British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Ahead of the game or behind the curve?

(or, why building *our* confidence in models is essential)

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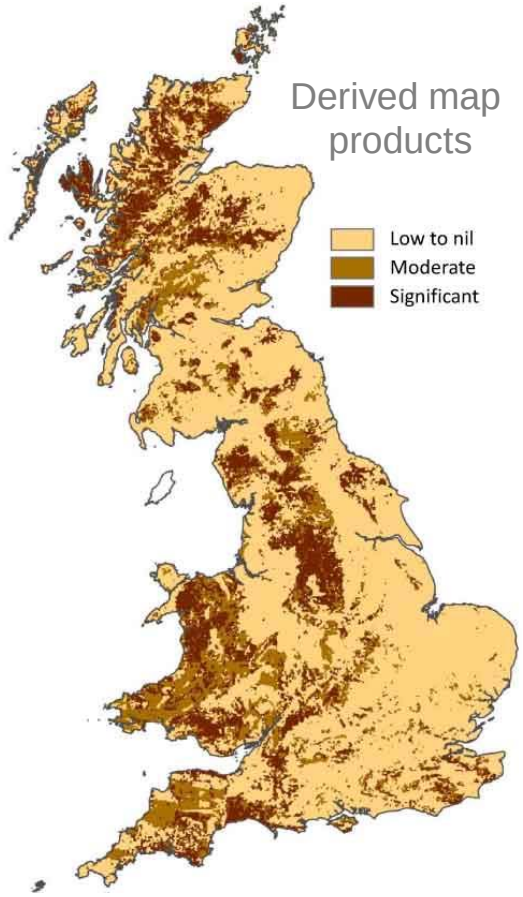
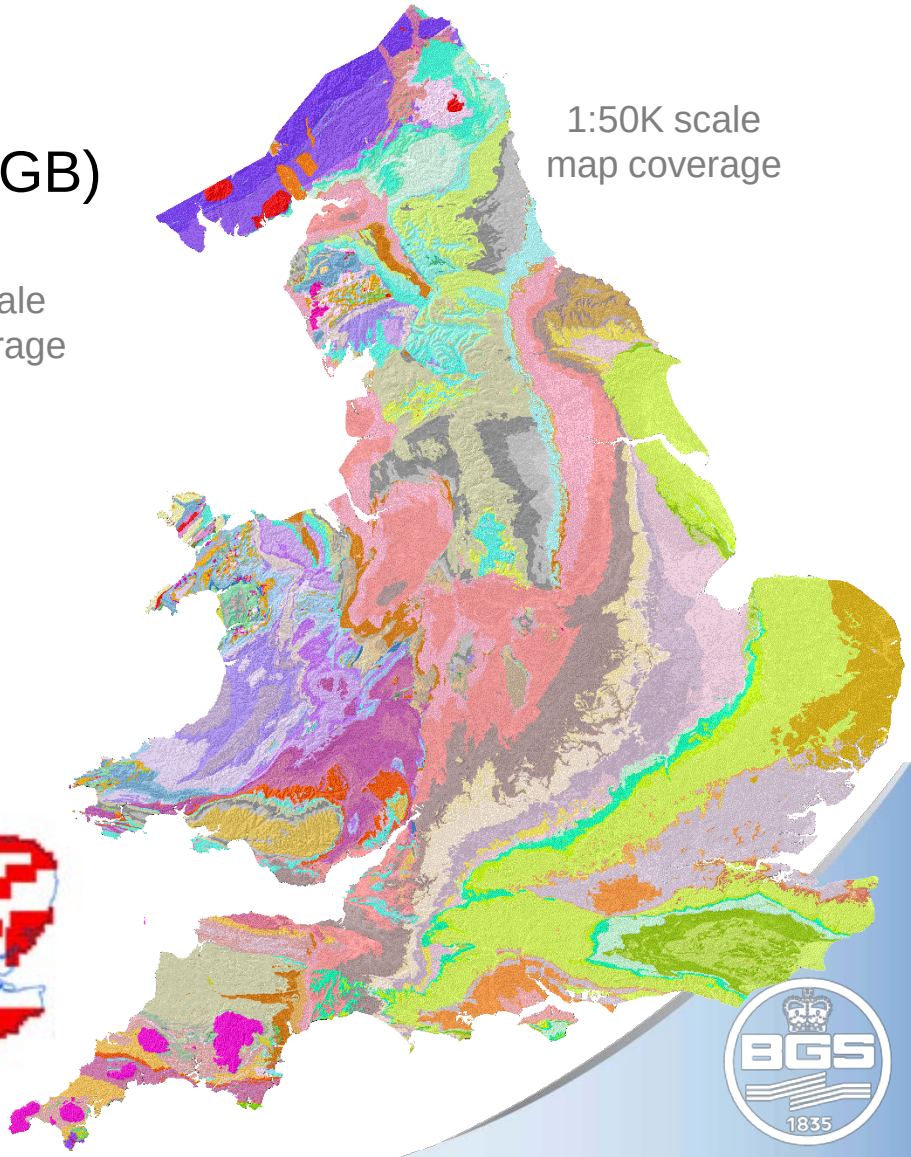
Ian Jackson explains 'the map that changed the world' - the William Smith 1815 map to HRH The Princess Royal.

