

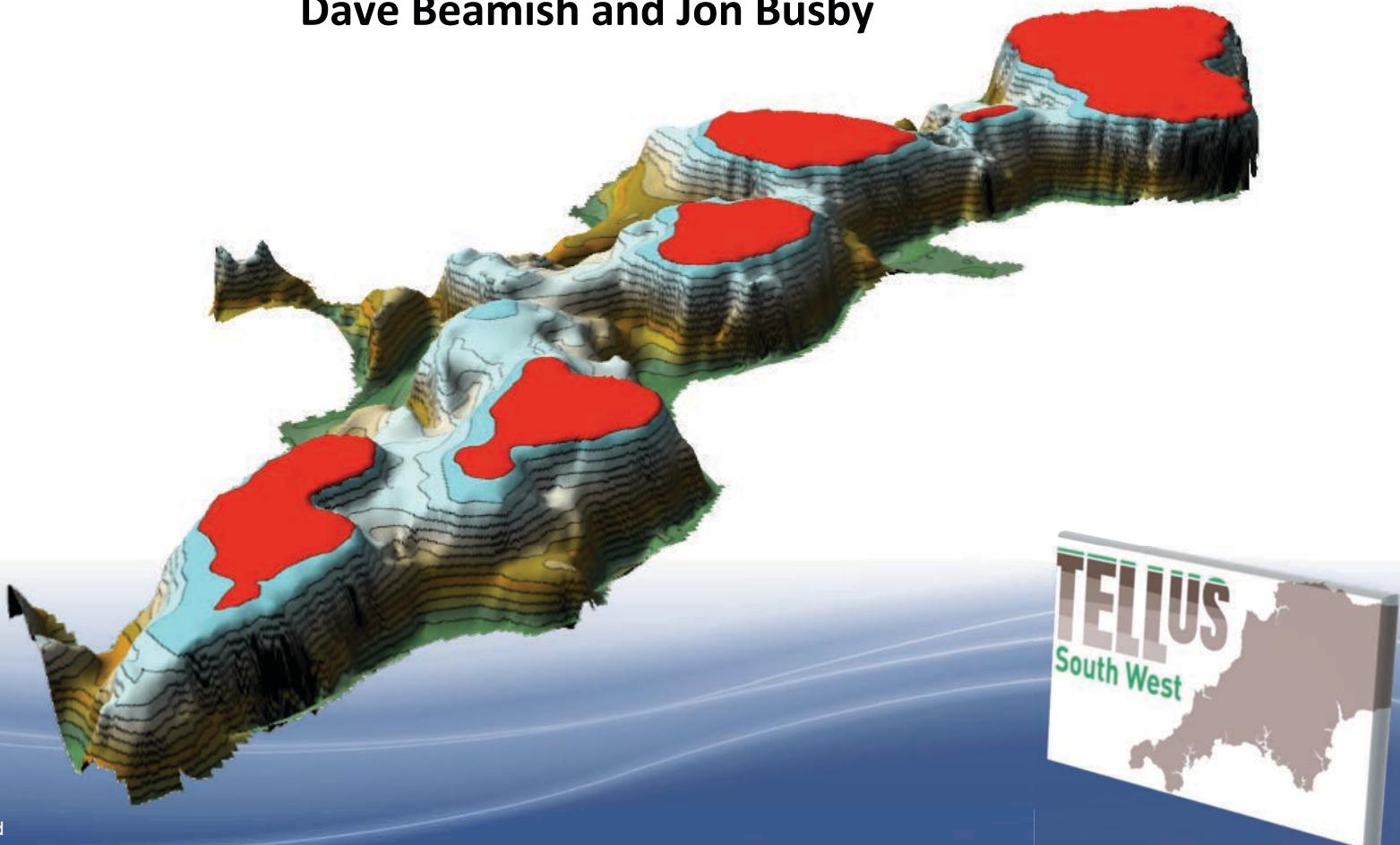


British  
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NATIONAL ENVIRONMENT RESEARCH COUNCIL

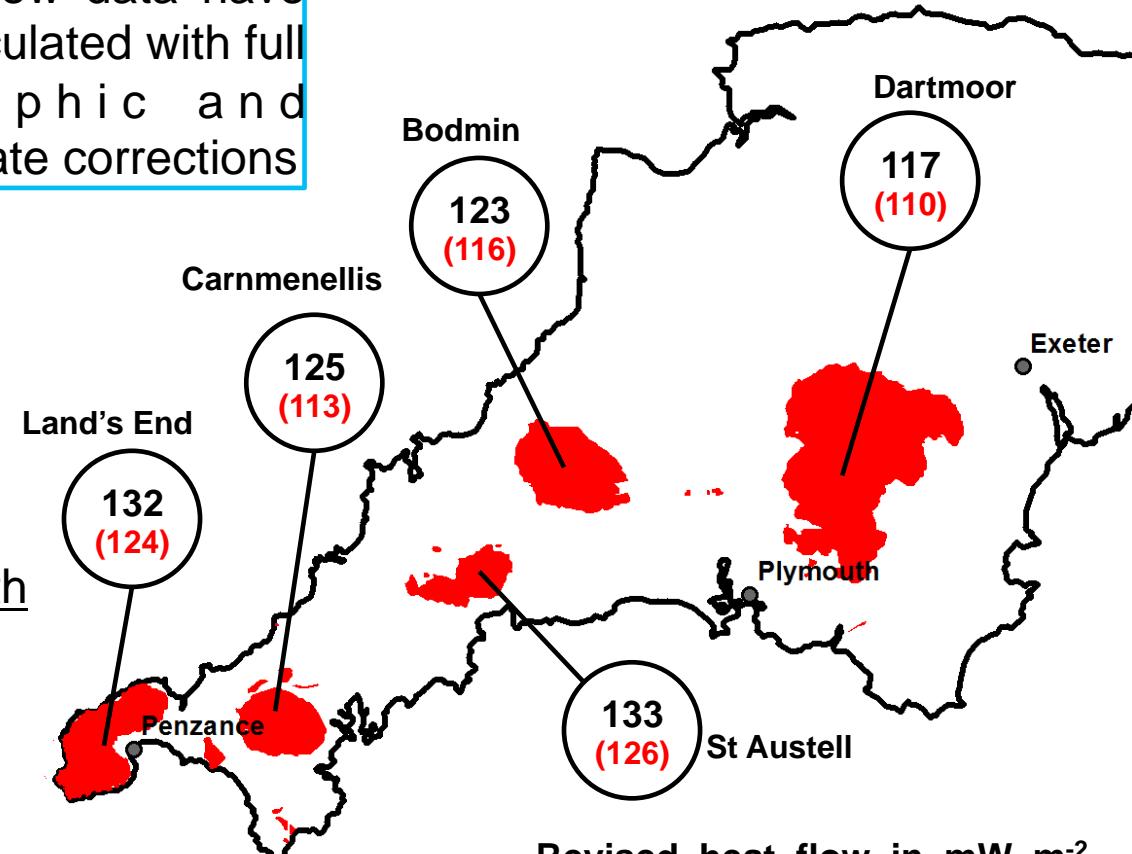
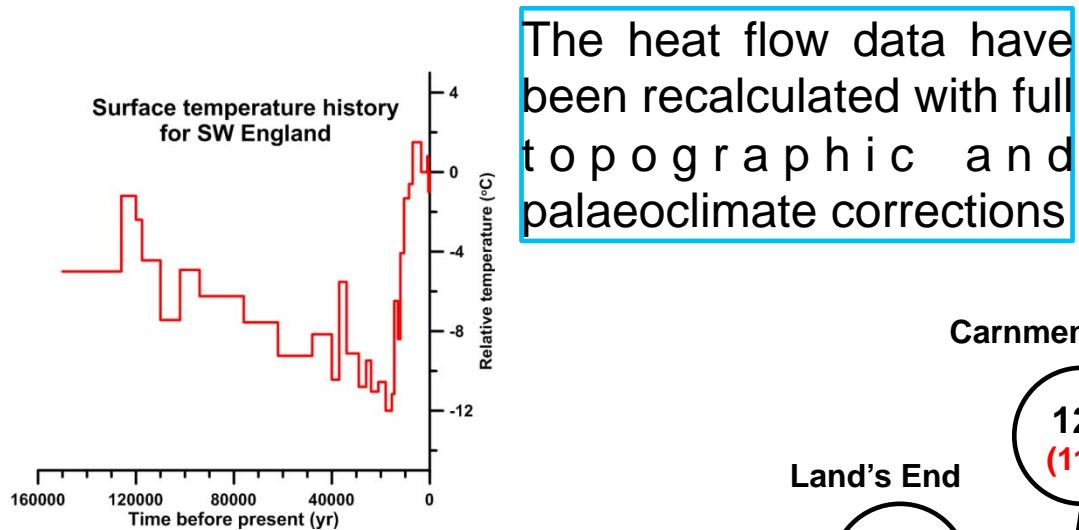
# Gateway to the Earth

