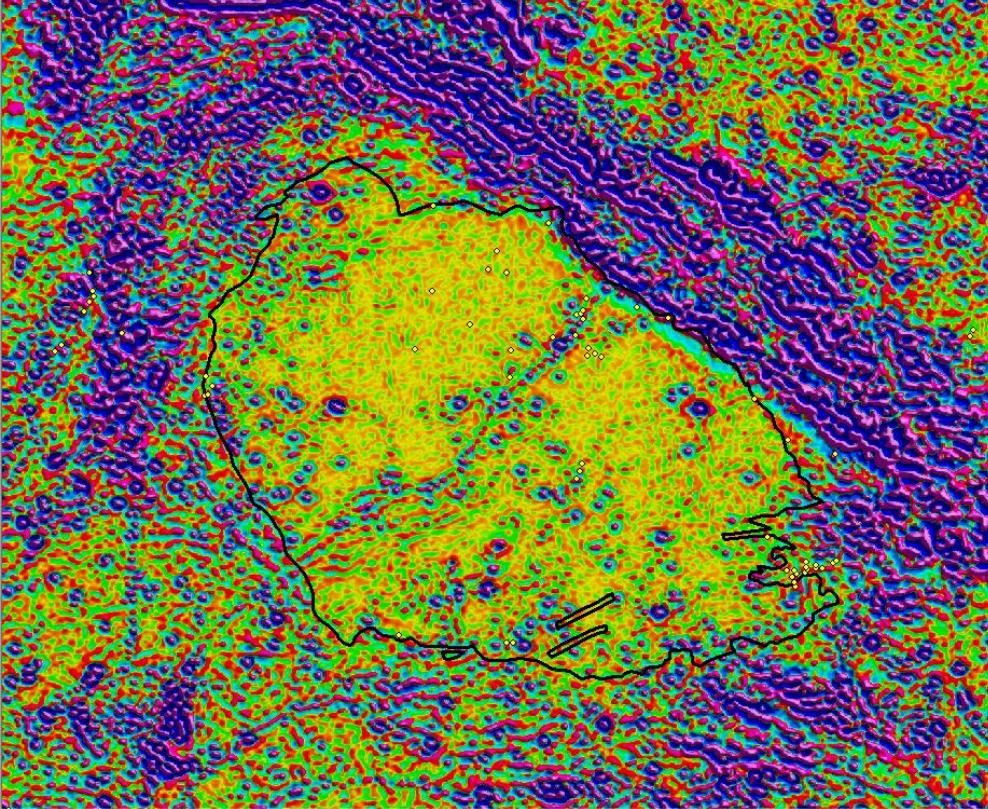
all elements high → White
all elements low → Black

