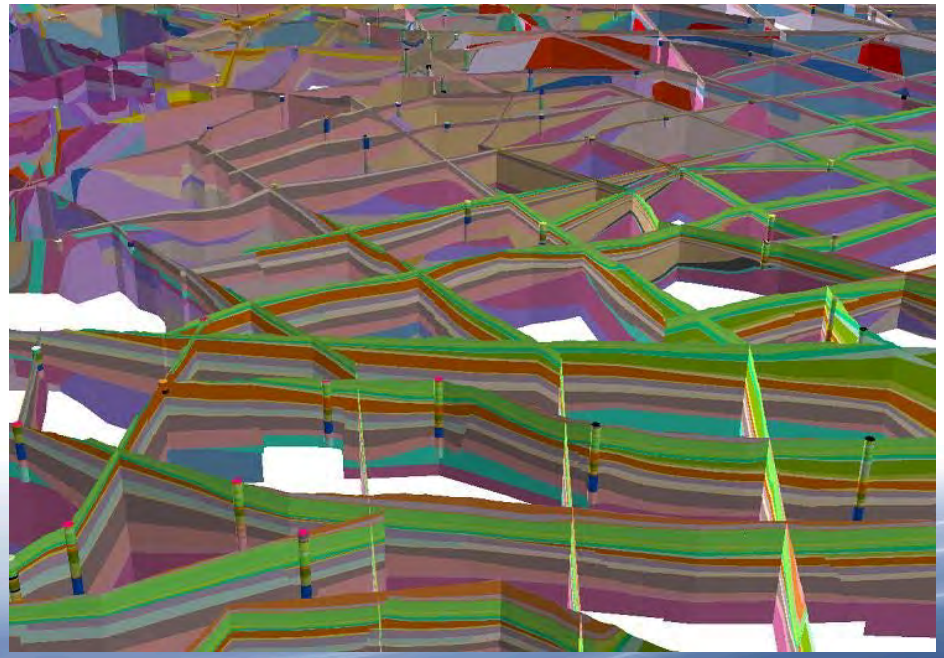
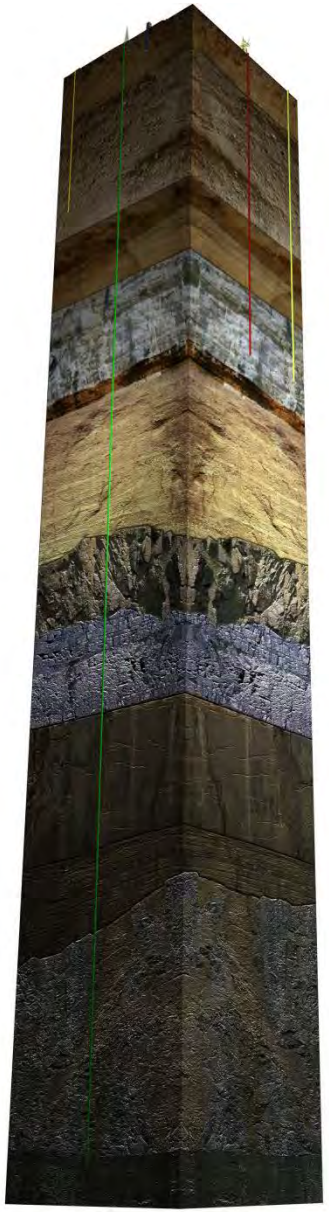
British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Gateway to the Earth

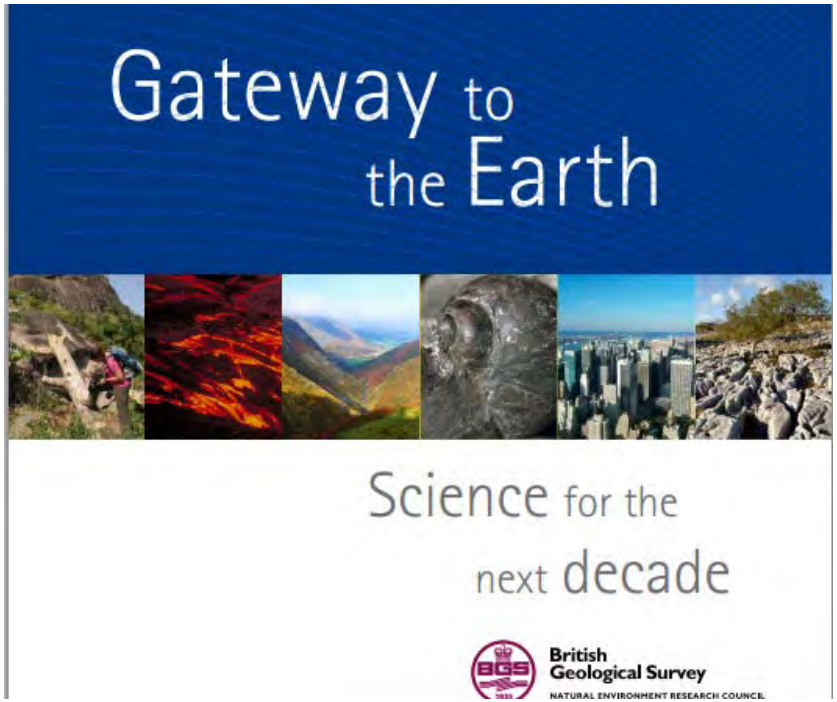
The National Geological Model

Steve Mathers and Rachel Dearden





New BGS Strategy 2014



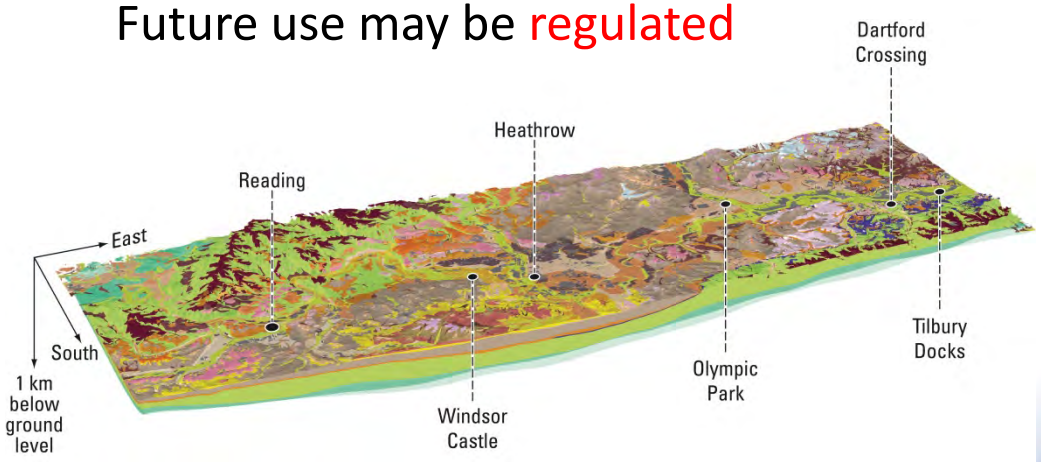
'In the next decade BGS will research the science of subsurface flows and interactions between flows and the solid rock matrix, **at time scales consistent with human usage of the subsurface'**

