

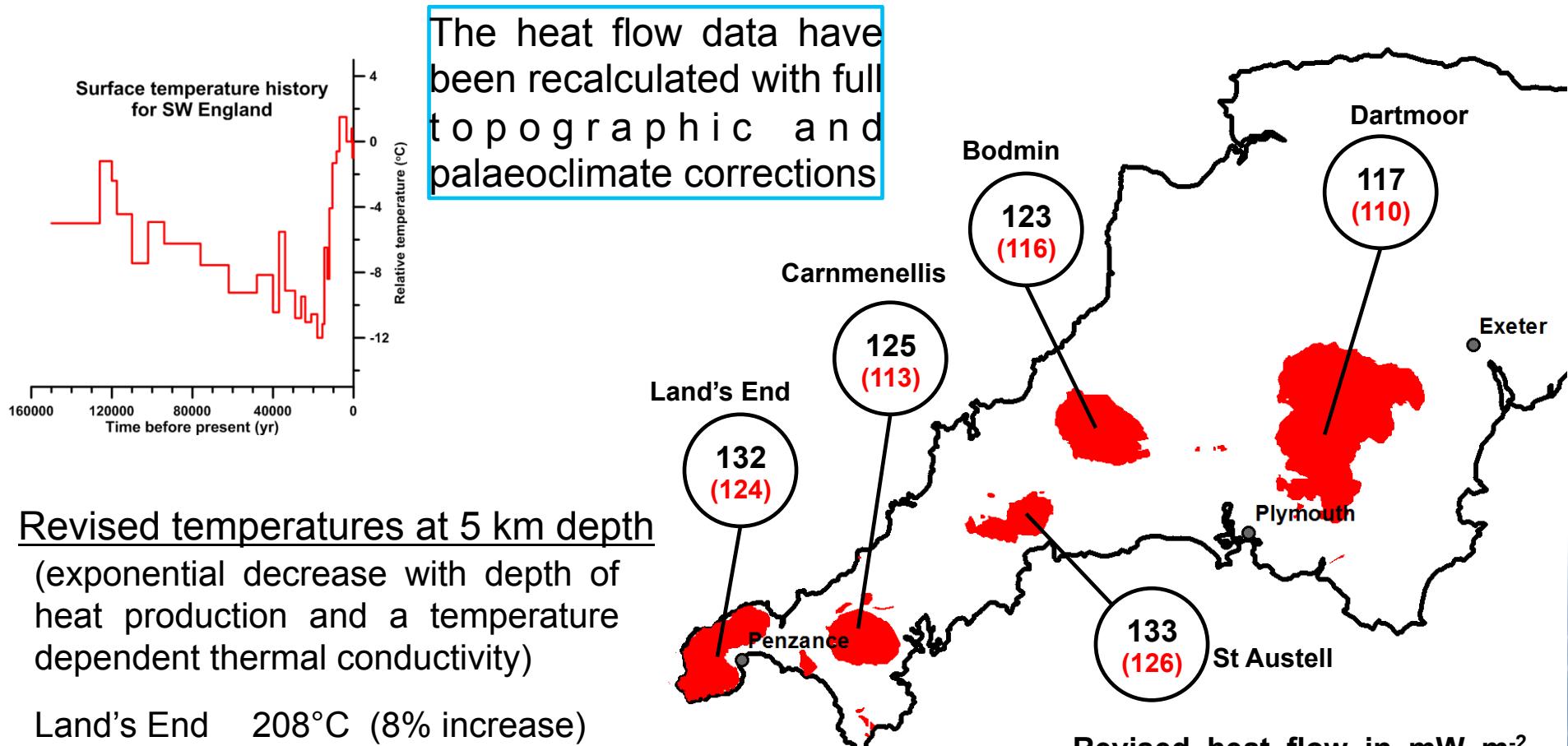


The TellusSW airborne geophysical data: insights into heat production and deep structure in SW England

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



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

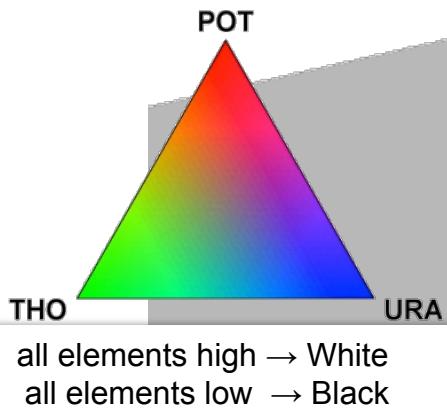
- Magnetics (MAG) – almost entirely bedrock focused (structural/minerals/petrographic). > **17 M data samples**
- Radiometrics (RAD) – much more diverse: connects bedrock, superficials and soils. > **855 k data samples**