## 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



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

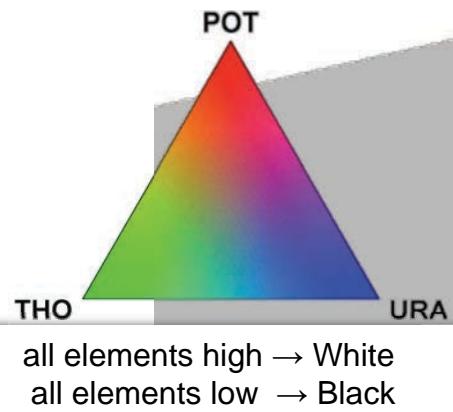
- Magnetics (MAG)– almost entirely bedrock focused (structural/minerals/petrographic). > **17 M data samples**
  - Radiometrics (RAD)– much more diverse: connects bedrock, superficials and soils. > **855 k data samples**

## RAD sampling ~70 m along line

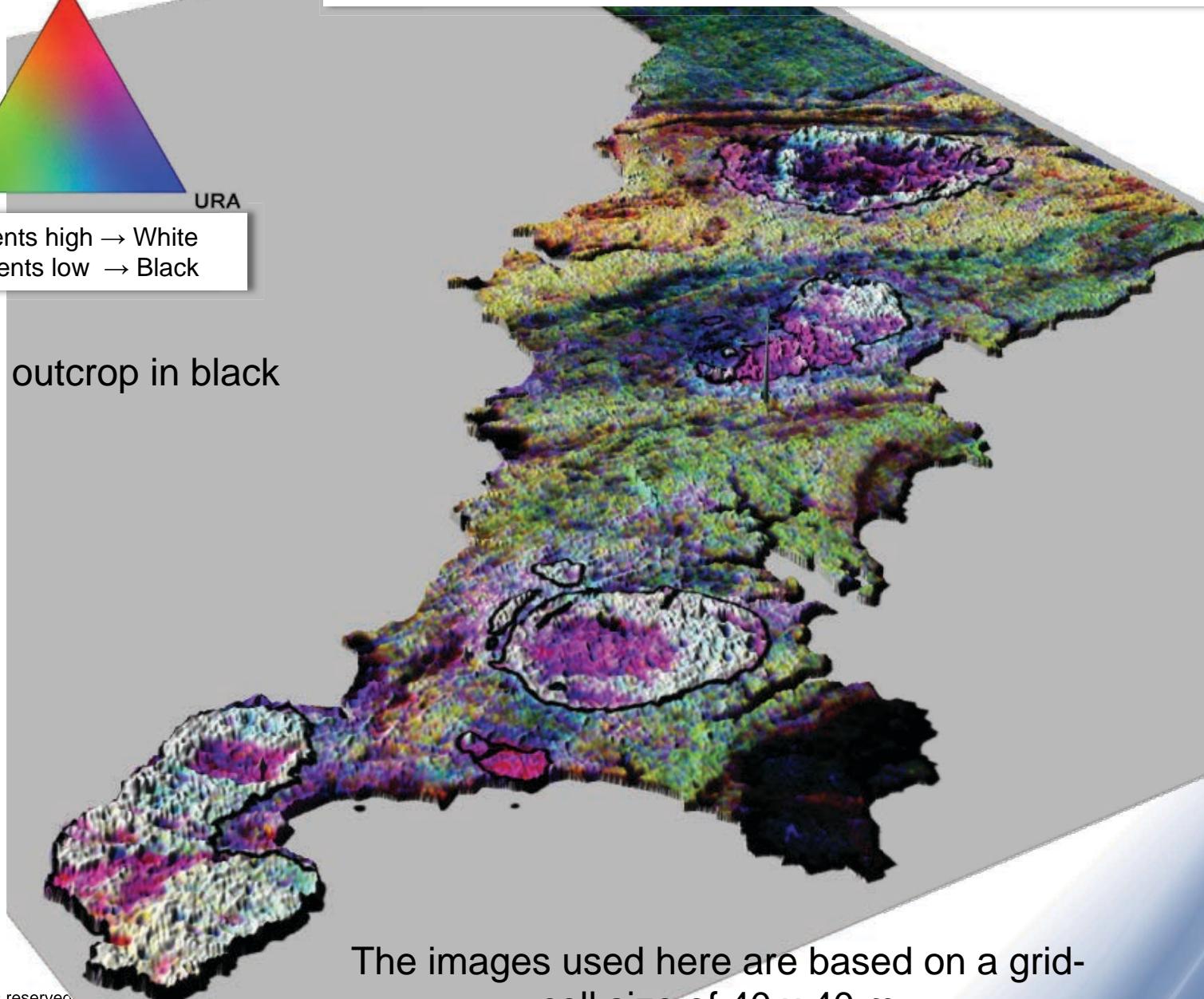