First we need to understand the geological framework within which these processes operate

Urban observatories

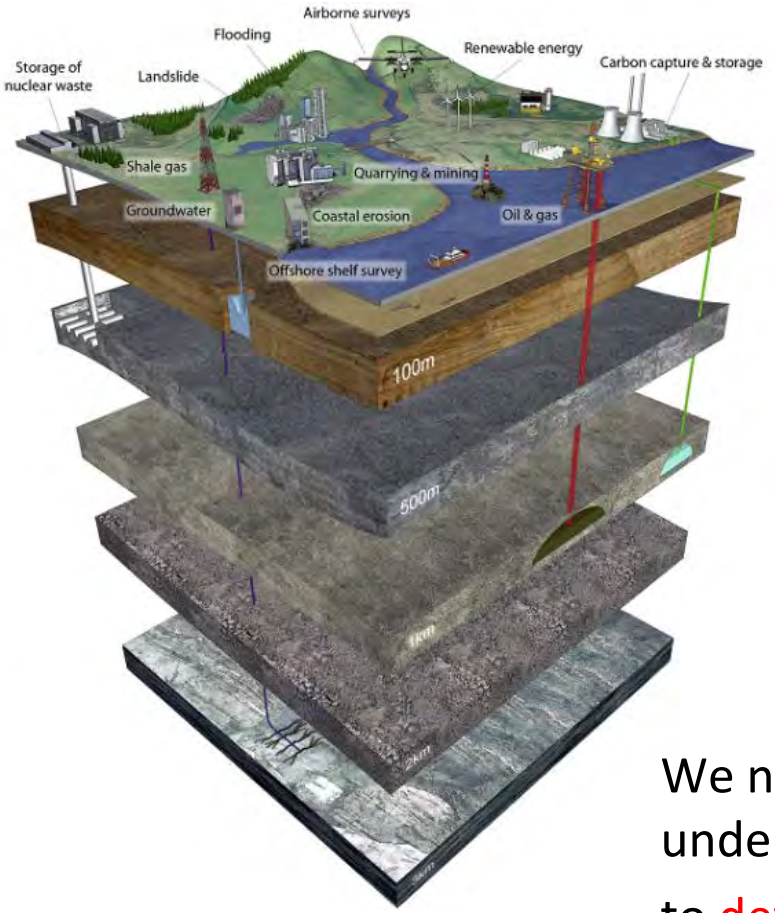
With urbanisation comes pressure on space and resources and, increasingly, the underground. So **understanding the subsurface beneath our cities is a key focus** for a modern geological survey.

Future use may be regulated

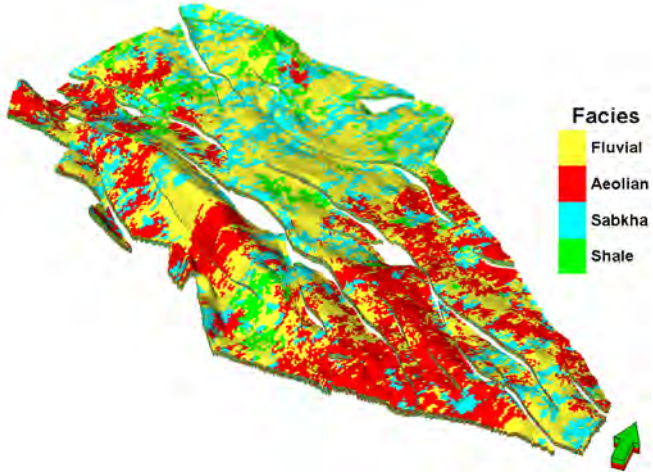


London – Thames Valley

Energy testbed



The regulator, the Government, business and the public need to be reassured that these activities are feasible and safe, so we need to understand subsurface processes better

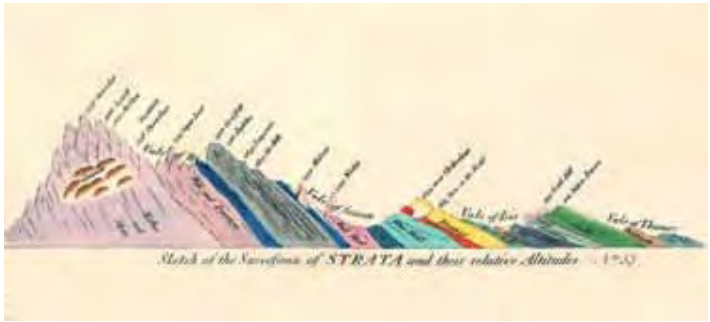


We need a single scientifically validated understanding and view of the subsurface to develop public trust in Government, industry and scientists to make the best use of this resource.