RAD sampling ~70 m along line

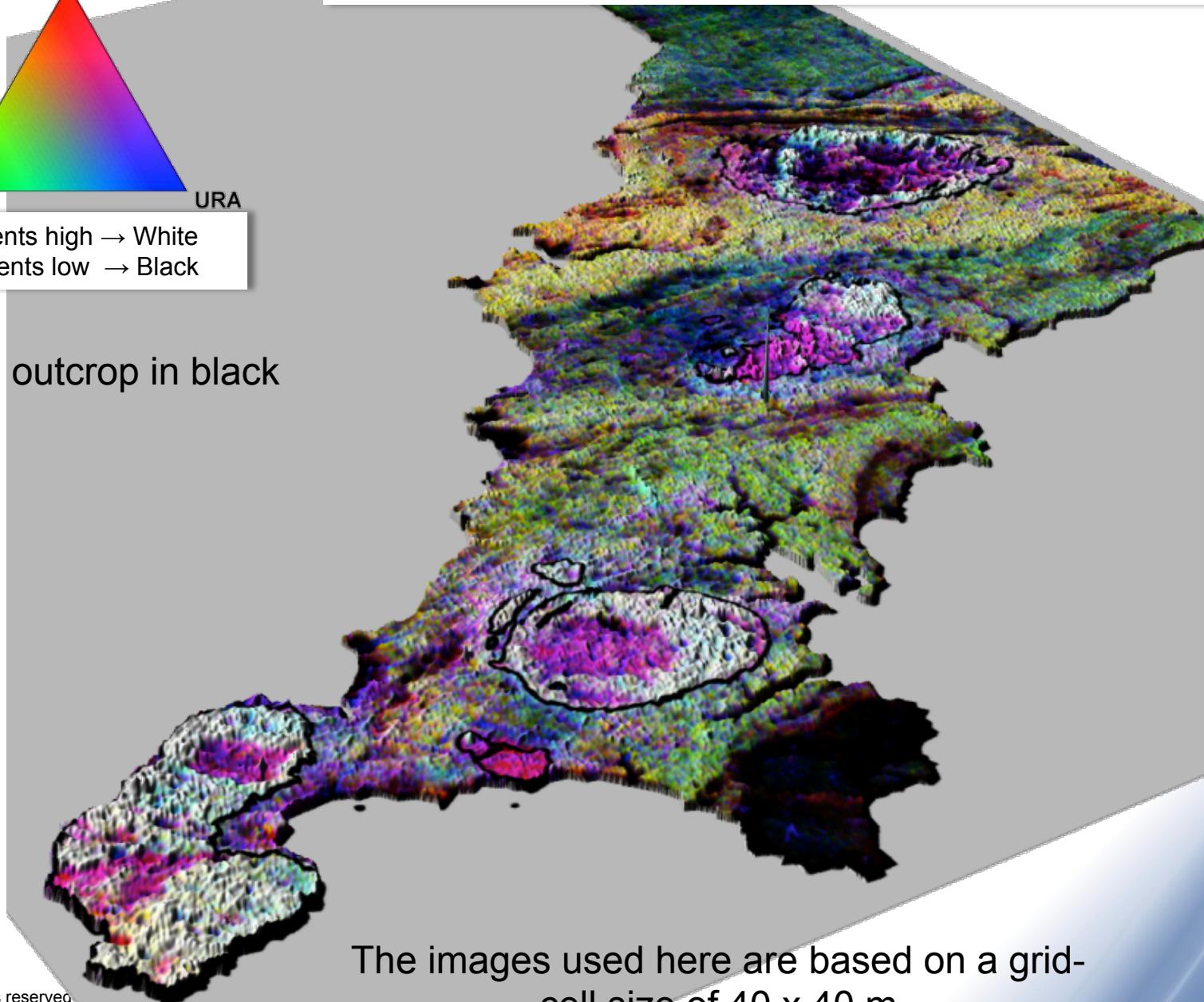
MAG sampling ~3.5 m along line

Radiometric Ternary image across the SW

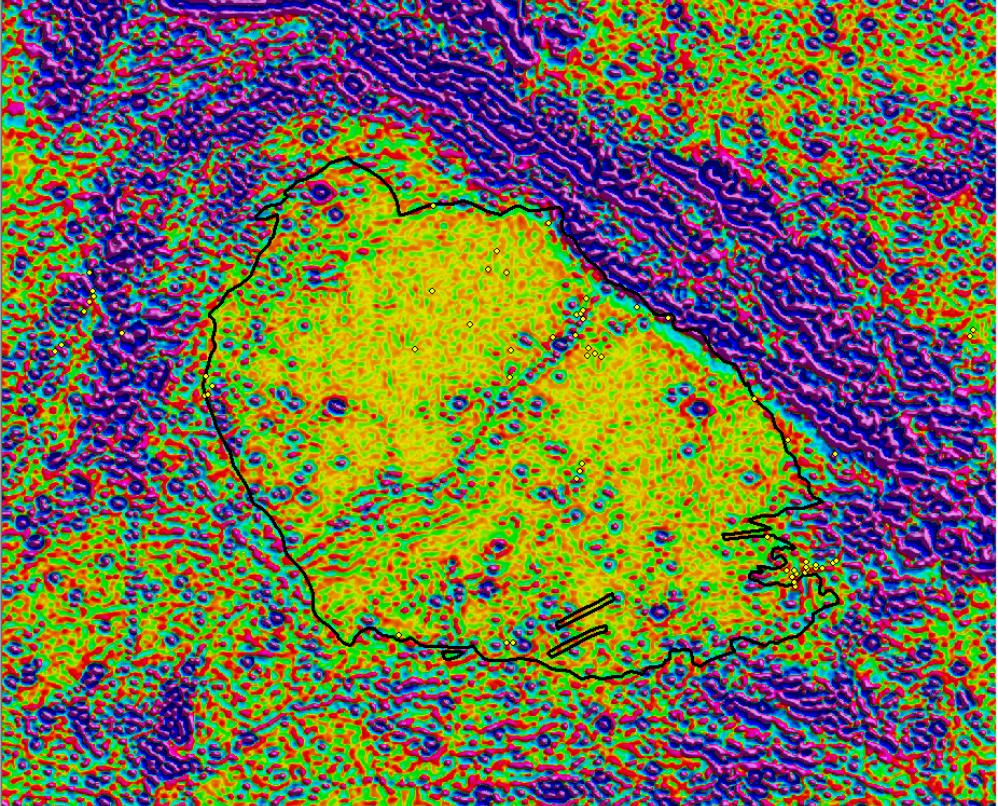
Amplitudes are Total Count



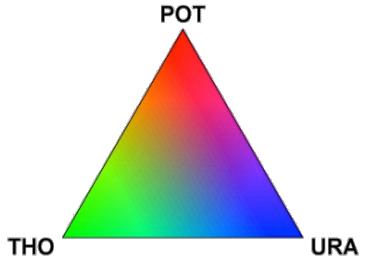
Granite outcrop in black



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