Granite outcrop in black



The images used here are based on a grid-cell size of 40 x 40 m

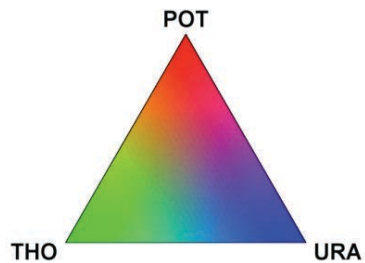
Detail across the Bodmin Granite



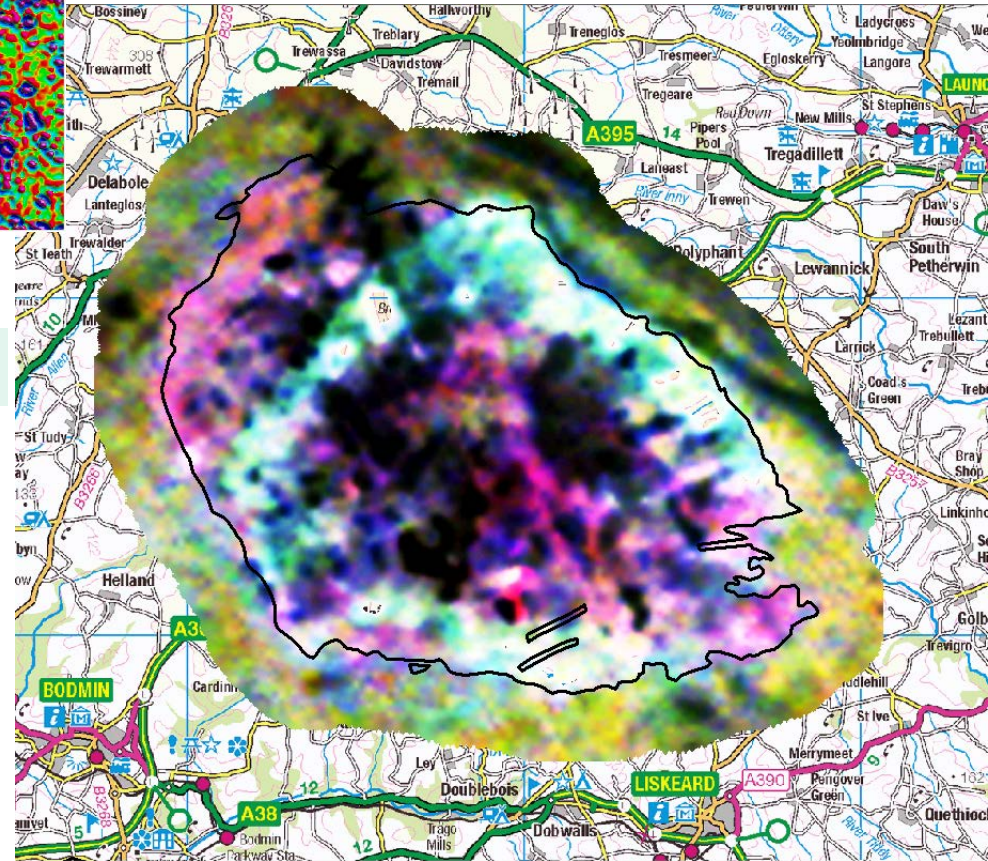
Processed Magnetic Data

The granites are largely non-magnetic. We see magnetic structure across the 'halo' (and also the route of the A30)

Radiometric Ternary Image

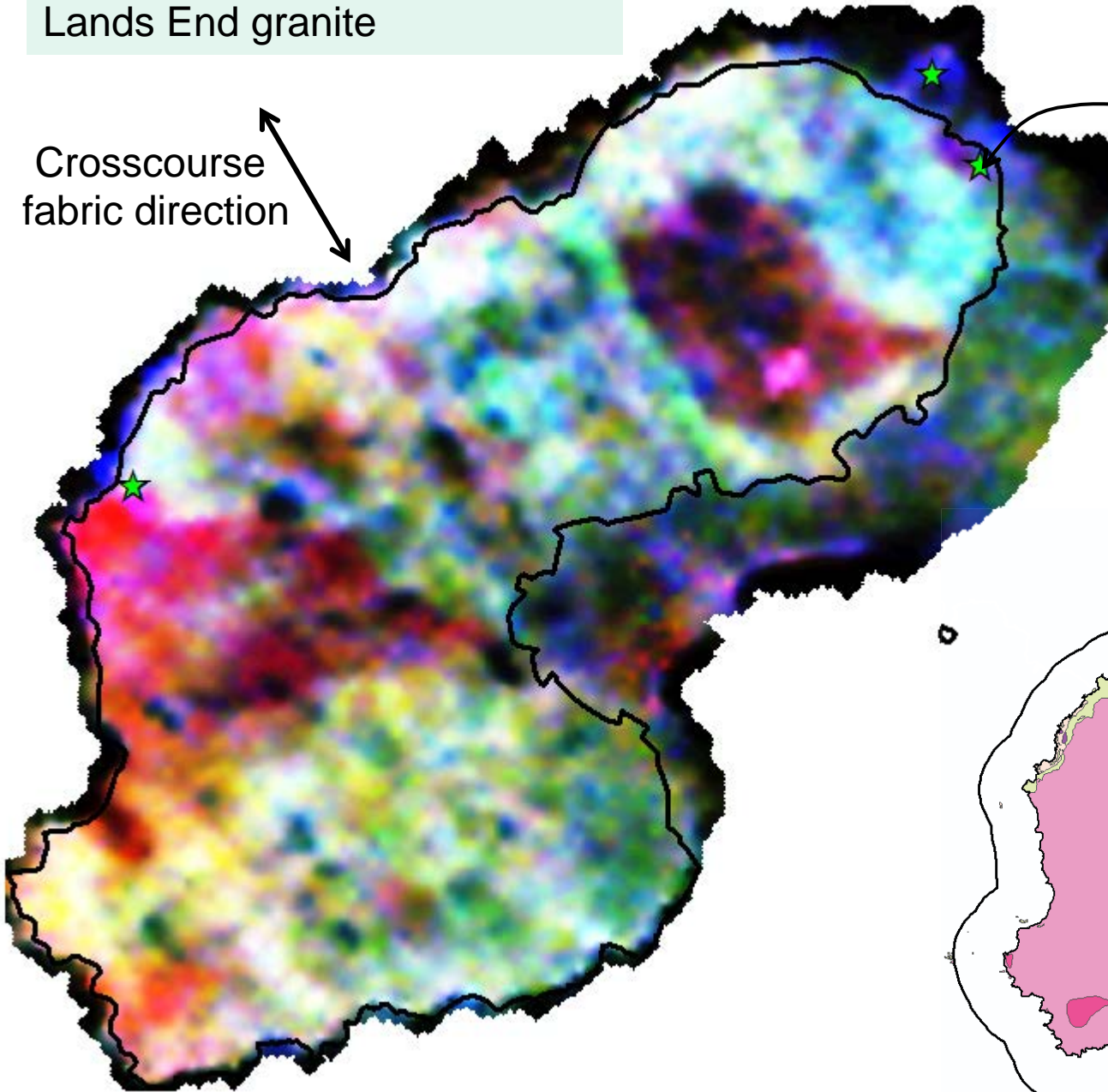
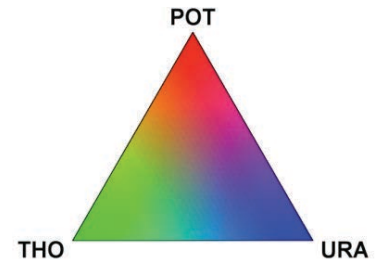
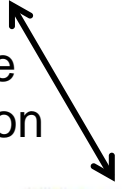