Maps to models

The mission remains constant:
To understand & explain UK Geology

1815



1874

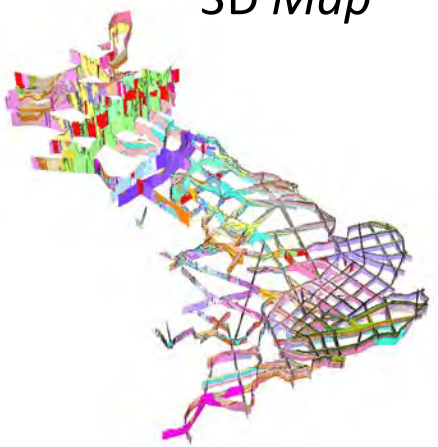
1939

2007

2012

Step change

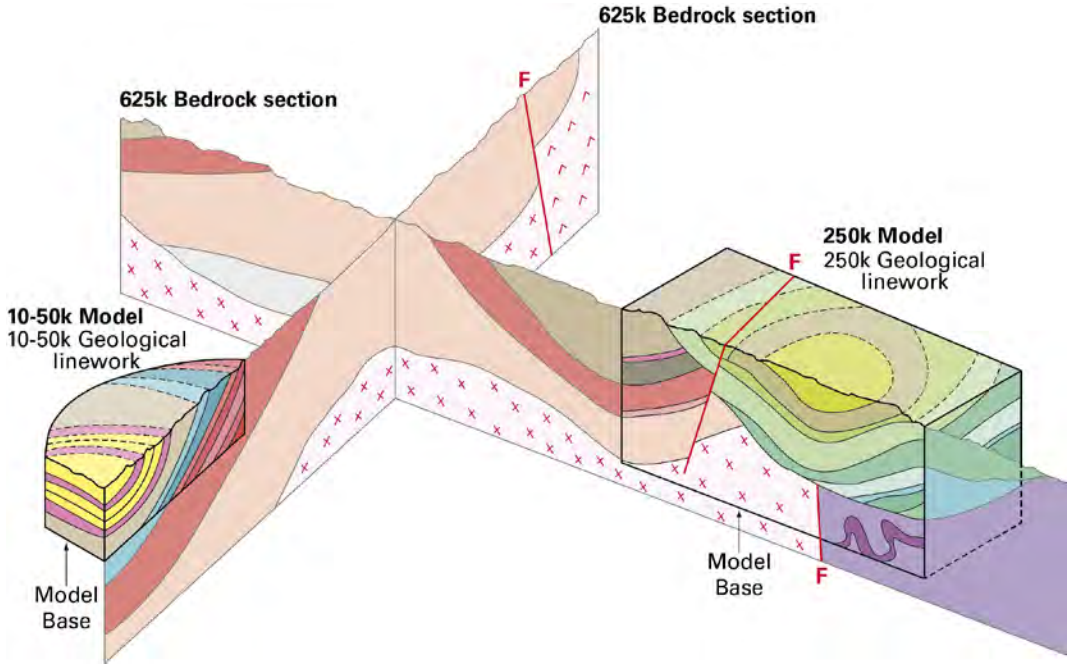
3D *Map*

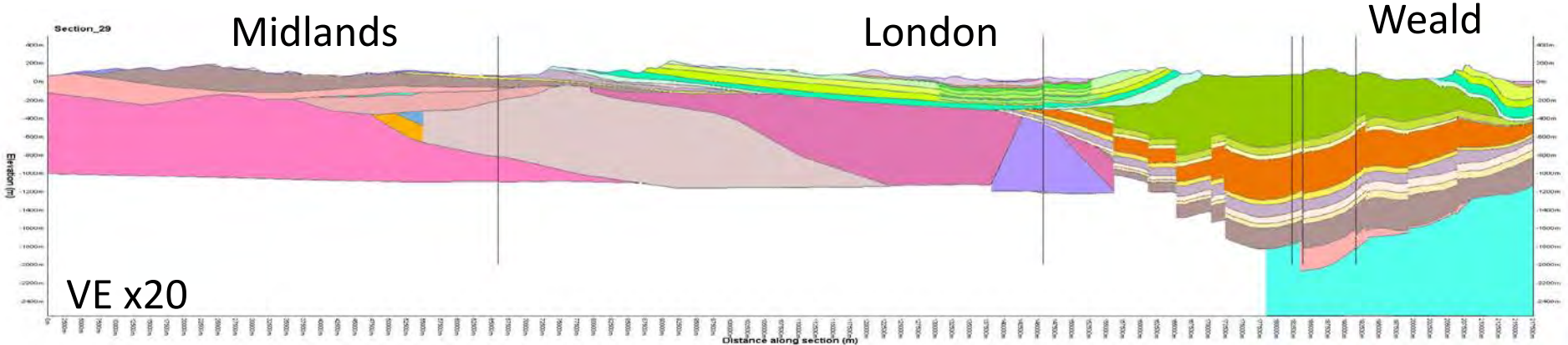


What is the National Geological Model?

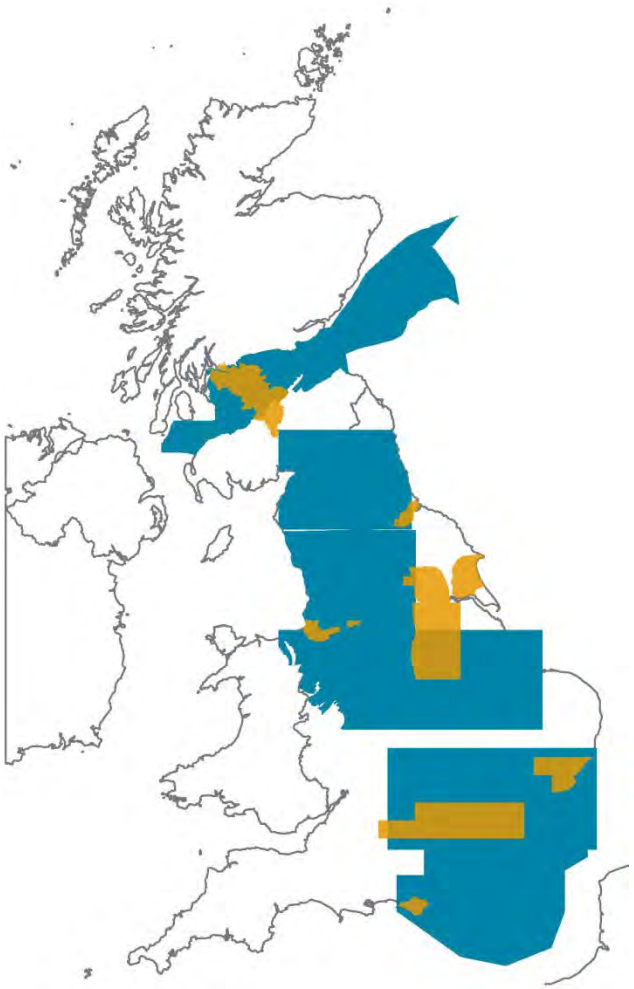
The National Geological Model (NGM) is an accurate, multi-scale, attributed, geospatial model of the subsurface arrangement of the rocks and sediments of the UK.