2D mapping at the BGS

- Mature mapping programme
- National digital coverage (DiGMapGB)

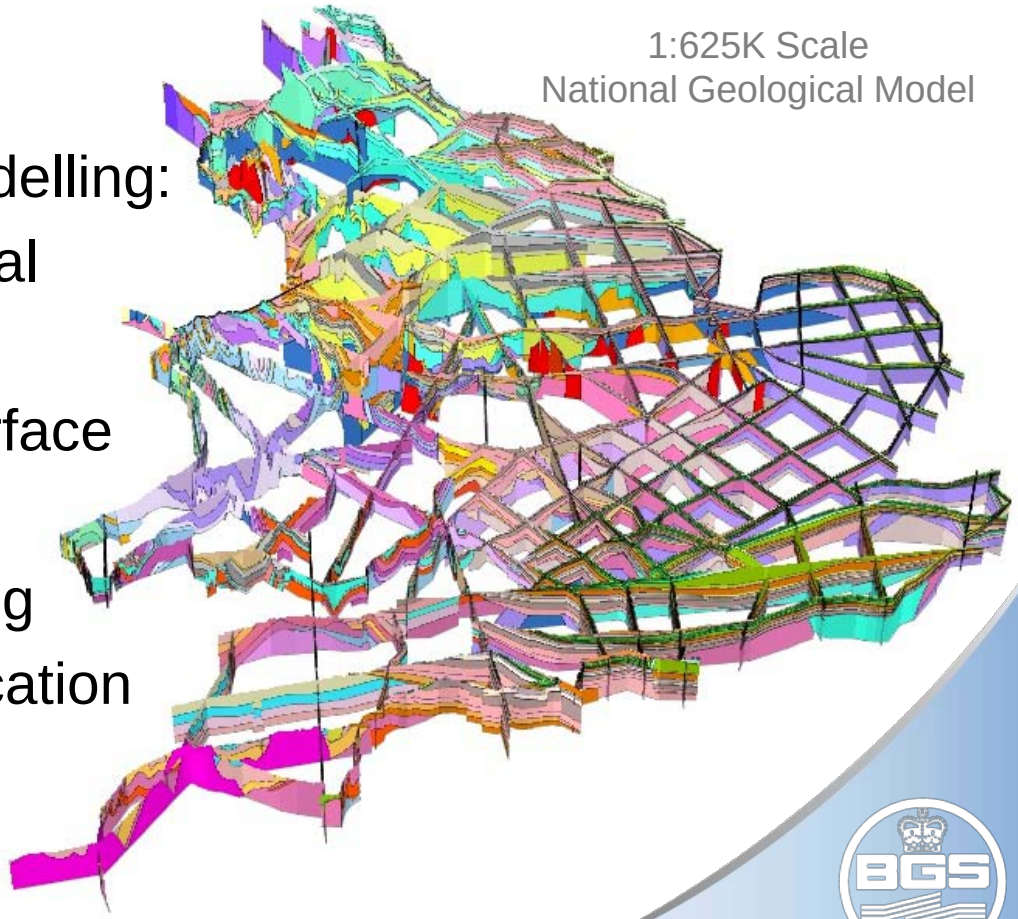




3D modelling at the BGS

- BGS is transitioning from 2D *mapping* to 3D *modelling*

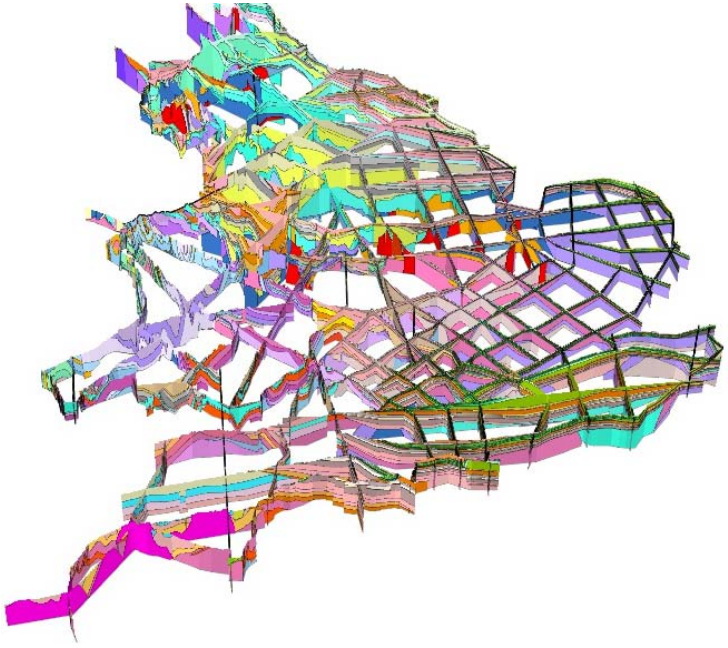
- Advantages of digital / 3D modelling:
  - contextualise diverse spatial
  - knowledge capture
  - resolve the ‘hidden’ subsurface
  - multi-scaled
  - input to numerical modelling
  - powerful tool for communication
  - etc...