Radiometric Ternary Image

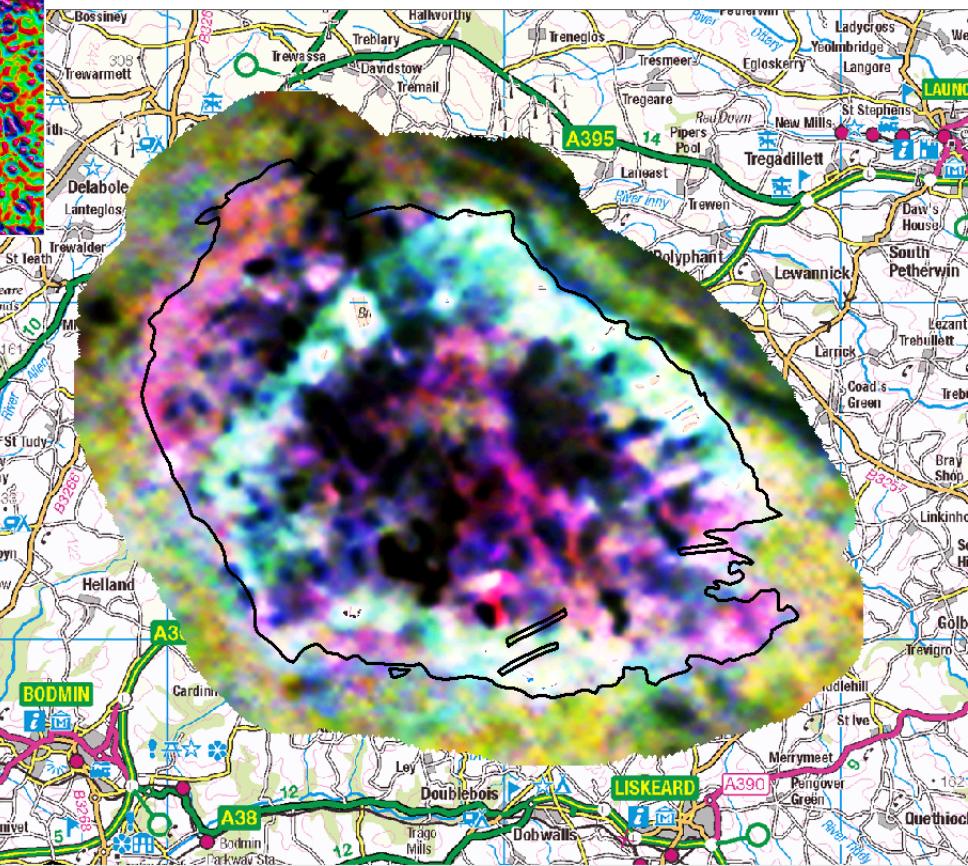


We see the radiochemical architecture of the granite. Which is distinct from the country-rock

Detail across the Bodmin Granite

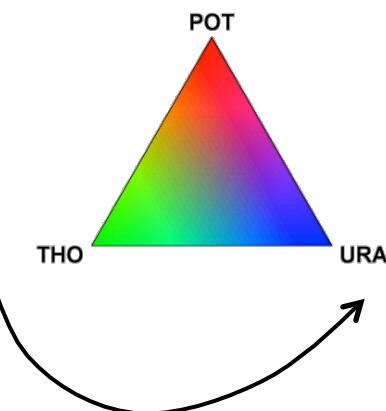
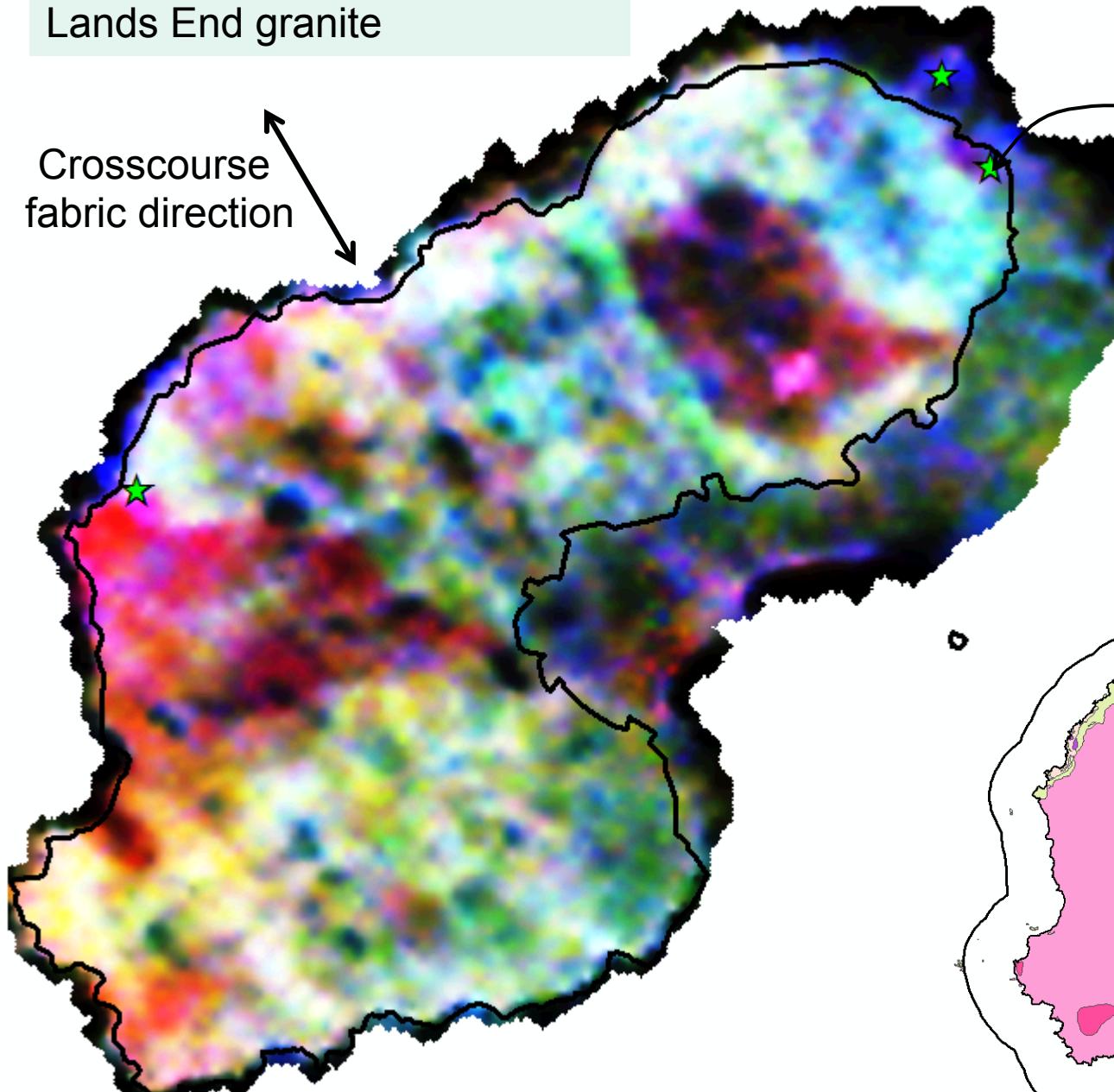
Processed Magnetic Data