Underpinned by all our geospatial data and understanding





Current model coverage



Higher resolution models

Lower resolution models

Models are diverse in size, depth and intended use due to their project-based (often client-orientated) construction

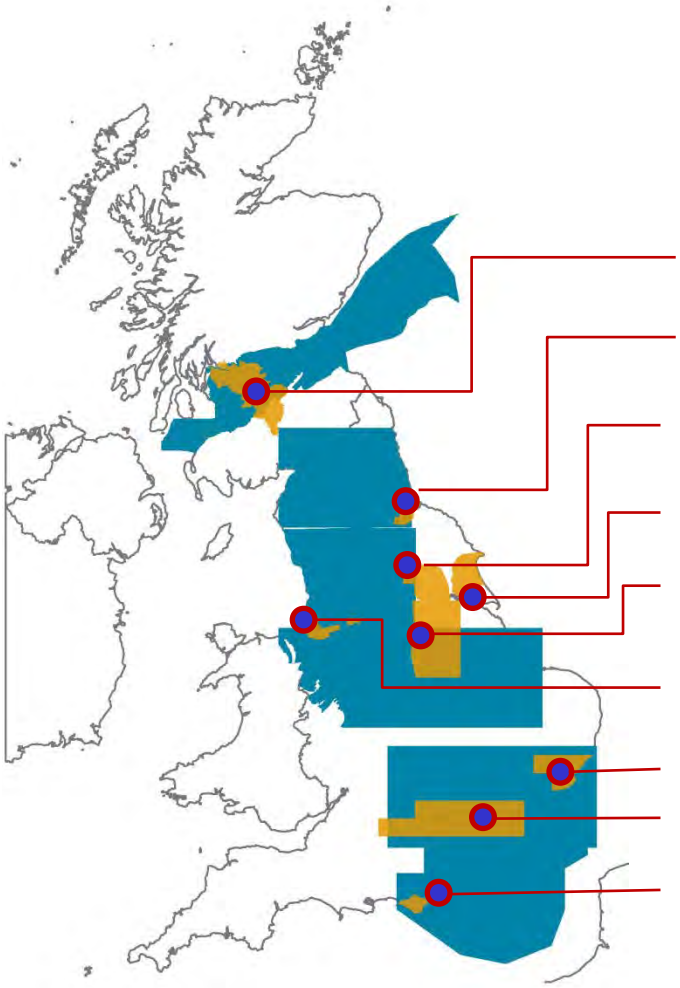
Over the past 4 years, BGS have been integrating individual models to form a more nationally consistent product.

The UK model currently comprises:

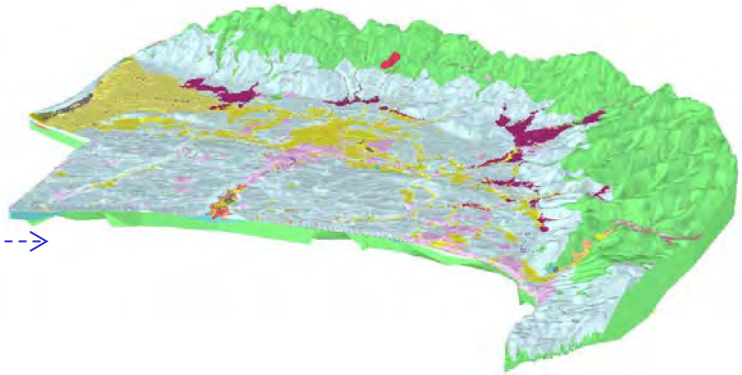
- Quaternary models
- Bedrock models
- Crustal model

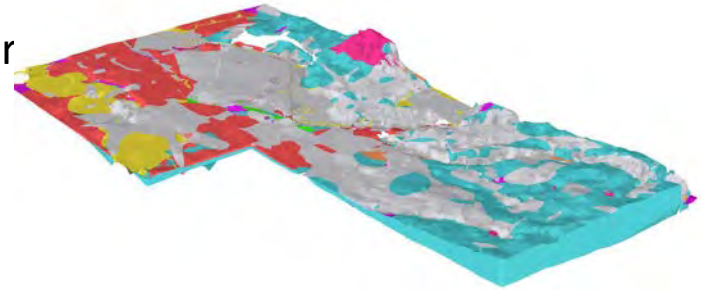
See website for more details

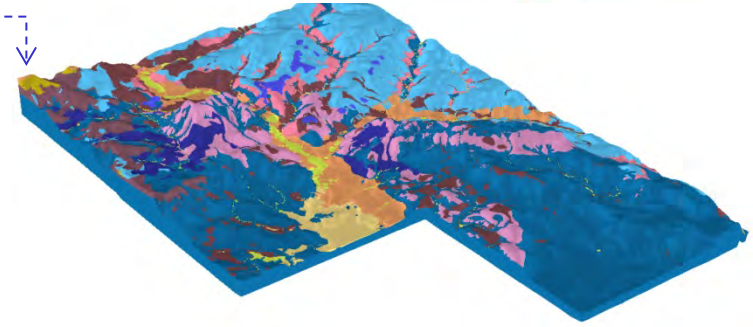
Quaternary models



Glasgow
Tees
York
East Yorkshire
Nottingham-Doncaster
Manchester,
Warrington, Liverpool
South east Anglia
London
Isle of Wight