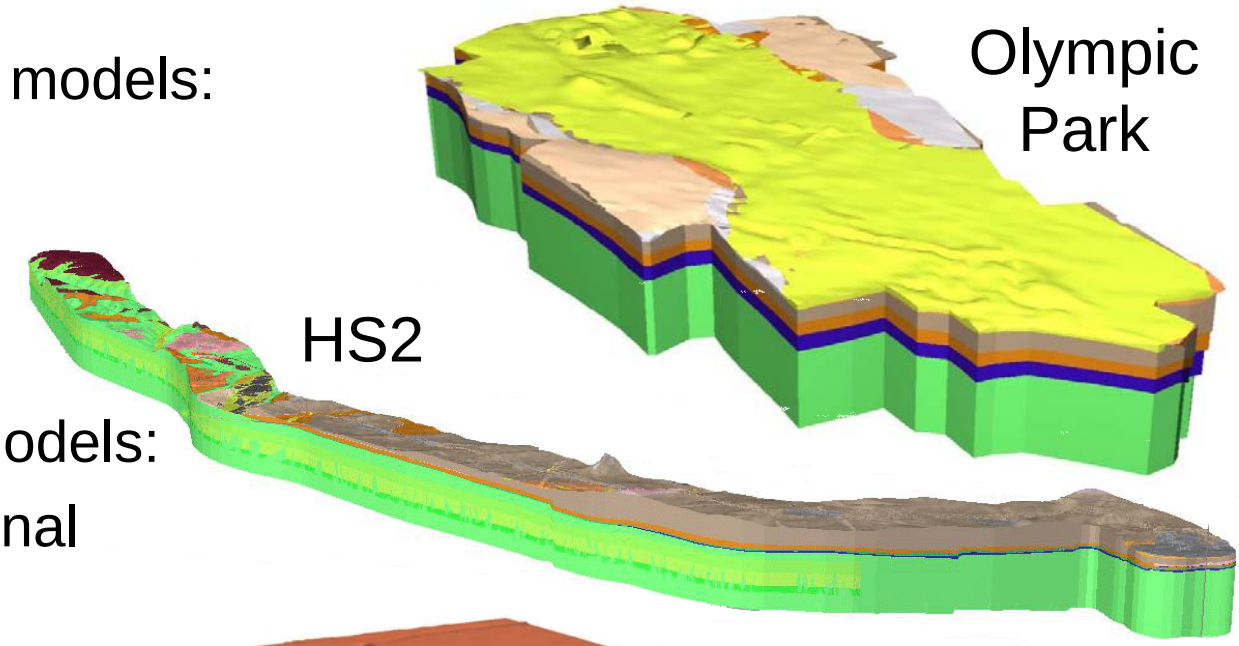


1:625K Scale
National Geological Model

3D modelling at the BGS

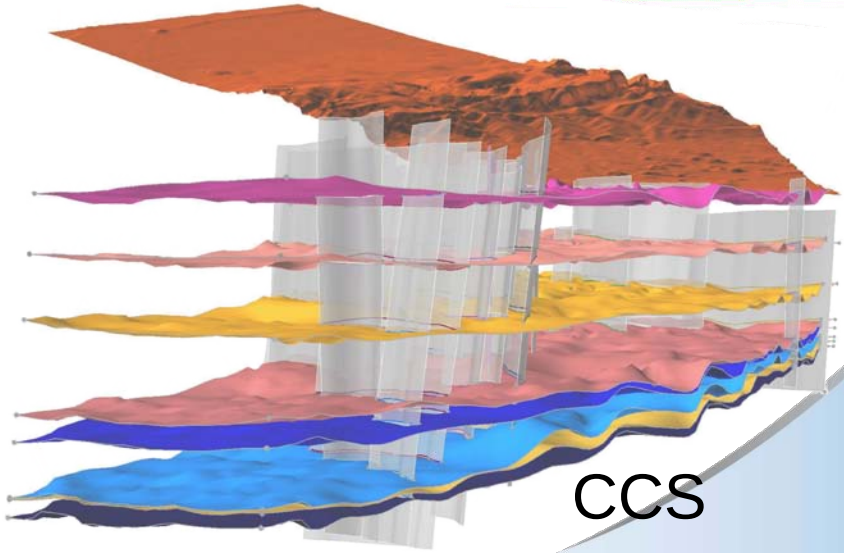
- Bespoke / responsive models:
  - site specific
  - linear route
  - regional studies
- Strategic / scientific models:
  - <1:10,000 to national