MAG sampling ~3.5 m along line

# Radiometric Ternary image across the SW

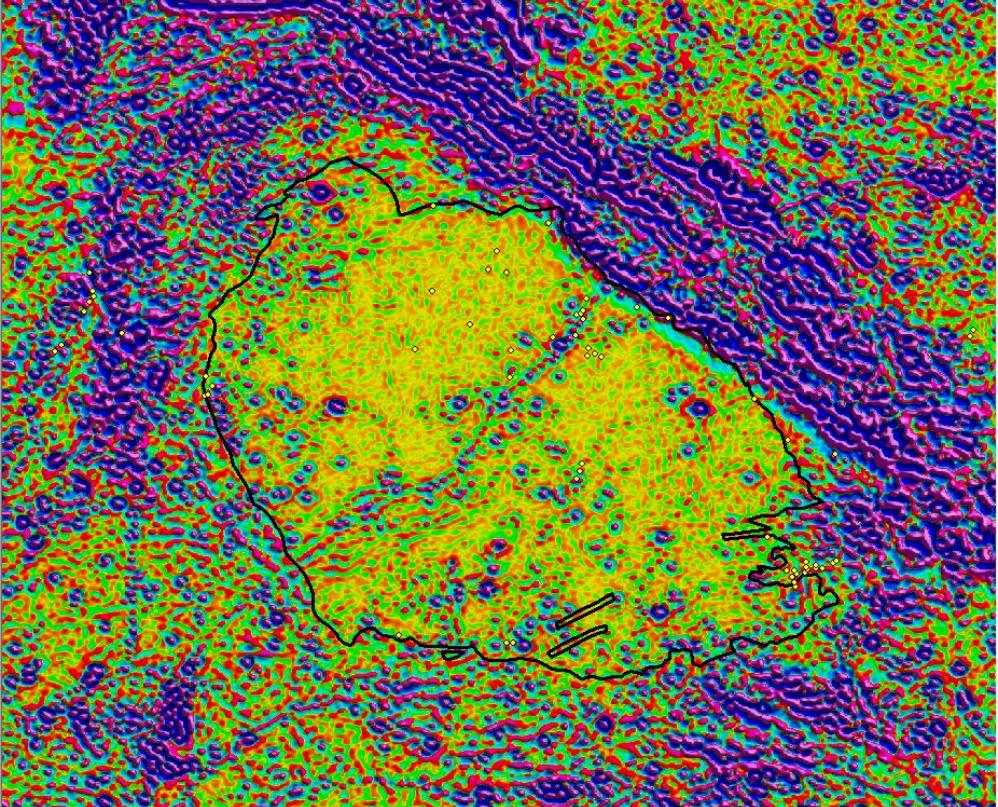
Amplitudes are Total Count



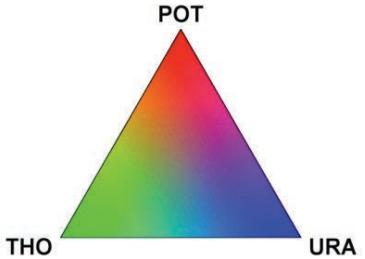
Granite outcrop in black



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



Radiometric Ternary Image

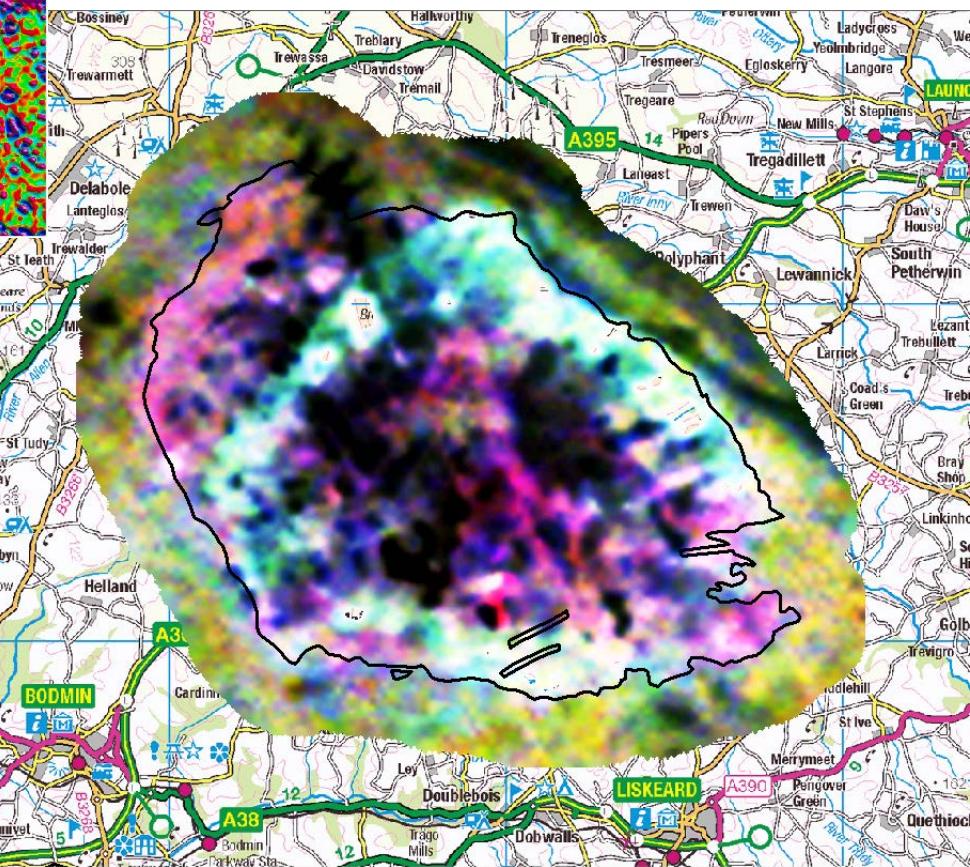


We see the radiochemical architecture of the granite. Which is distinct from the country-rock