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

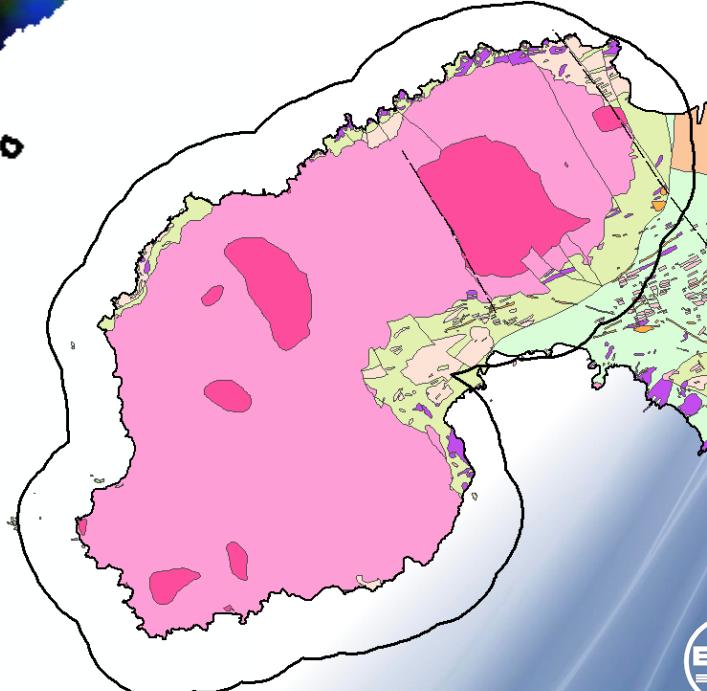


Radiometric Ternary Image Lands End granite

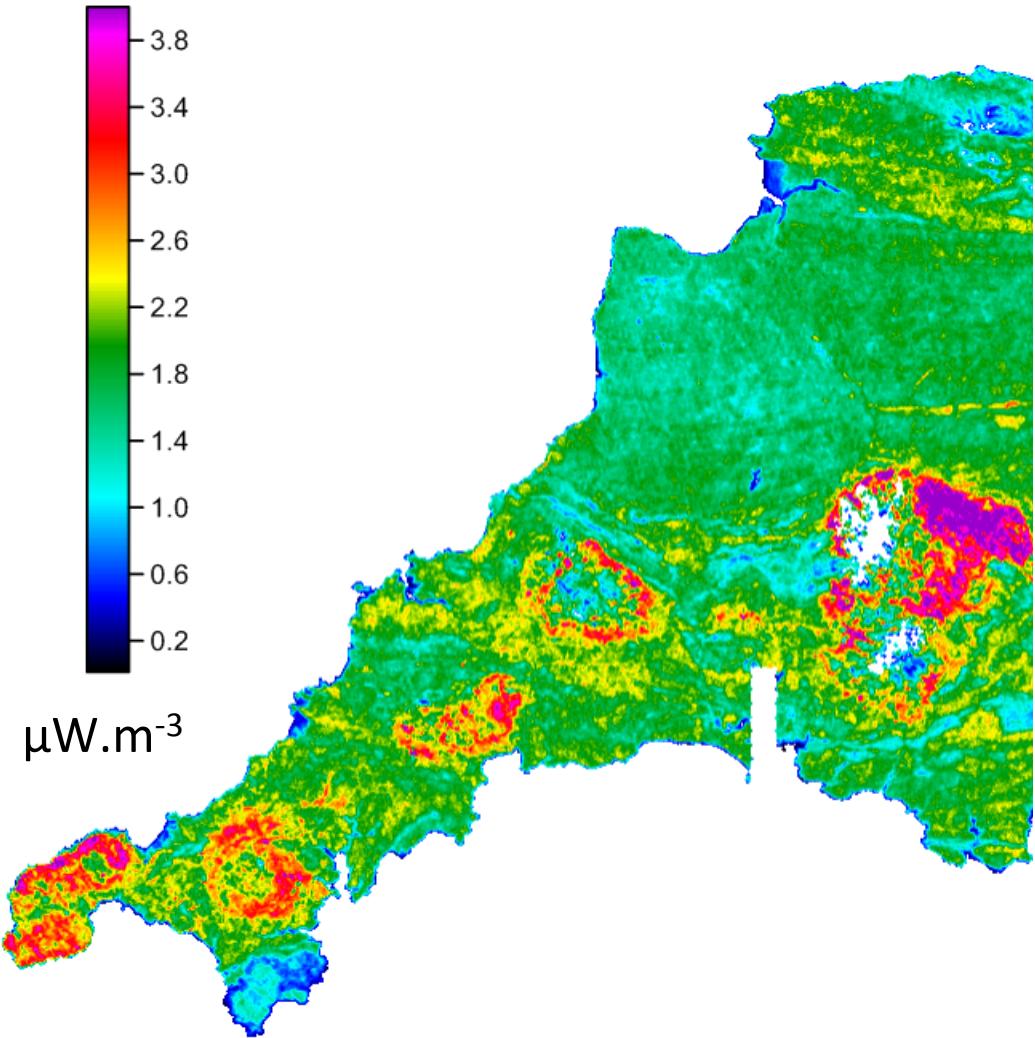
Crosscourse
fabric direction