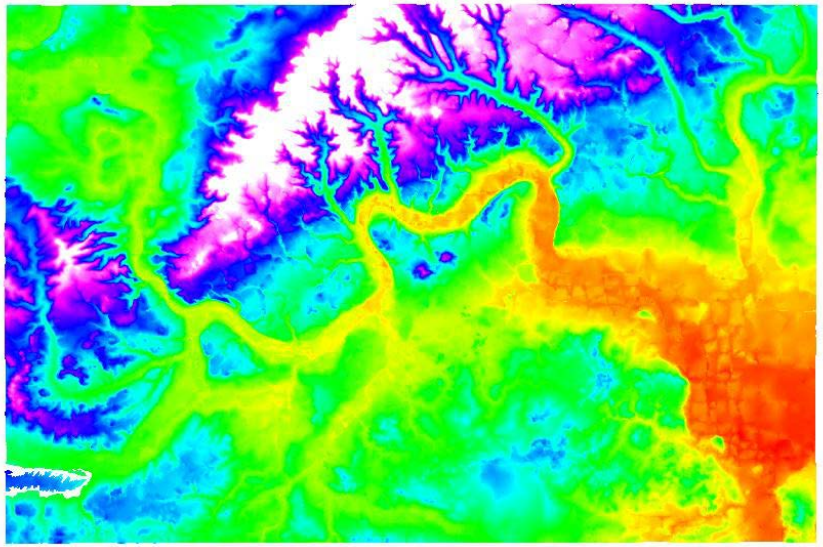






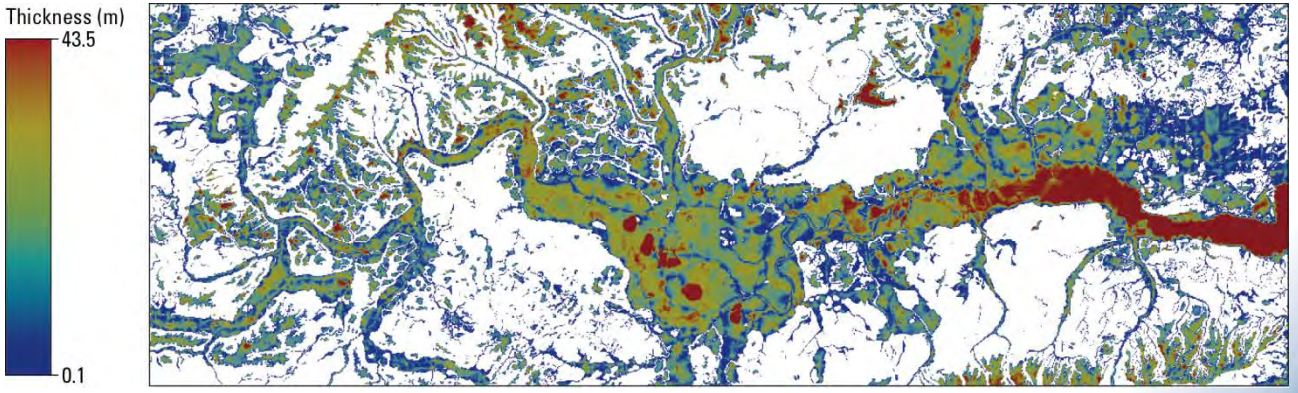
Shallow, high resolution models built for groundwater resources, planning, flooding, aquifer vulnerability, infrastructure and education.

Quaternary models: outputs

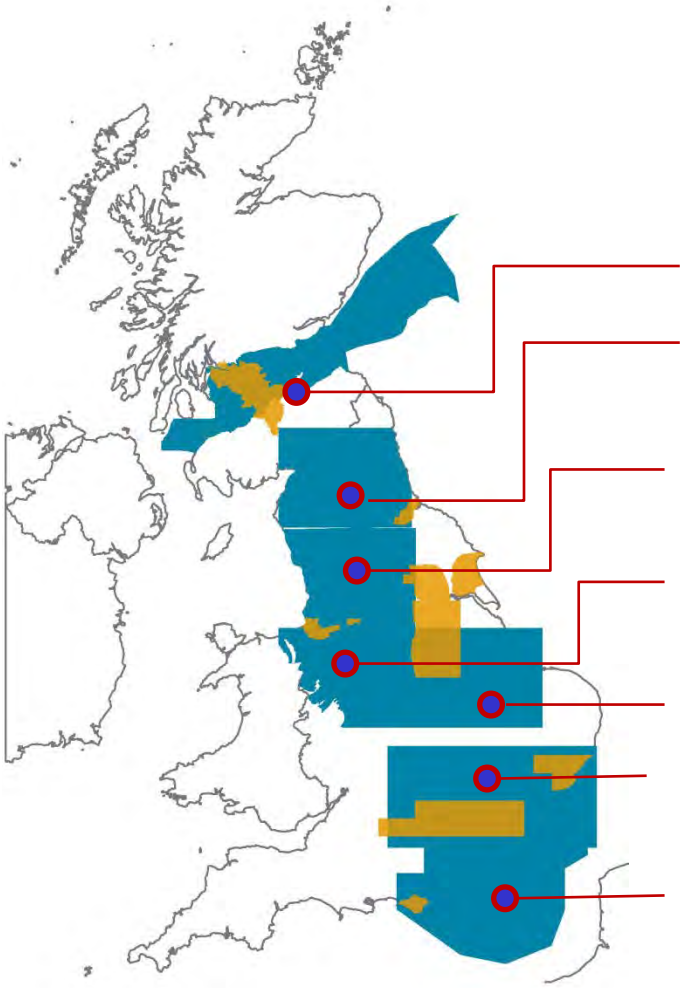


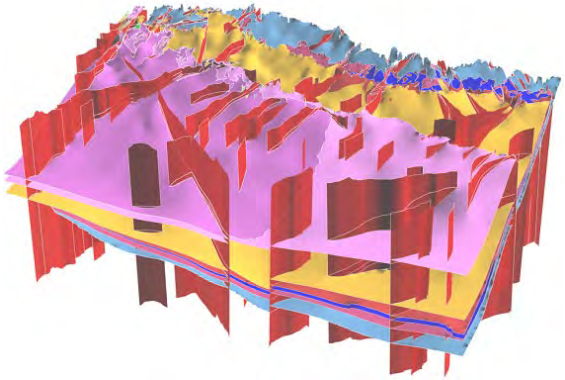
Base of Quaternary ‘rockhead’