## Detail across the Bodmin Granite

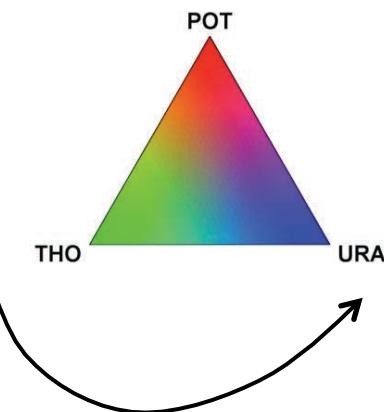
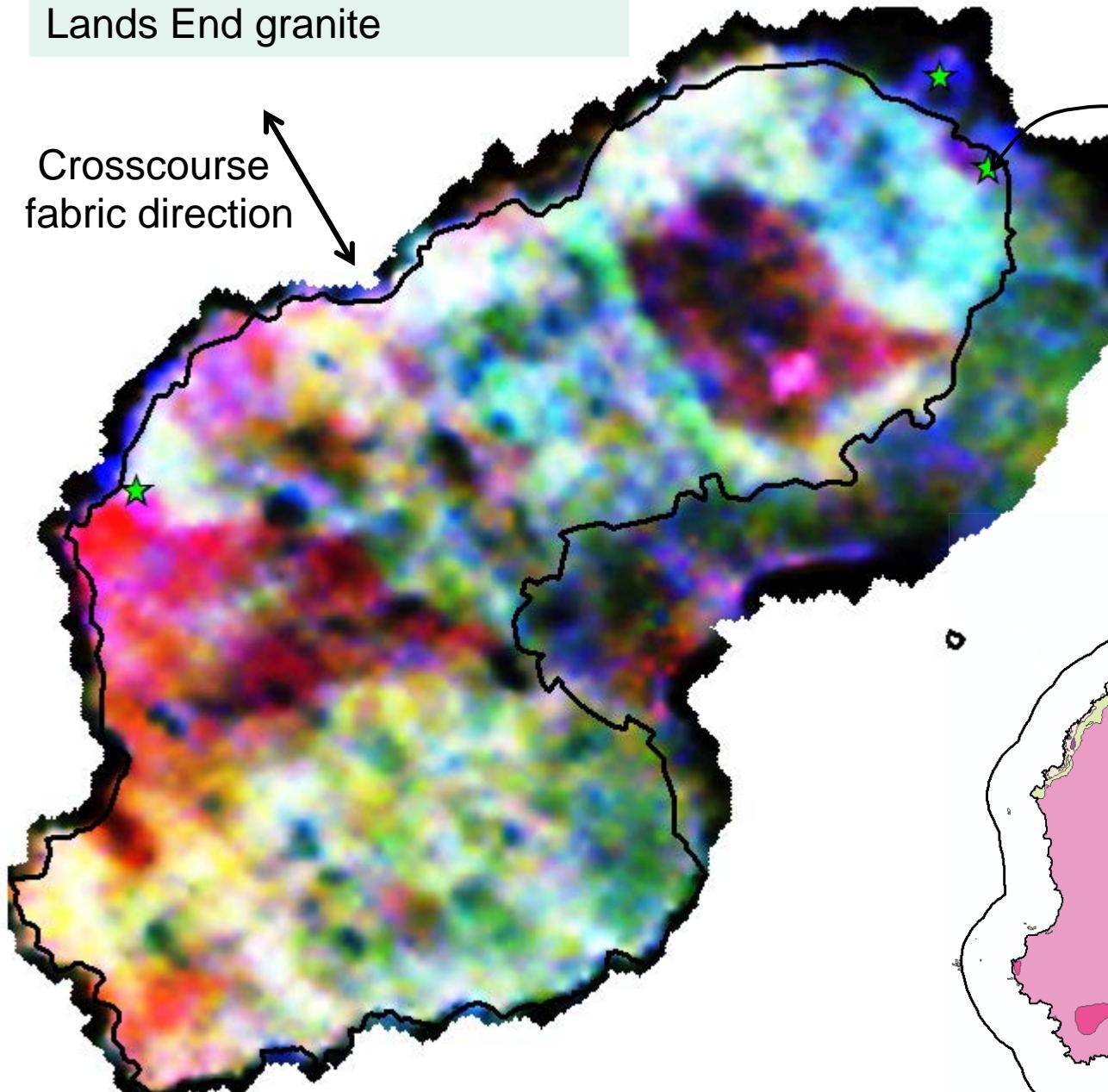
### Processed Magnetic Data