Olympic Park

HS2

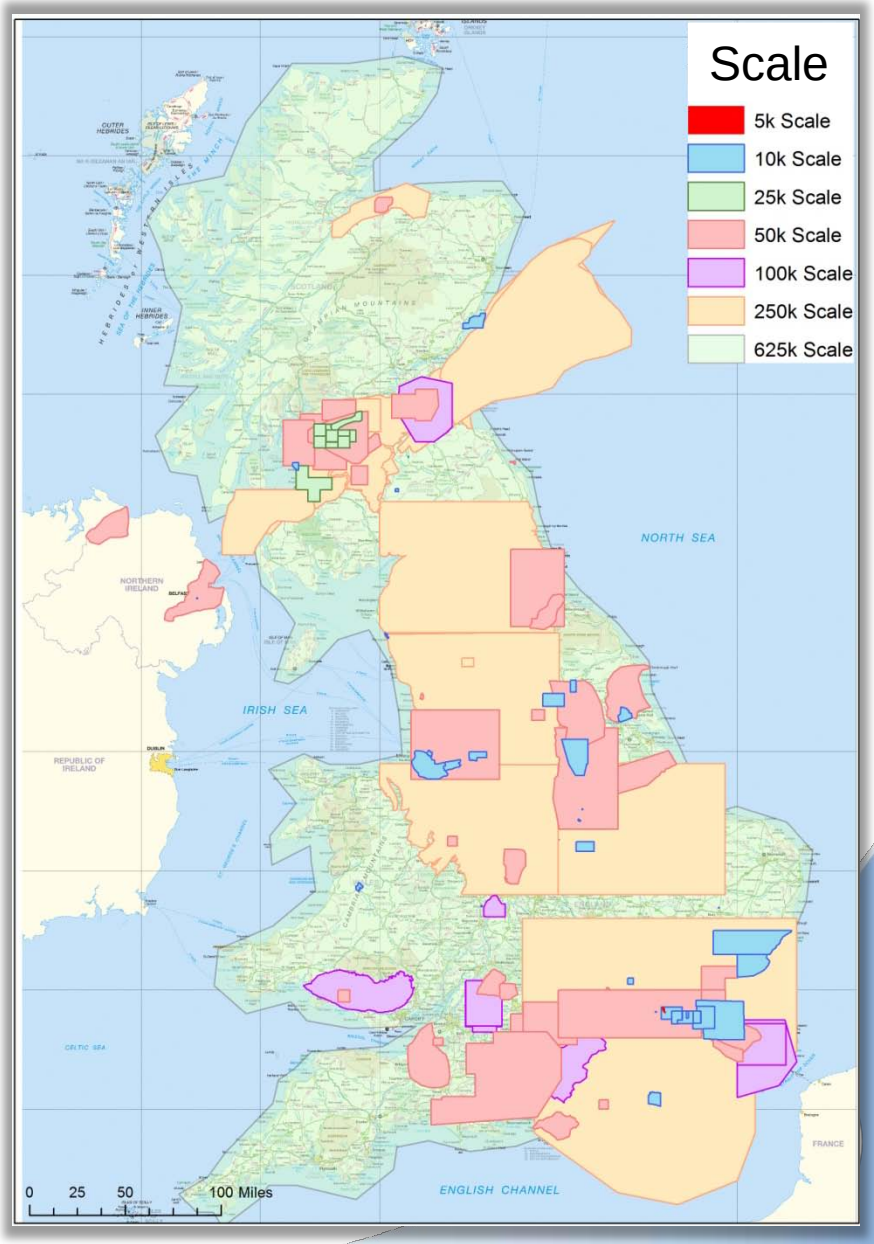


CCS

3D modelling at the BGS

- Extensive coverage
- Emerging model re-use
- Commissioned enhancement
- Effective infrastructure
- Increased capacity
- Maturing market (e.g. Building Information Modelling)