1:50k bedrock map



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

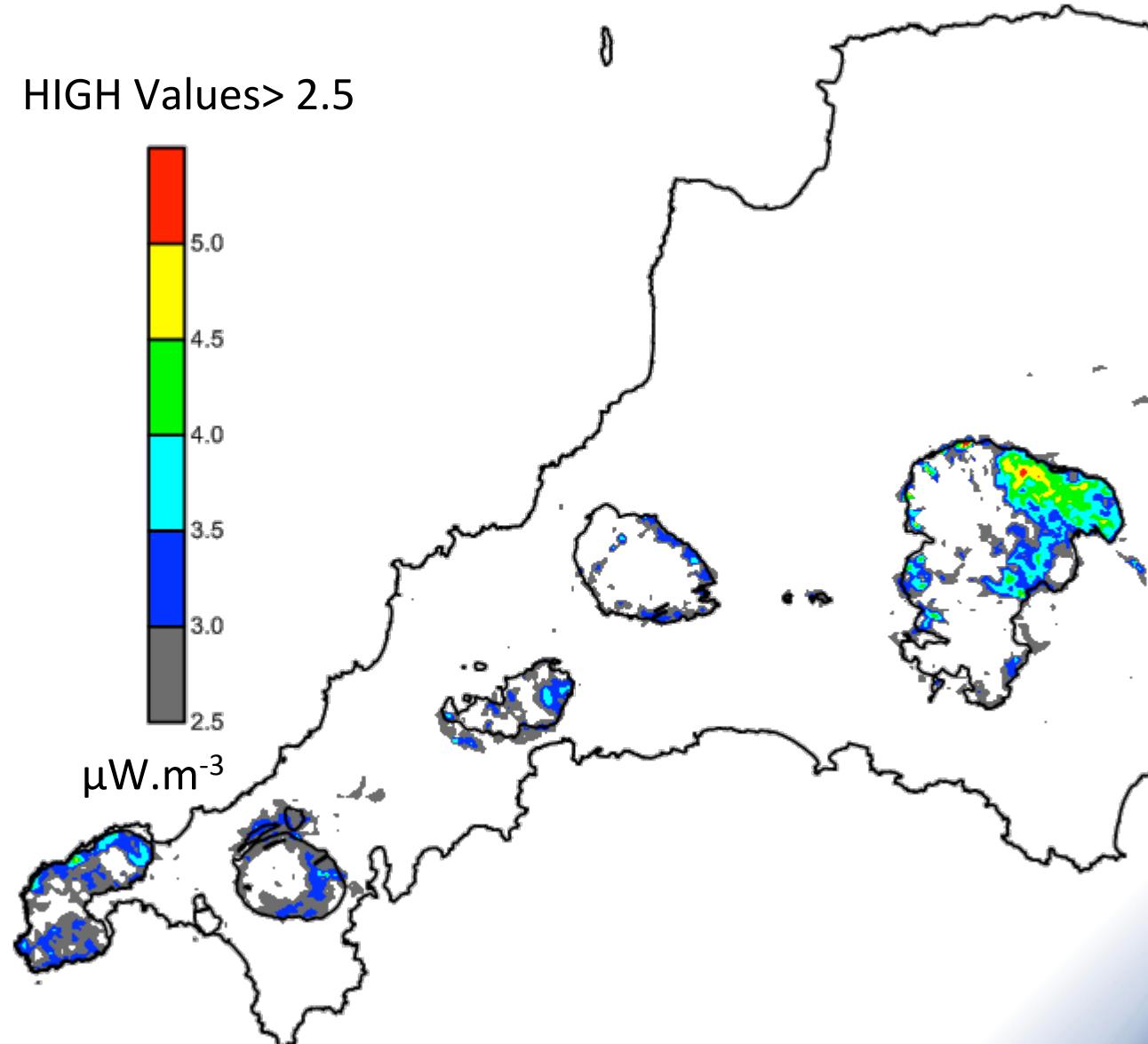


The procedure is based on a ‘parent-material’ (bedrock) principle and the estimates are invariably too low.