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

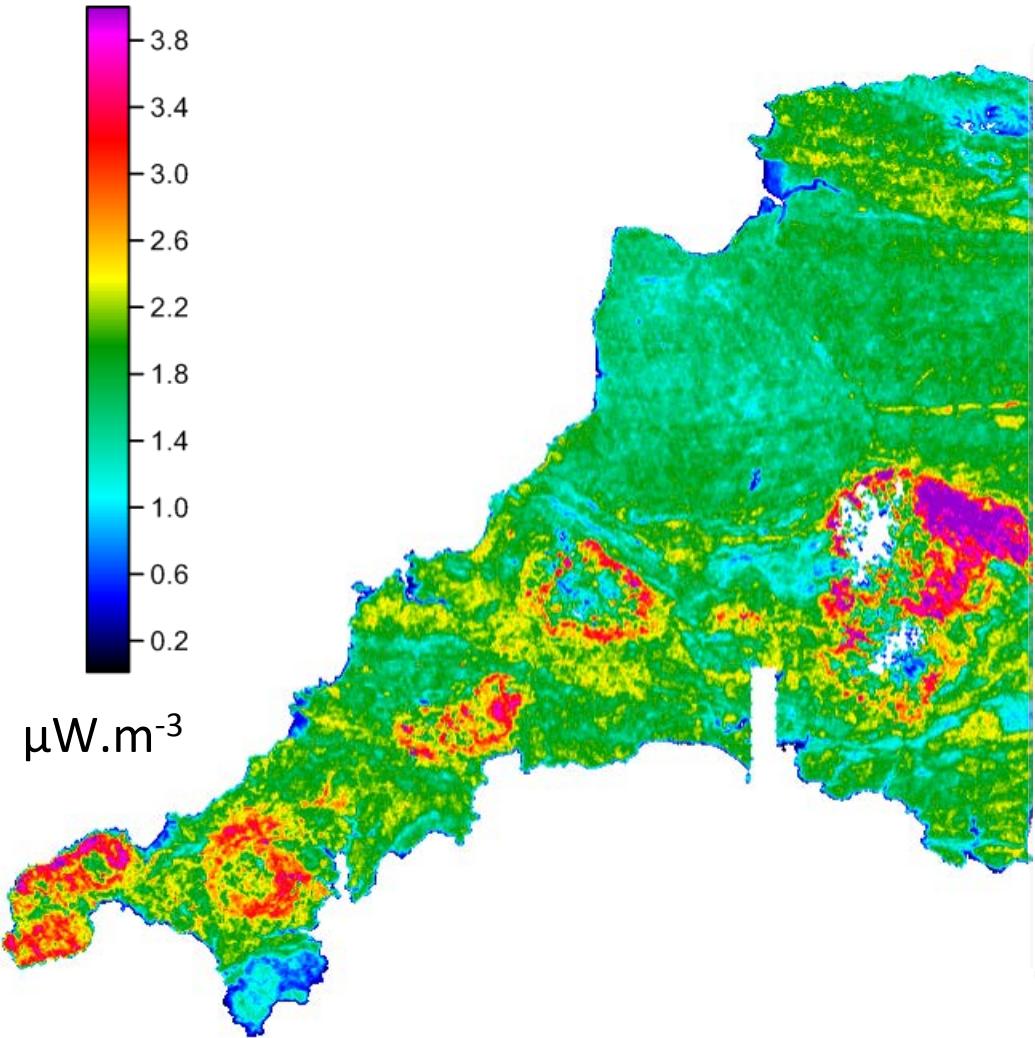
Crosscourse  
fabric direction



1:50k bedrock map



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

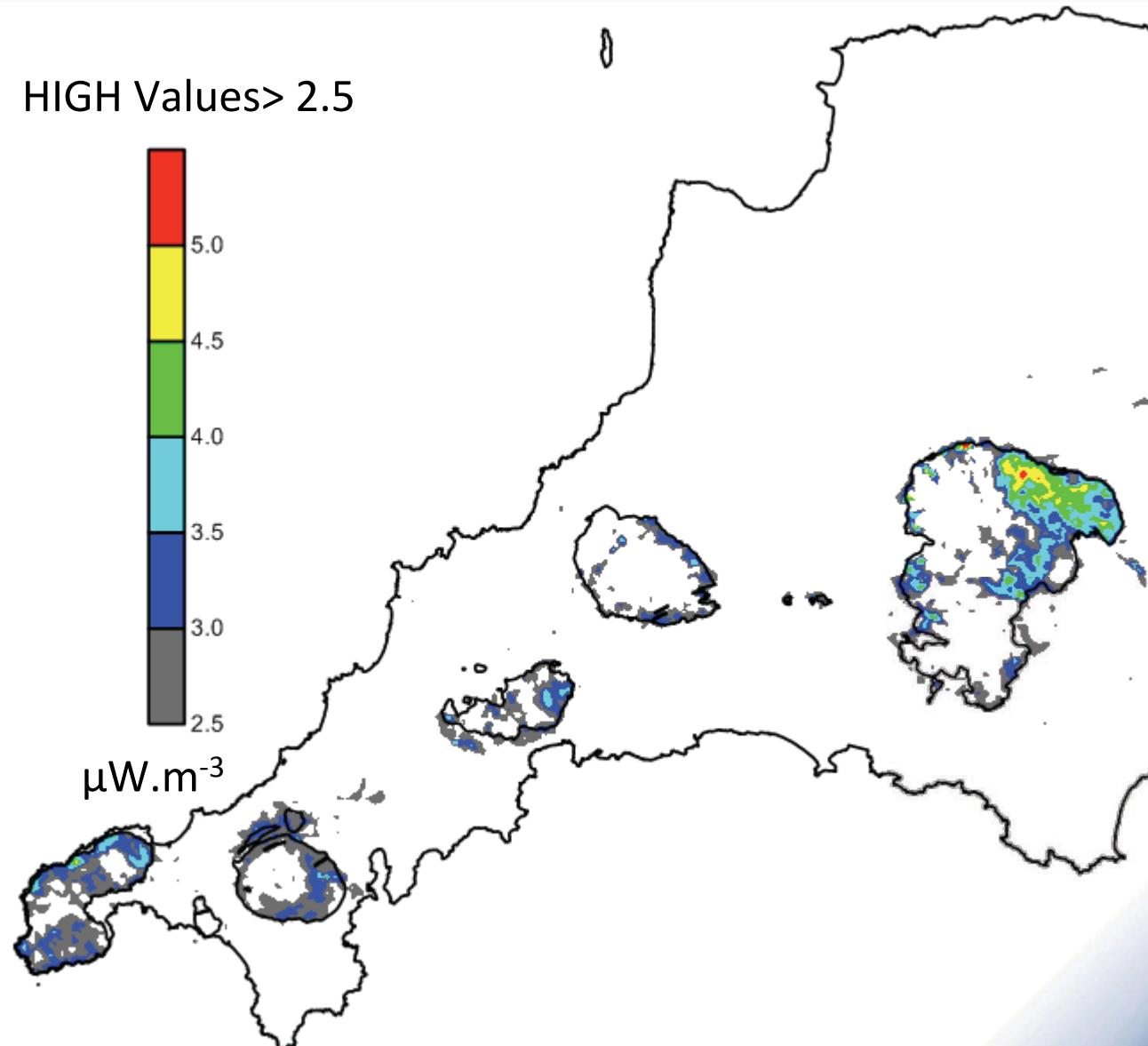


The procedure is based on a 'parent-material' (bedrock) principle and the estimates are invariably too low.