We see the radiochemical architecture of the granite. Which is distinct from the country-rock

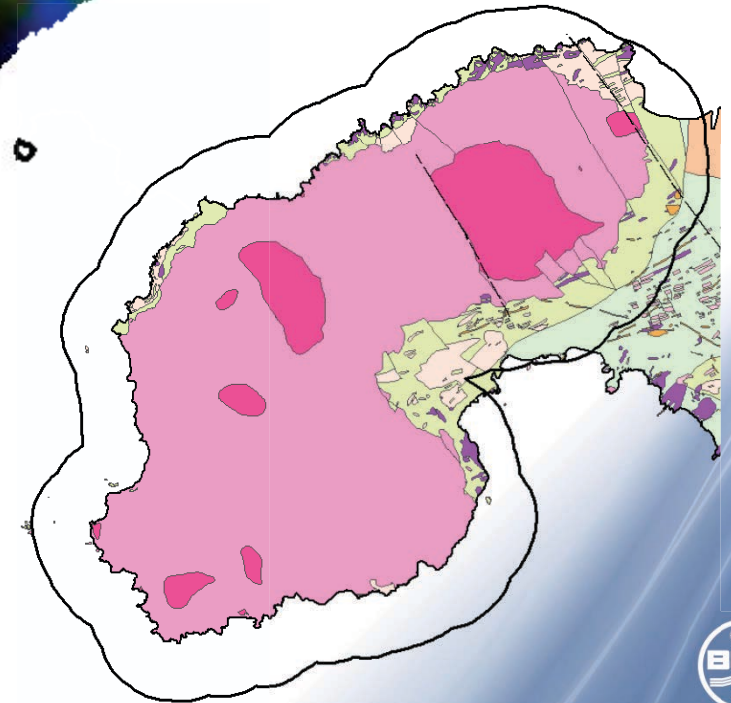


Radiometric Ternary Image
Lands End granite

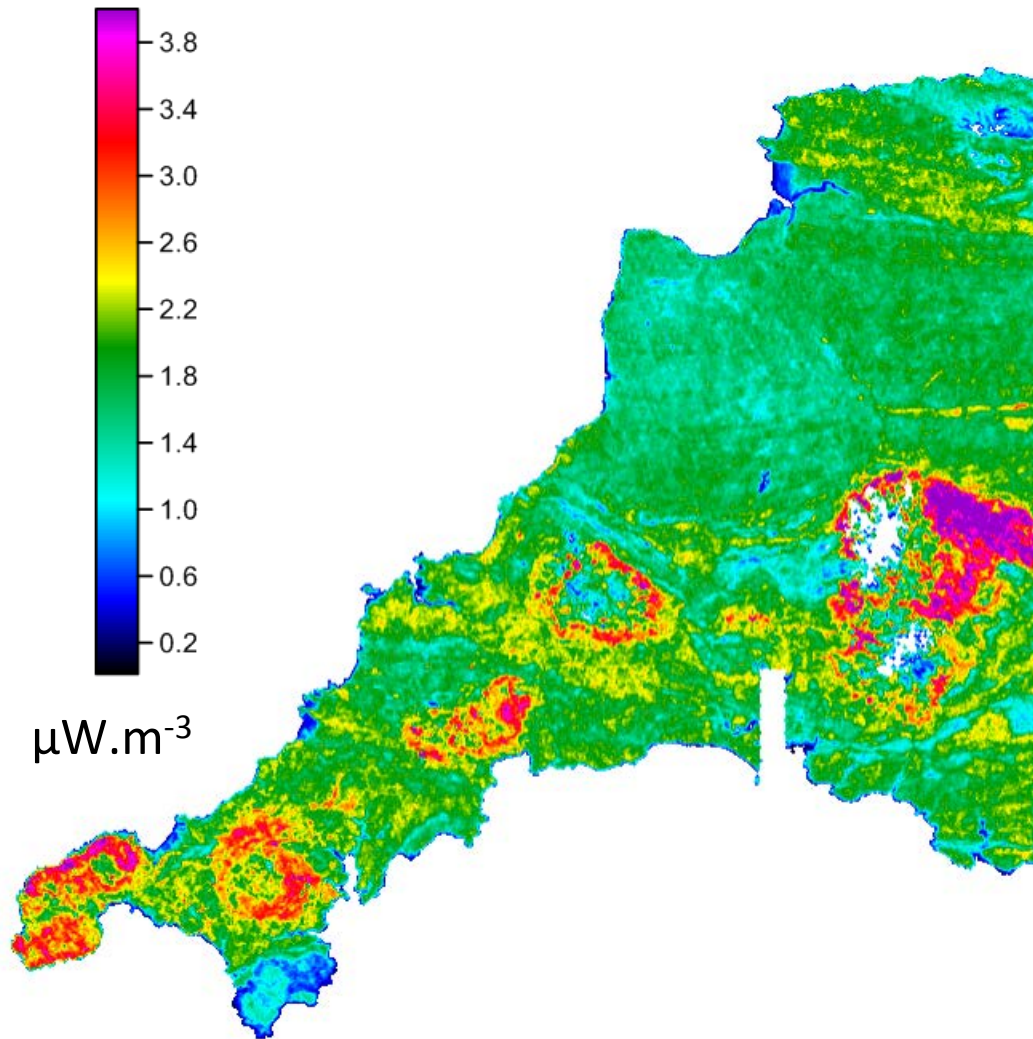
Crosscourse
fabric direction