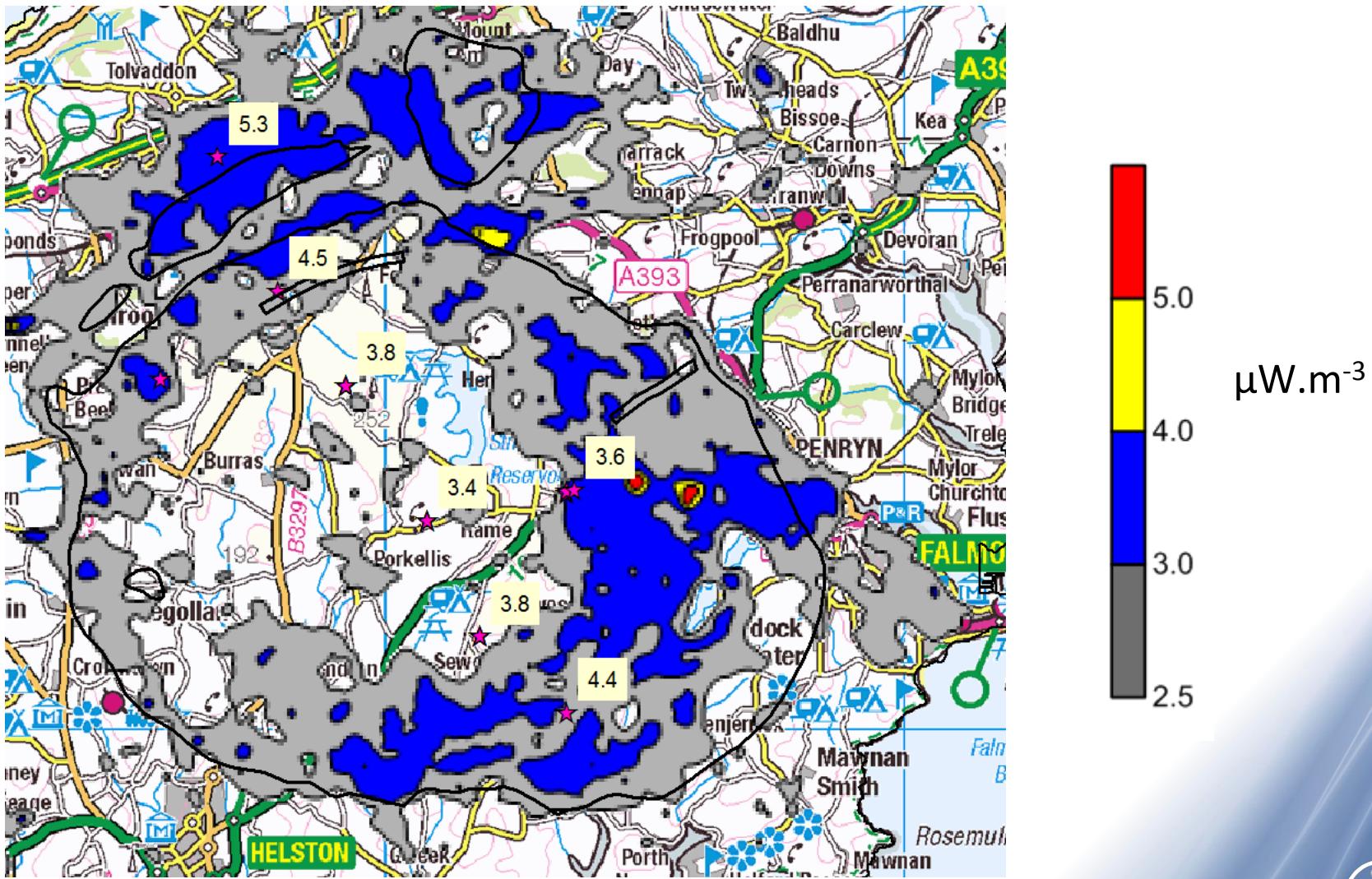
We can perform (as here) a calibration to improve the ‘bedrock-equivalent’ concentrations.

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

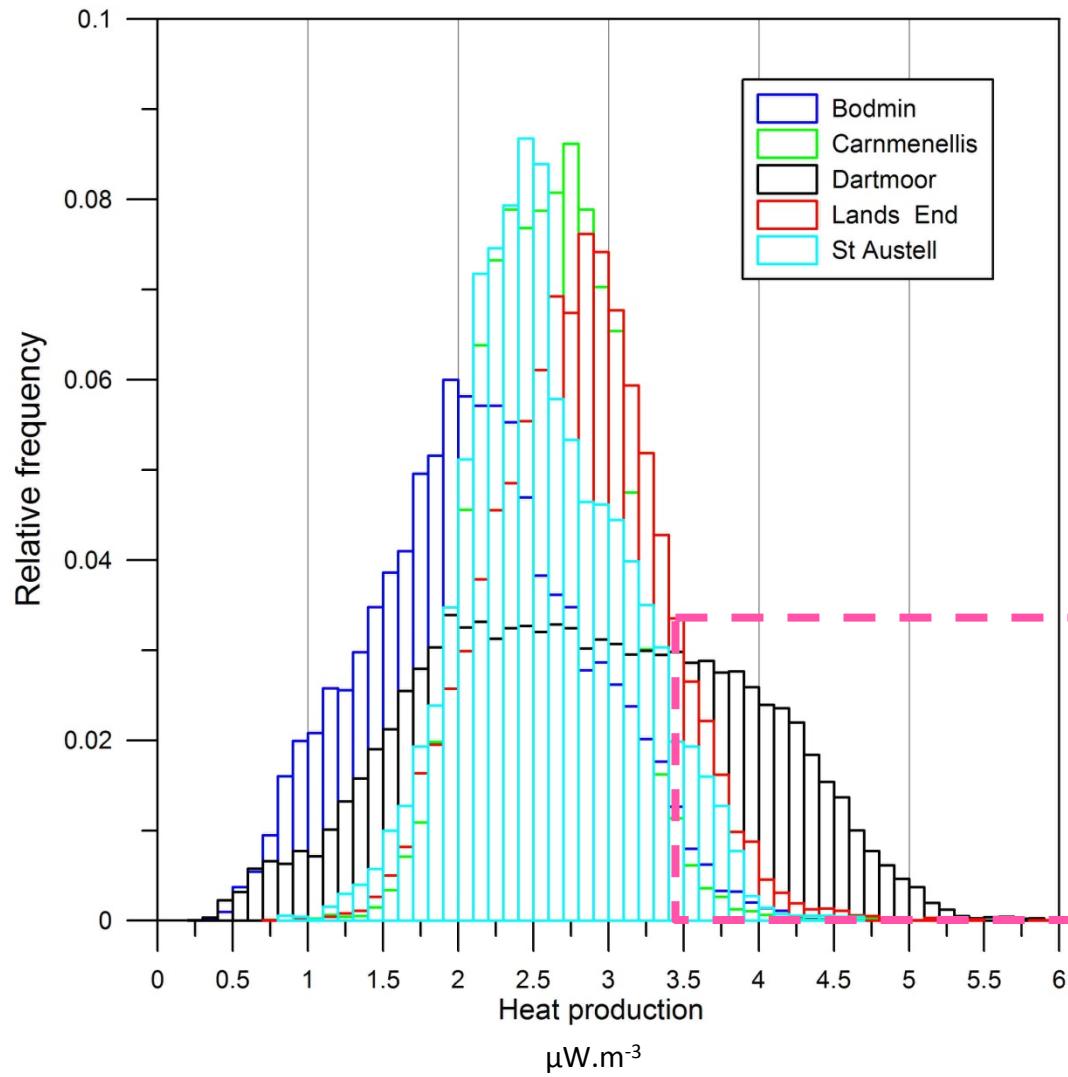
The high-values of heat production are largely, but not exclusively, confined to the 'edges + halos' of the granite outcrops