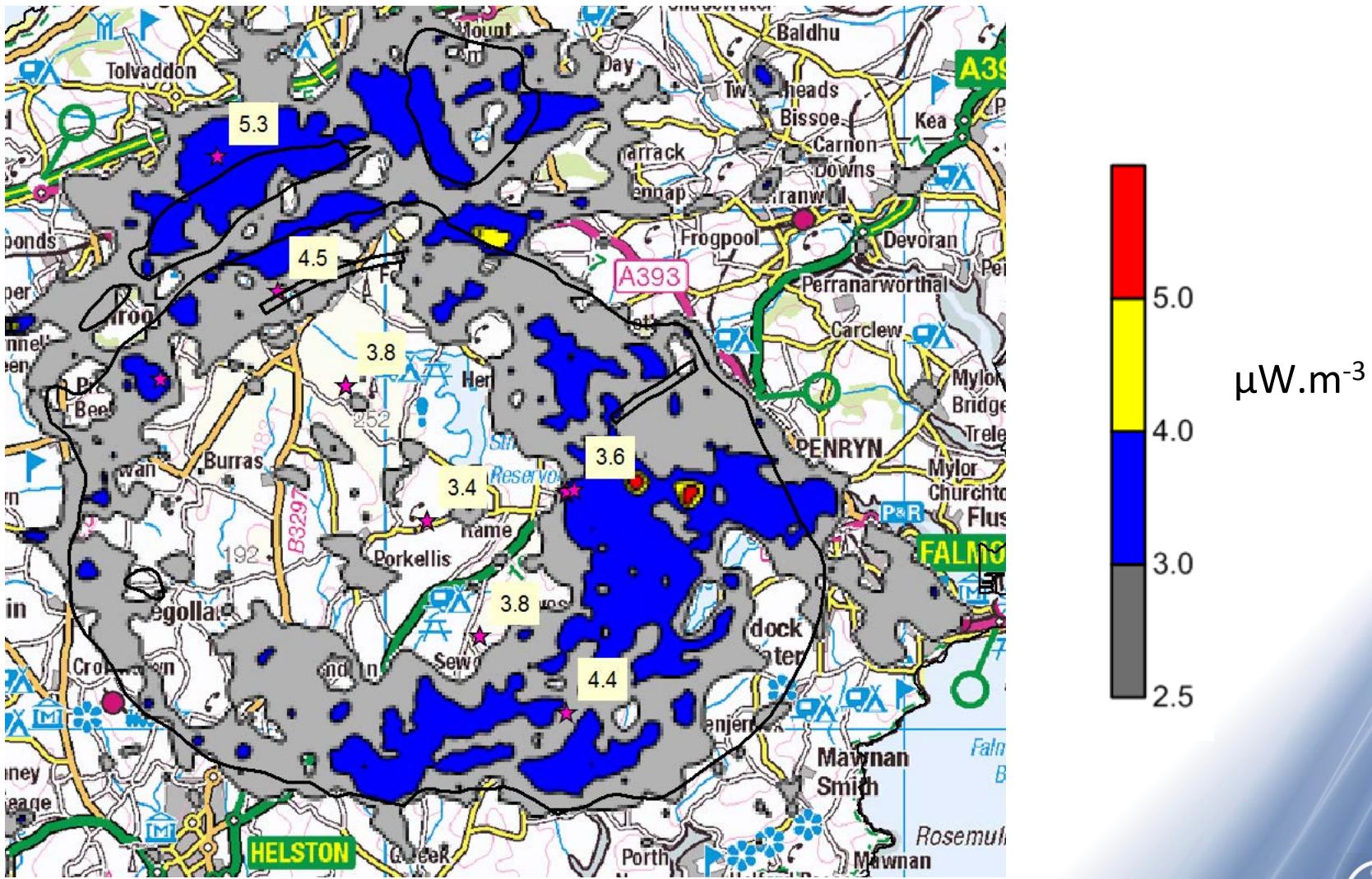
We can perform (as here) a calibration to improve the 'bedrock-equivalent' concentrations.

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

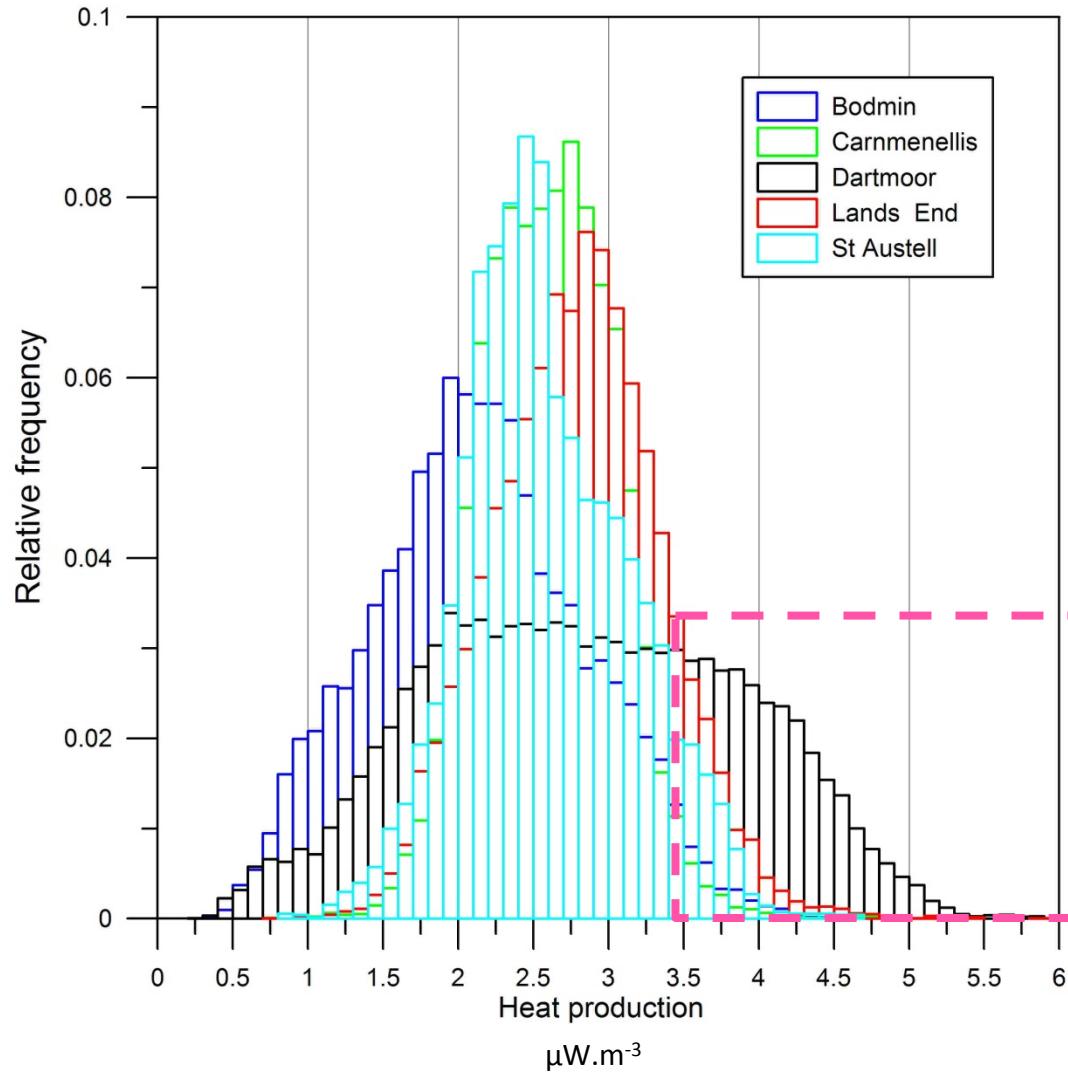
The high-values of heat production are largely, but not exclusively, confined to the 'edges + halos' of the granite outcrops