1:50k bedrock map



Near-surface heat production is calculated from the ground concentrations of all 3 radioelements

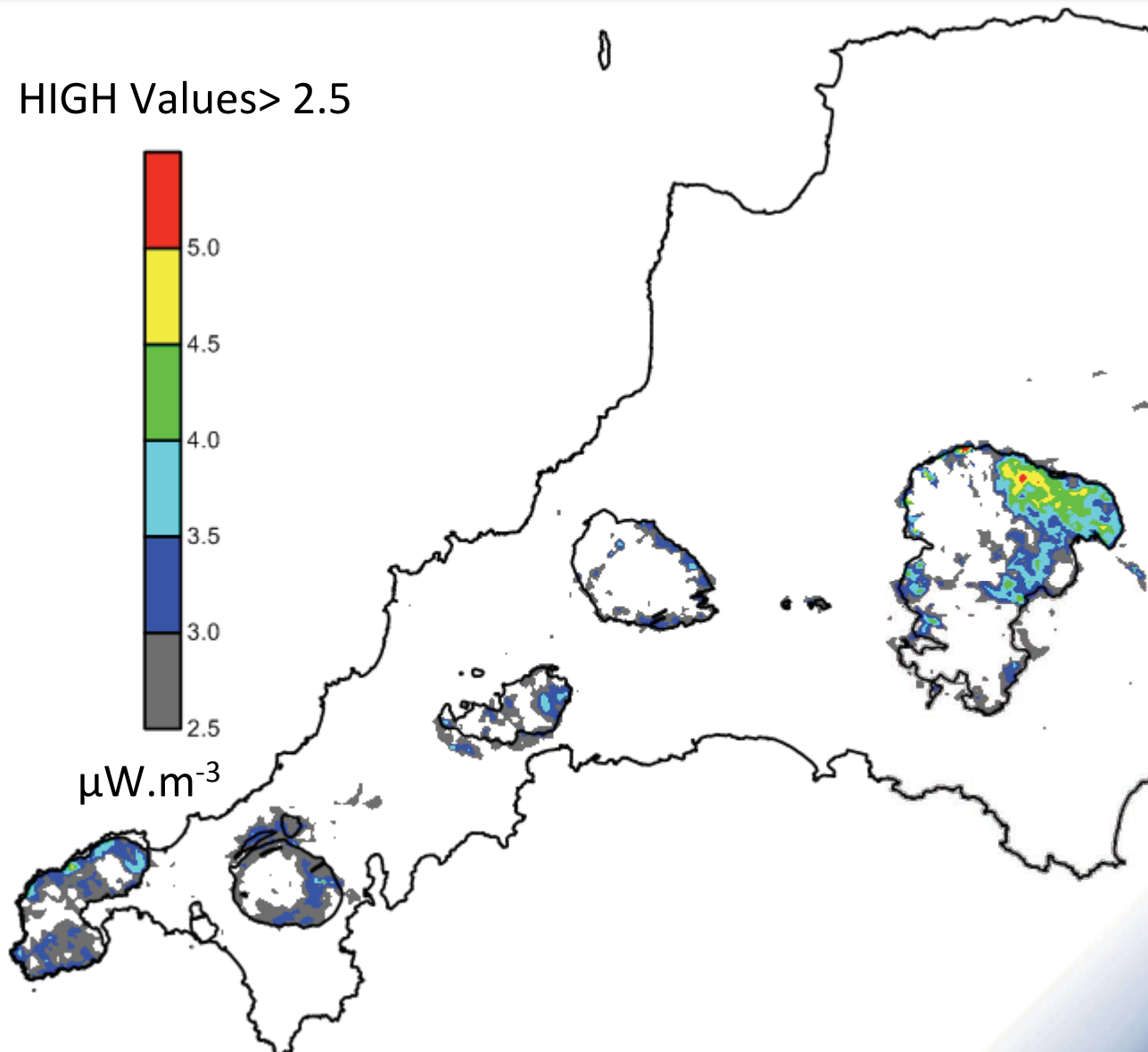


The procedure is based on a 'parent-material' (bedrock) principle and the estimates are invariably too low.