Quaternary thickness



Bedrock models





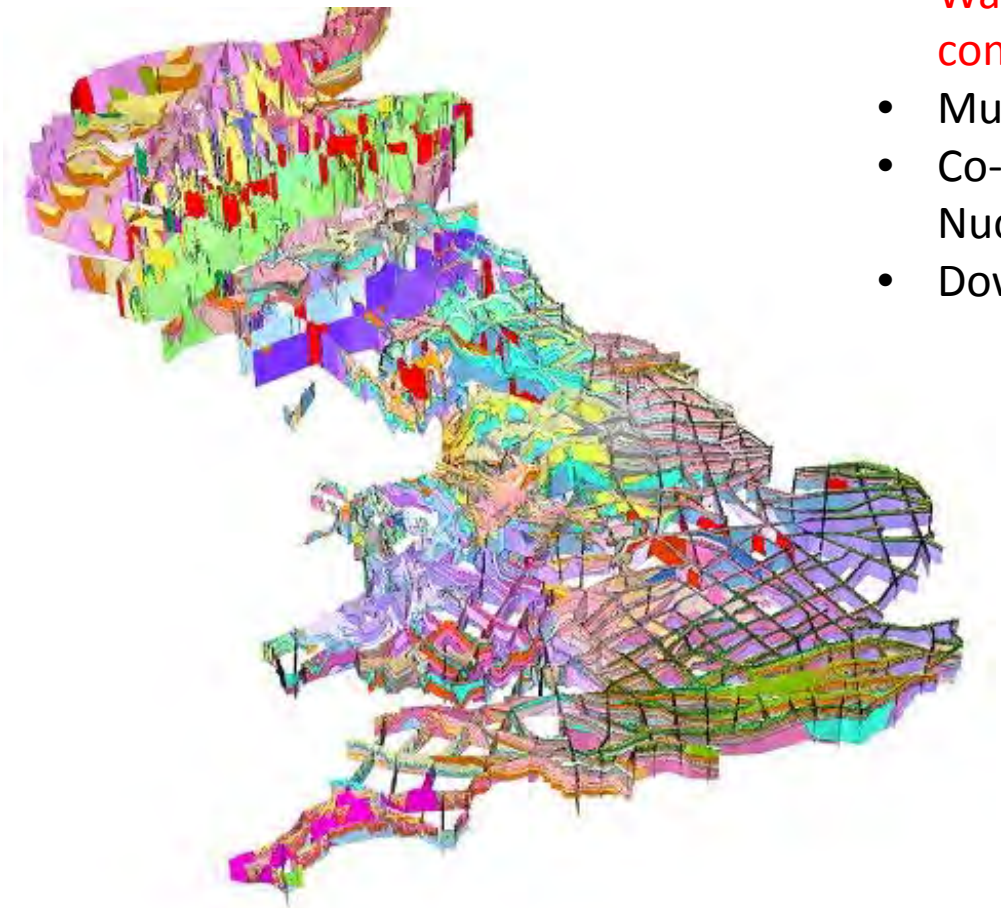
East Midlands Permo-Trias

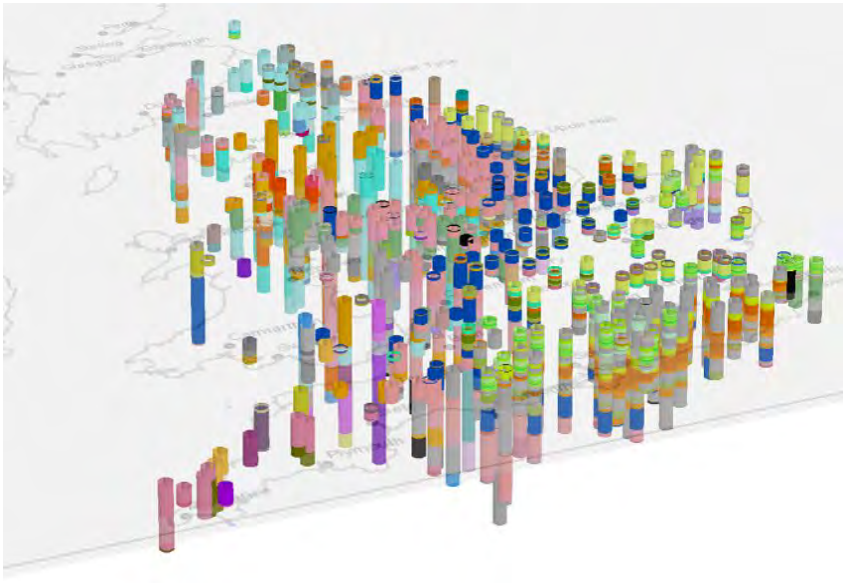
Deep, low resolution models of sedimentary basins built for hydrocarbon evaluation, CCS and groundwater resources

Bedrock models

GB3D fence diagram

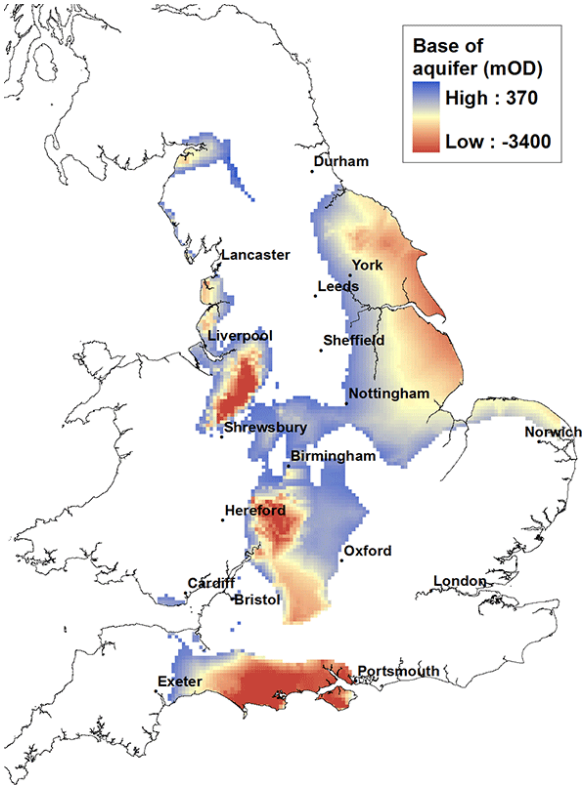
- 150 Sections, >25,000 line km
- Depth ranging from 1.5 to 6 km
- Underpinned by 300 boreholes in England and Wales, as well as seismic, models and structural contours
- Multi-scaled
- Co-funded by the Environment Agency and Nuclear Decommissioning Authority
- Downloadable from the BGS website