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

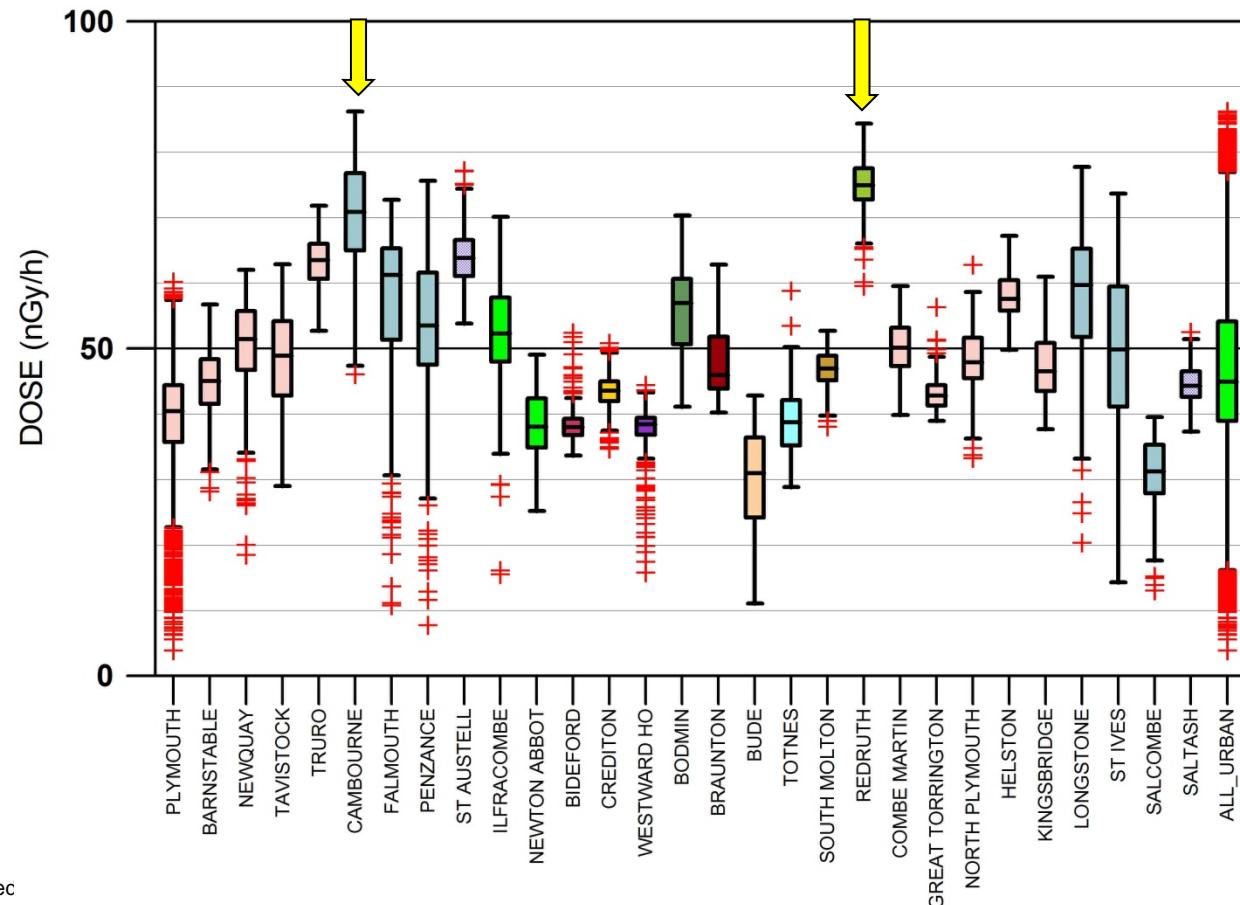


# Summary of heat production across 5 granite outcrops



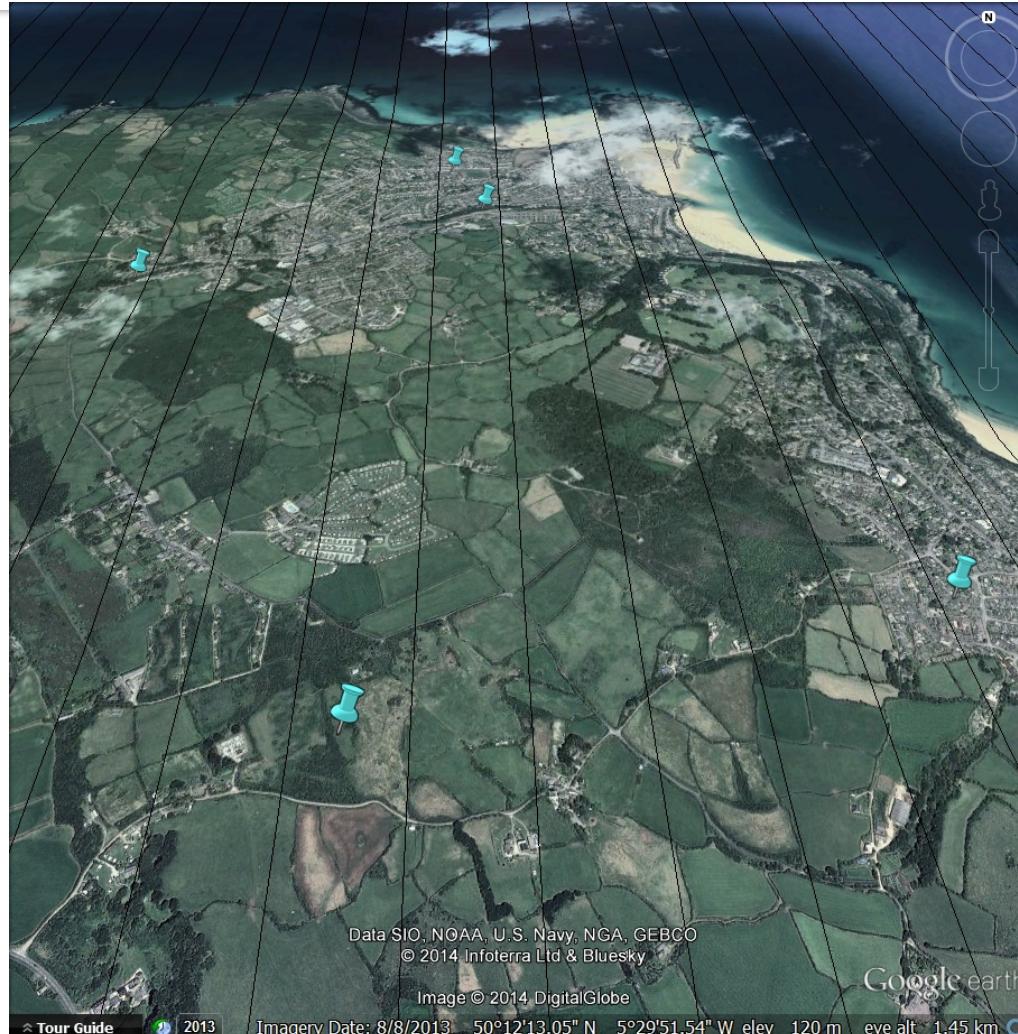
## Heat production at the district/urban scale