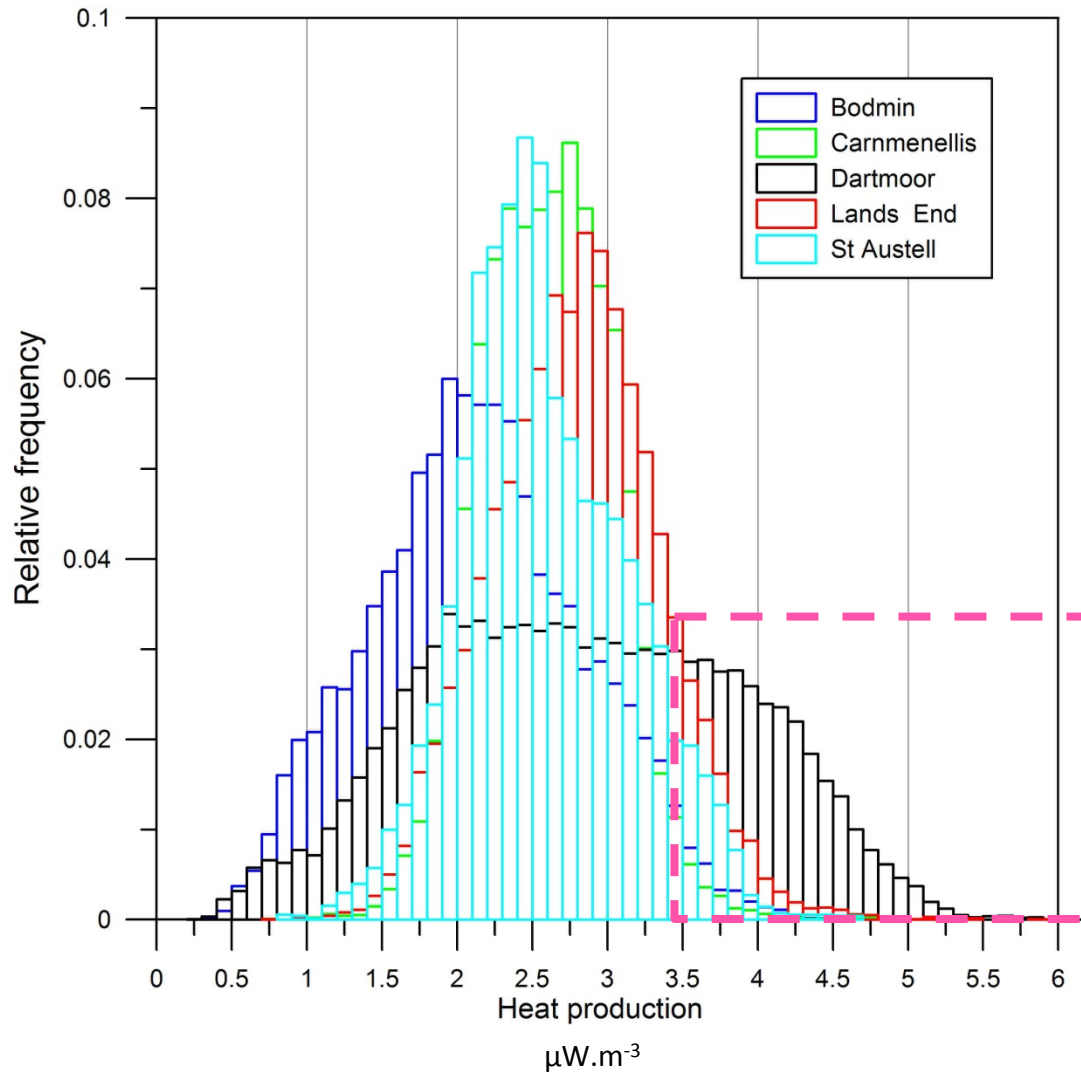
We can perform (as here) a calibration to improve the 'bedrock-equivalent' concentrations.

Soil attenuation effects (e.g. due to peat-cover) are more problematic and we are still working on this.

The high-values of heat production are largely, but not exclusively, confined to the 'edges + halos' of the granite outcrops