Comparison of radiometric and borehole estimates of heat production. Carnmenellis granite 6 locations

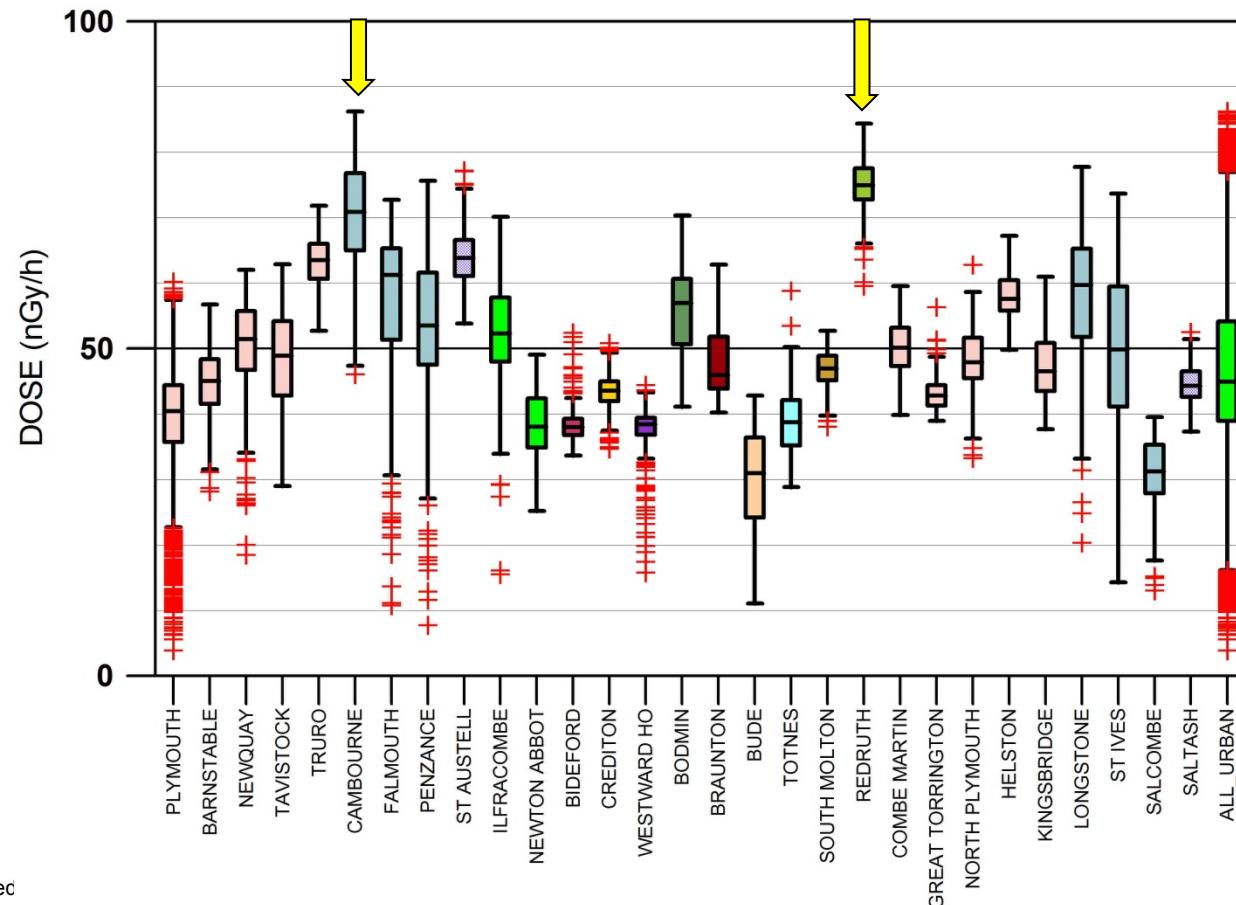


Summary of heat production across 5 granite outcrops



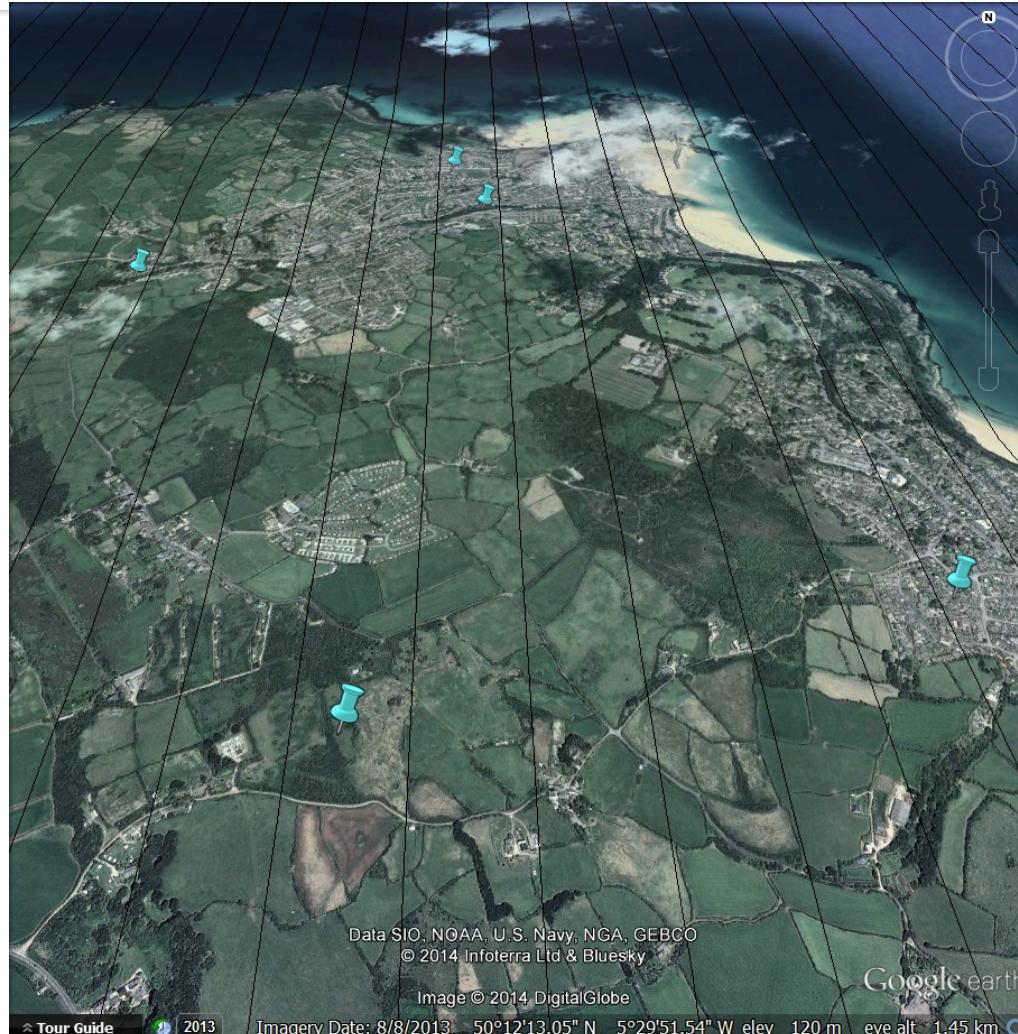
Heat production at the district/urban scale

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