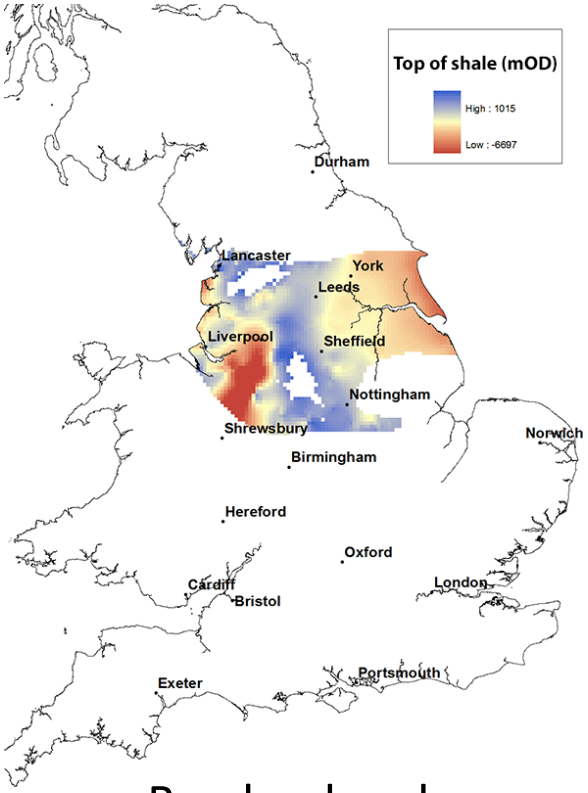
Bedrock models: outputs

Aquifer occurrence



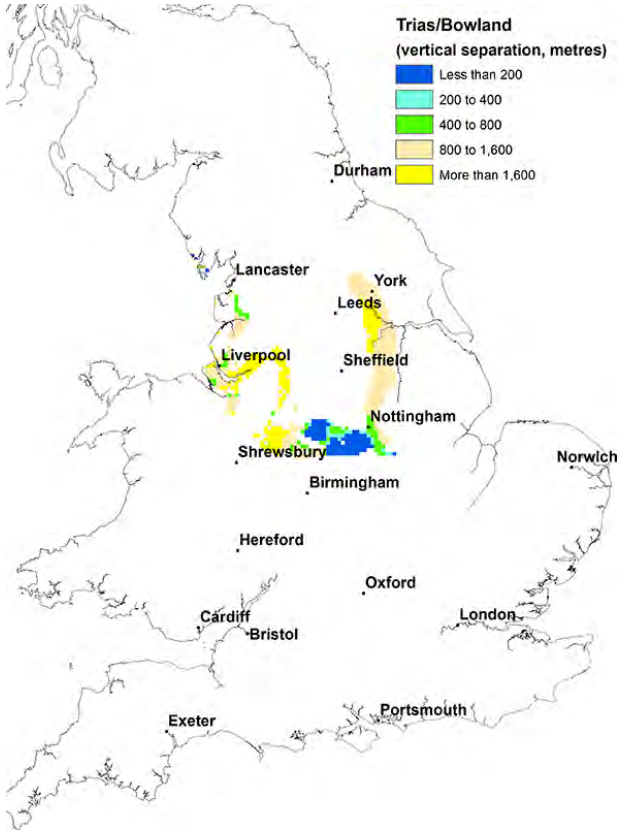
Triassic sandstone aquifer coverage

Shales occurrence



Bowland and Craven Groups

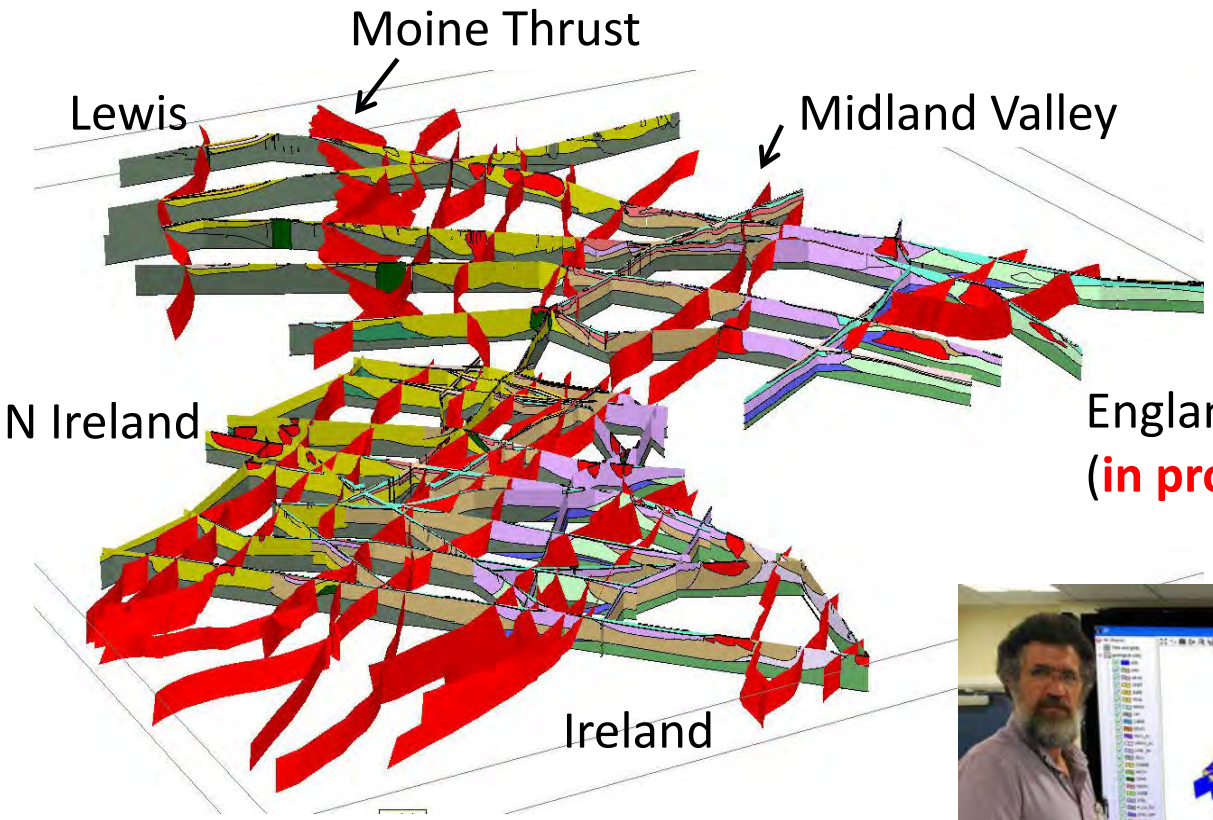
Shale-aquifer separation



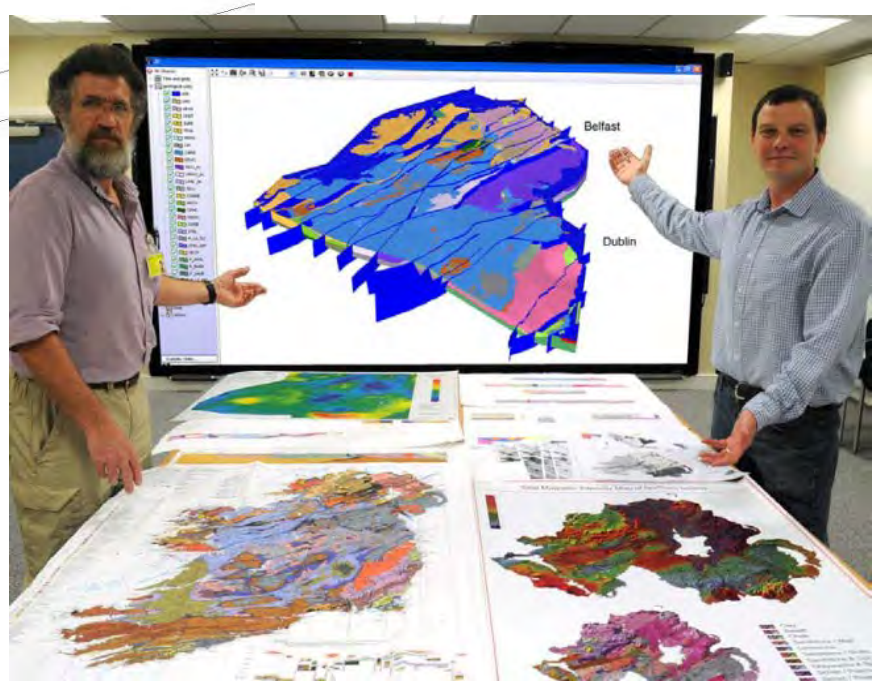
EA funded study

[See website for more information]