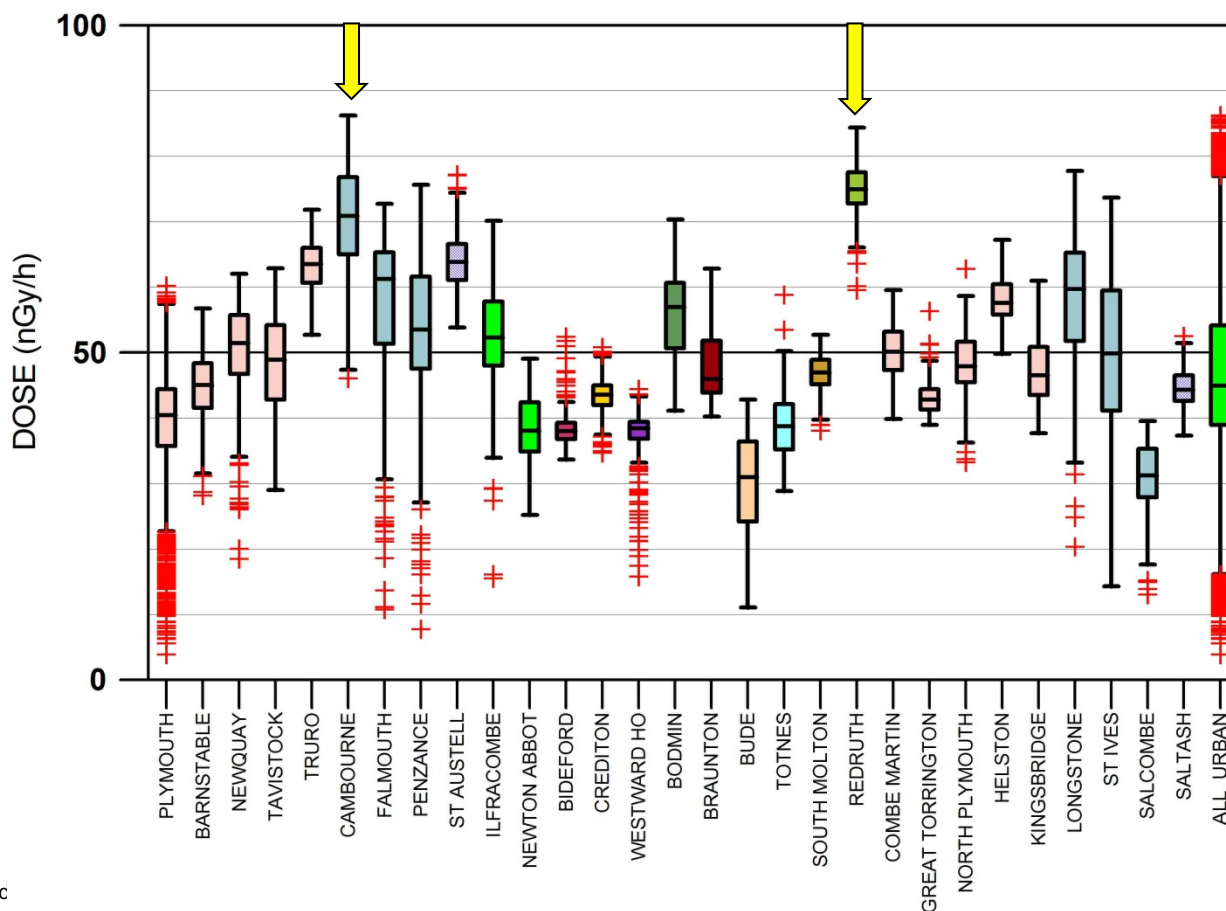


Summary of heat production across 5 granite outcrops



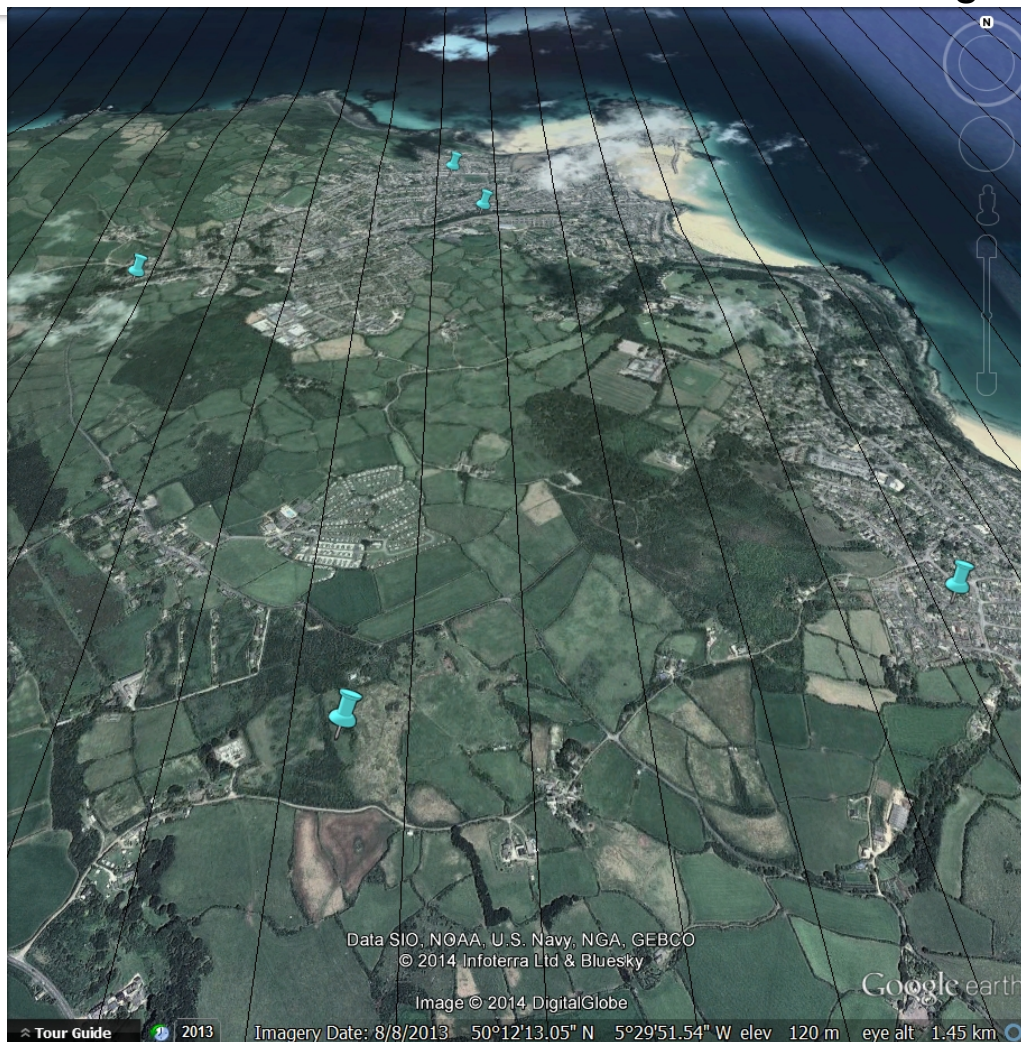
Heat production at the district/urban scale