- *So what is the problem?*

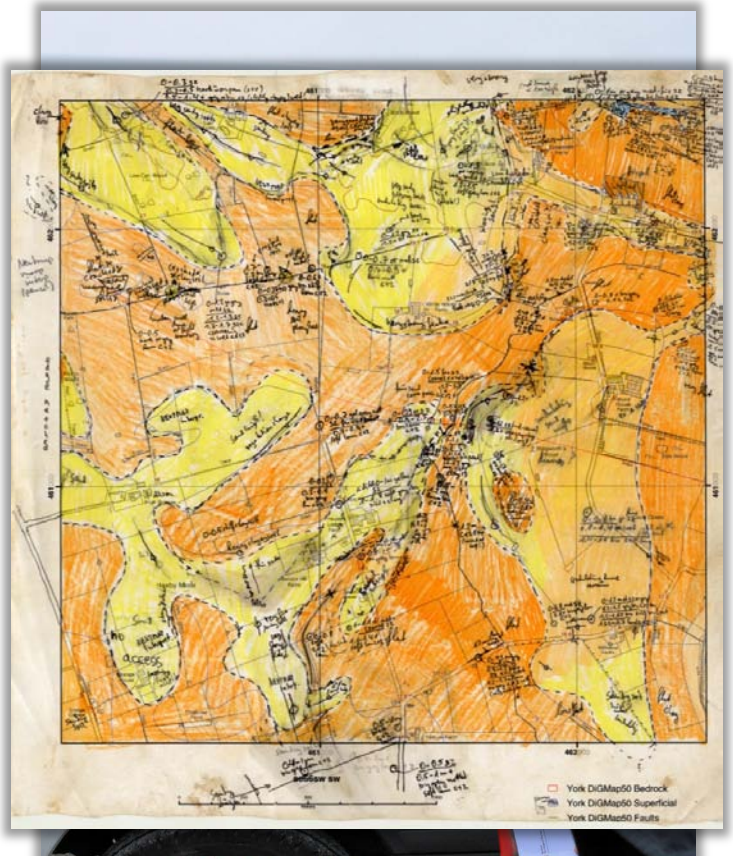


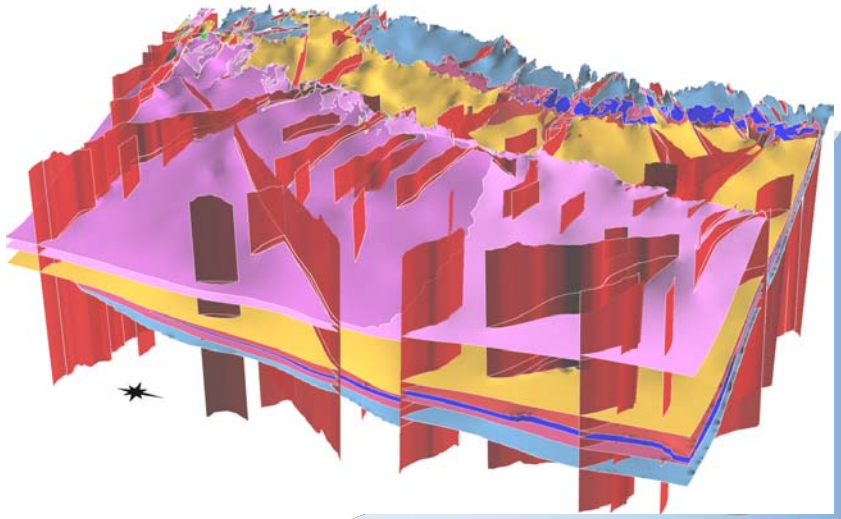
Ian Jackson explains 'the map that changed the world' - the William Smith 1815 map to HRH The Princess Royal.

‘In maps we trust’

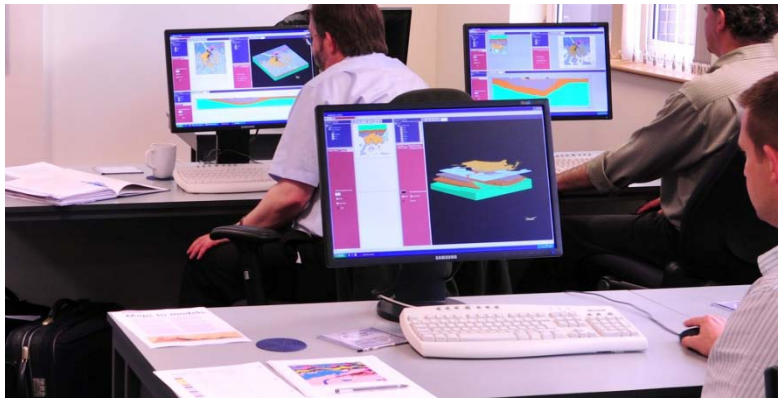
Cultural challenge

- Benefits of 3D recognised, but...
- ...underlying scepticism remains:
  - loss of control
  - distrust of ‘visual persuasion’
  - “not *real* geology”
  - no ‘tangible’ output
- Resulting lack of confidence / buy-in is an obstacle in the transition to 3D