Crustal model



BGS-GSNI-GSI
Sections 15km deep



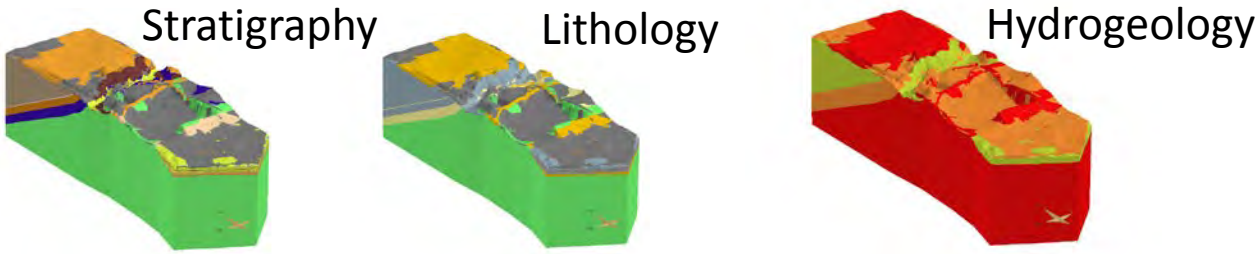
- Of particular interest to academics
- Note structural continuity of terranes along the Caledonian trend. Illustrates plate tectonic context and fuels debate, e.g. blue Iapetus Suture

Geological model parameterisation

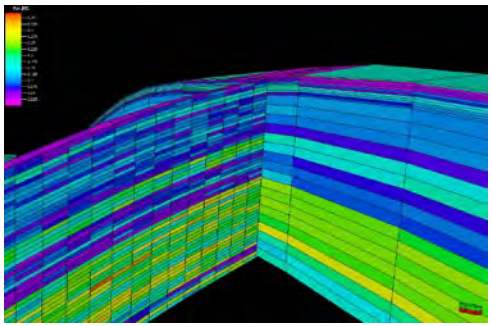
BGS is actively researching methods to parameterise geological models allowing us to describe the properties of the geology.

We do this by:

- Bulk attribution, London and Thames Valley

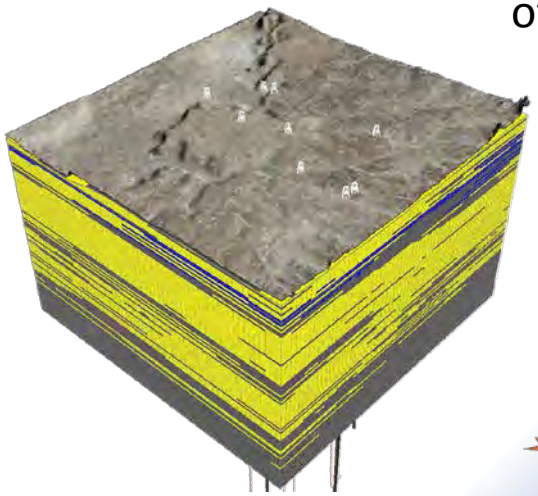


- Statistical property assignment



Effective porosity

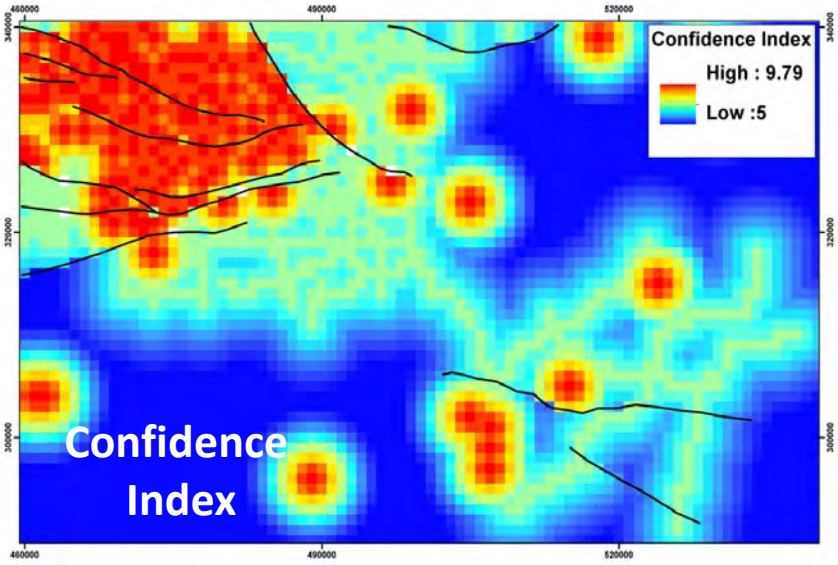
Simulated distribution of lithofacies, Algeria



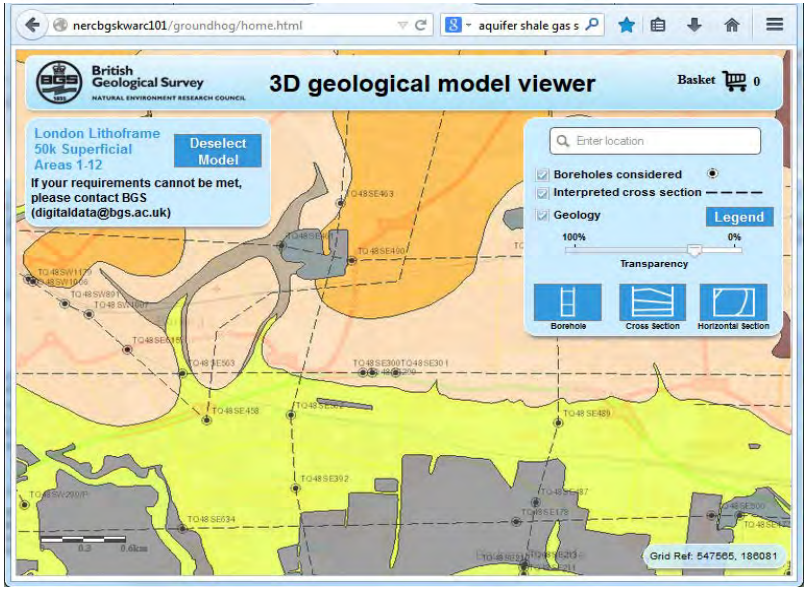
Geological model confidence

A **Confidence Index** is geostatistically calculated for each surface based on data distribution, elicited data quality and an assessment of predictability.

e.g. the Variscan Unconformity of the East Midlands.



Portraying confidence by indicating what data has been considered in the model and where the geology has been interpreted.



Summary

- Geology in 3D as it really is
- Best available answer everywhere
- Fit for any purpose
- Parameterised for Environmental 3-4D studies
- Informs water, radwaste, energy, minerals, engineering, planning and education sectors

For more information contact Steve Mathers sjma@bgs.ac.uk or visit the BGS webpages at www.bgs.ac.uk