The survey overflowed all the urban centres in the SW, although at higher elevations (~200 m). The data are height corrected and we can estimate radioactivity levels within defined urban centres. The box-whisker statistical comparison below shows the highs and lows of towns arranged in decreasing order of population. The granite associations clearly show through



Heat production in the vicinity of population centres : St Ives

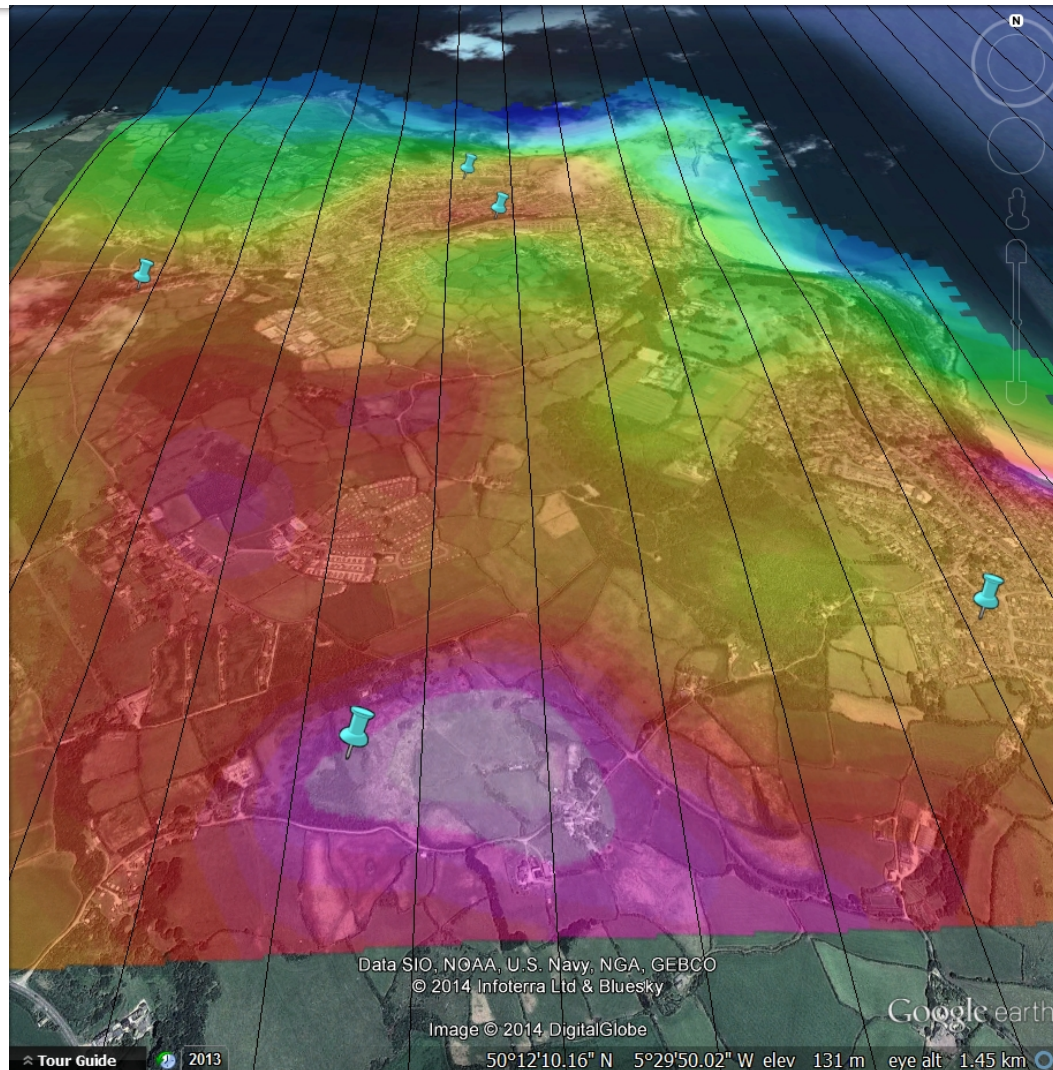
The estimates are provided by N-S survey lines spaced at 200 m. The image shows the survey lines (looking North) across the area of St Ives. The area contains a series of former mineral mines including Wheal Treawith.