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

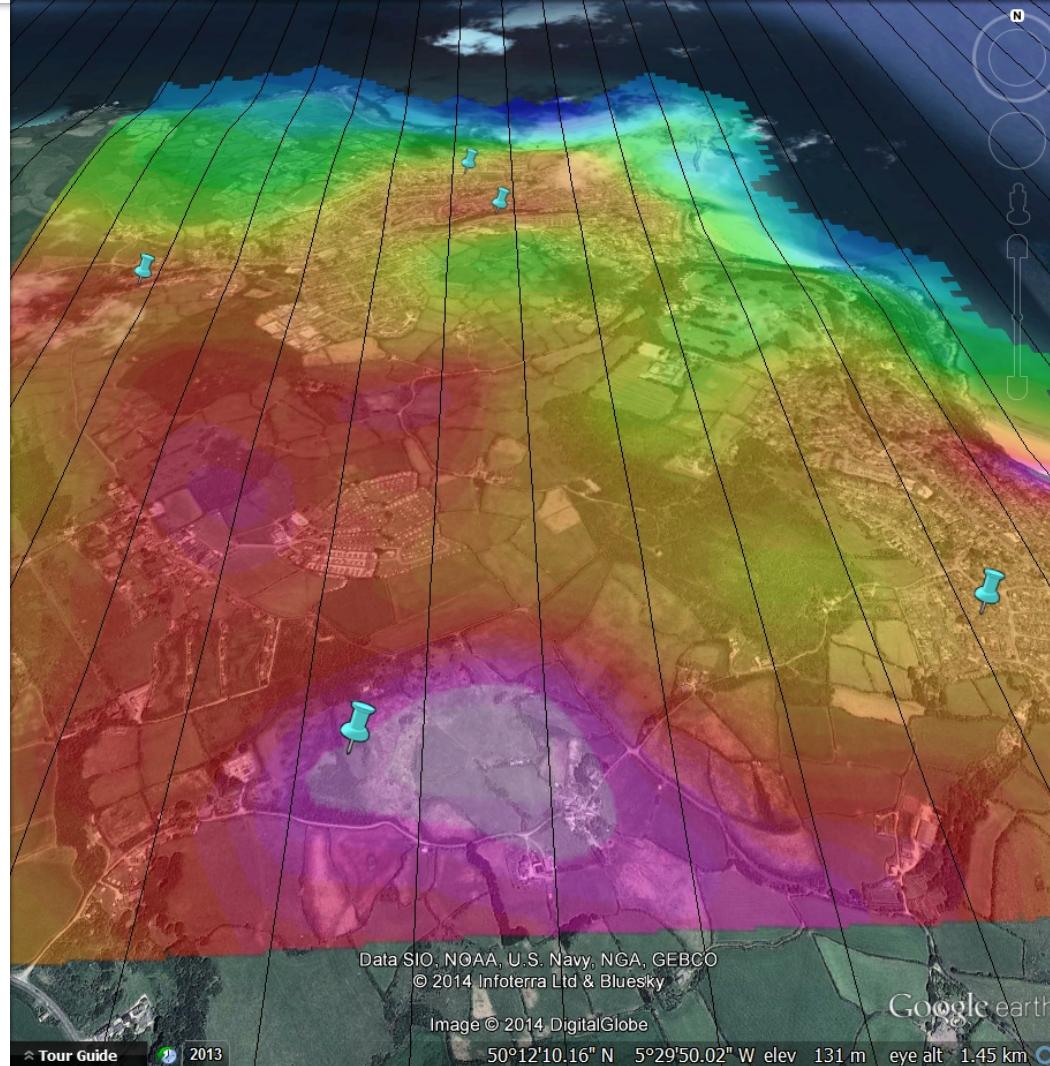
The estimates are provided by N-S survey lines spaced at 200 m. The image shows the survey lines (looking North) across the area of St Ives. The area contains a series of former mineral mines including Wheal Treawith.



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 screenshot shows the Tellus South West Map Viewer interface. At the top left is the 'TELLUS® SOUTH WEST' logo and 'Map Viewer' text. Below is a search bar and a note: 'Choose where you would like to investigate by navigating the map, or searching for a location below.' A 'Map Layers' section allows users to click plus buttons to add layers to the map. The main area shows a map of the Southwest of England with roads and place names like Exeter, Tiverton, and Torbay. To the left is a sidebar titled 'Available Layers' under 'BGS' and 'Ordnance Survey'. Under 'BGS', there are numerous layers such as 'TellusSW Magnetic: TMI AS (SW only)', 'TellusSW Magnetic: TMI IGRF (SW only)', 'TellusSW Magnetic: TMI HGM (SW only)', etc. Under 'Ordnance Survey', there are layers like 'OS Terrain 50 aspect', 'OS Terrain 50 curvature', etc. At the bottom of the sidebar is a link 'Click to add/remove map layers'.

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



The screenshot shows the Tellus South West Geophysical Survey website. At the top left is the 'TELLUS South West Geophysical Survey' logo. Below it is a navigation menu with links: Home, News and events, Data, FAQs, Geophysics, Galleries, Why are we doing this survey?, When and where are we surveying?, Conference, About the Tellus South West Geophysical Survey, Video of the 2008 Isle of Wight airborne geophysical survey, TellusBlogs, and Downloads. The main content area features a large image of a red twin-engine aircraft flying over a rocky coastline. To the right is a video player showing a woman speaking. Below the video is a smaller image of a person working on a survey site. The 'About the Tellus South West Geophysical Survey' section contains text about the survey's purpose, methods, and findings. The 'Video of the 2008 Isle of Wight airborne geophysical survey' section has a play button and a timestamp of 0:00 / 14:30. The 'TellusBlogs' section has a link to 'Tellus – The Questions by Andy Howard'. The 'Downloads' section has a link to 'Tellus South West fact sheet'. The bottom right corner features the British Geological Survey (BGS) logo.