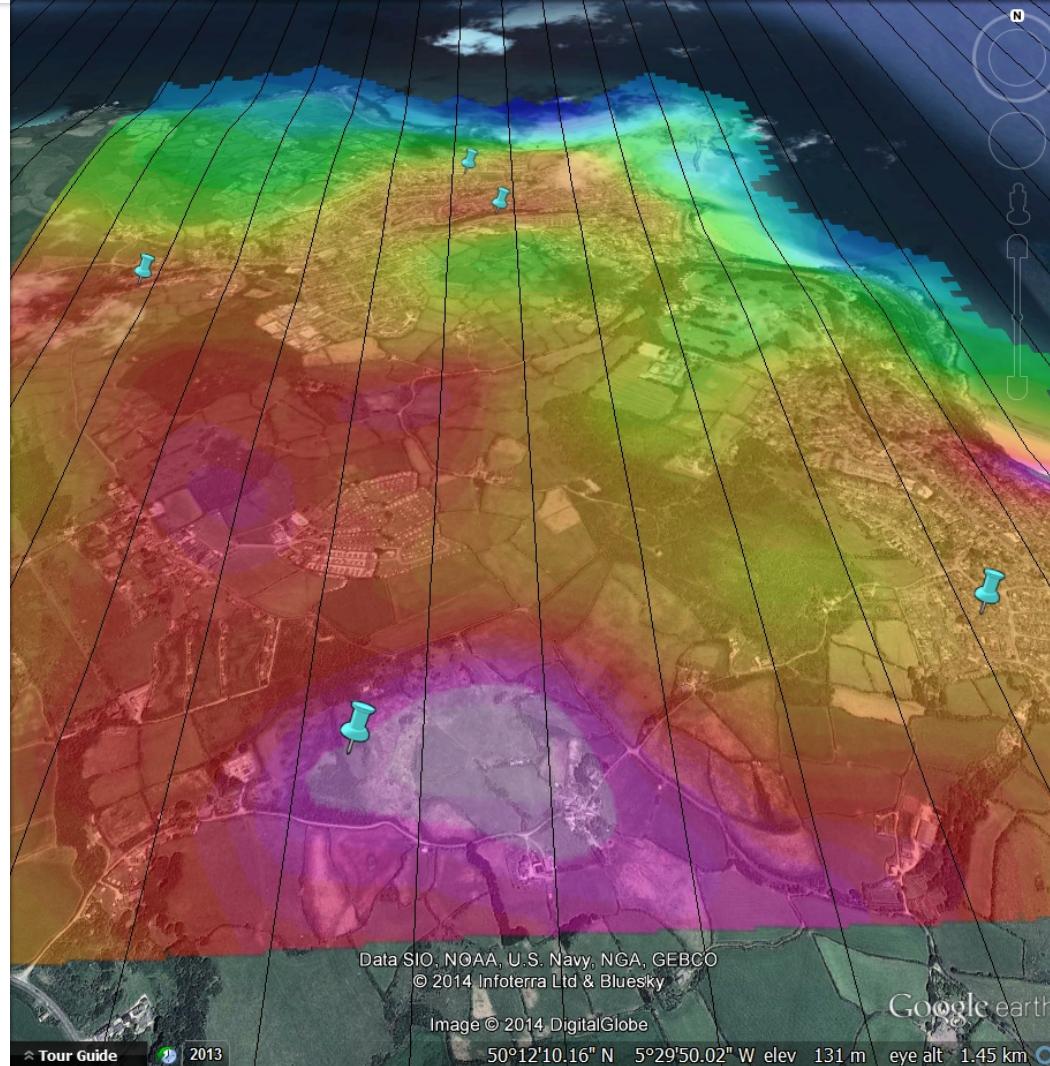
Heat production in the vicinity of population centres : St Ives

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.



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

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

The TellusSW project web page is
<http://www.tellusgb.ac.uk/>
As below