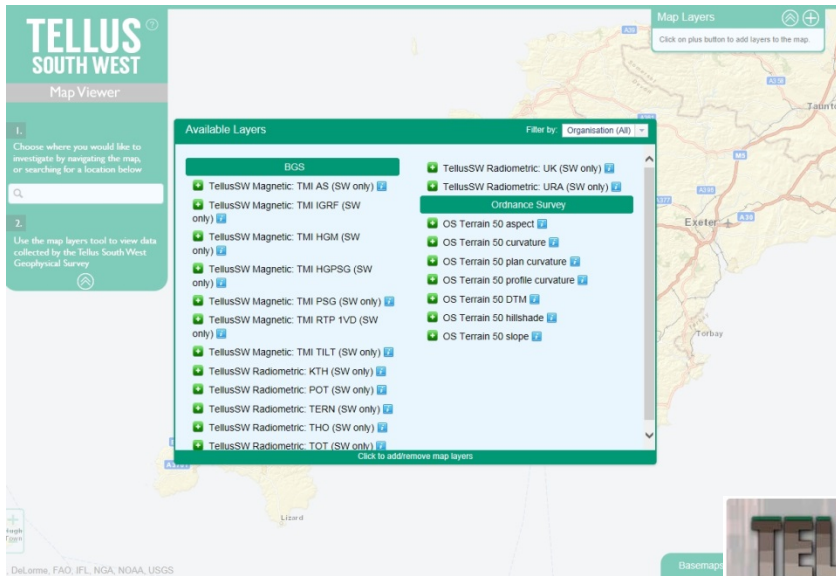
Wheal Treawith
Cu (1825-1856)
URA (1909-1913)

Heat production in the vicinity of population centres : St Ives

The image shows the survey lines (looking North) across the area of St Ives together with a heat production image with a high value zone in the foreground



The TellusSW data are free and can be downloaded via the WEB



The TellusSW project web page is

<http://www.tellusgb.ac.uk/>

As below

Here, the data can be simply downloaded as .csv & .zip data files e.g.

Download the data:

- TellusSW airborne geophysics
 - Magnetics data zipped GeoTIFFs, 91Mb
 - Radiometrics data zipped GeoTIFFs, 100Mb



Home

Tellus South West Geophysical Survey

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Why are we doing this survey?
When and where are we surveying?

Tellus South West Geophysical Survey

The British Geological Survey (BGS) has carried out a low-level airborne geophysical survey of the South West of England as part of the Tellus South West Project.

The survey aircraft has flown over most of Devon and Cornwall, and parts of Somerset, and will be gathering magnetic and radiometric measurements in order to extend our understanding of the geology, soils, natural resources and environment.

Fugro Airborne Surveys have been contracted to operate the survey using a twin-engine, small cargo/passenger aircraft, fitted with geophysical survey equipment.

Conference

The Tellus South West Data Launch will be held on 20 May 2014 08:45 – 13:30.

Please look out for more information about our upcoming Stakeholder Liaison Event.

High-quality survey data

Airborne geophysical surveys rapidly generate high-quality data for large or inaccessible areas. They can provide new insights into bedrock geology and structure, mineral deposition, groundwater flow and accessibility, natural radiation levels such as radon, plus soil types and peat distribution.

Information gathered from the survey will help us to understand and contribute to the sustainable development and management of the South West of England.

Resources

This region has many natural resource and development opportunities that require investigation, whilst also making sure the outstanding natural beauty of the area is sustained, including its diversity of natural habitats and ecosystem services, the amenity value of the landscape and coast for leisure and tourism.



About the Tellus South West Geophysical Survey.



A twin-engine Rains Cassra F406 aeroplanes, fitted with geophysical survey equipment, used in the TELLUS South West survey. Photo courtesy of Fugro Airborne Surveys (Pty) Ltd.

More information

- Tellus Border Survey Ireland
- Rock Surveyors take to the Skies, BBC News England



Video of the 2008 Isle of Wight airborne geophysical survey

TellusBlogs

- Tellus – The Questions by Andy Howard
- TELLUS A STORY: Fitting for the TELLUS SW project by Clive Mitchell
- Tellus Takes Off by Dr Andrew Howard

Downloads

- Tellus South West fact sheet