- Significant technical advances made
- Pro-active approach needed to support cultural change

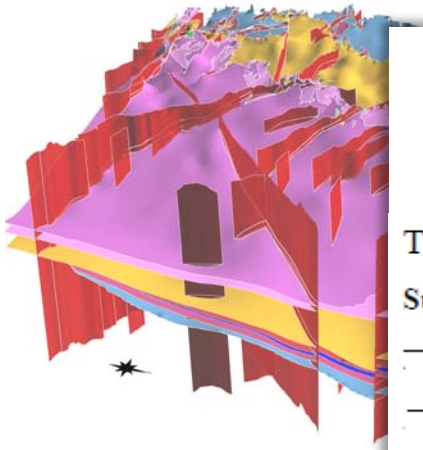




Technology



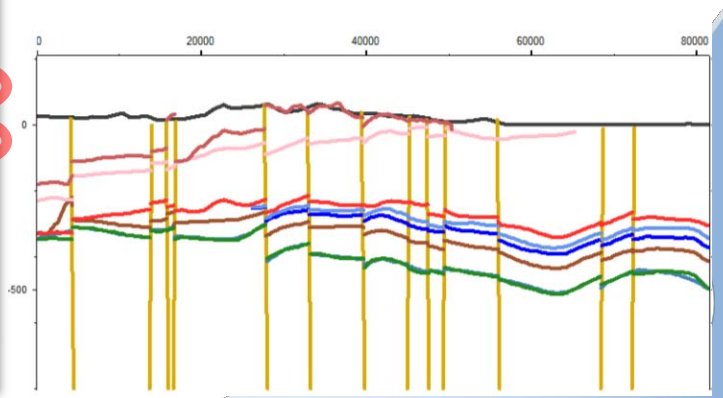
- Avoid ‘black box’ technology...
- ...whilst concealing complexity
- Ensure professional & stable software and training
- Provide tools for model interrogation...
- ...and mechanisms for model update, including metadata
- Support the capture of ‘uncertainty’ in the interpretation



Specifications for the preparation of 1:10 000 and 1:25 000 scale geological maps and DiGMapGB-10 data

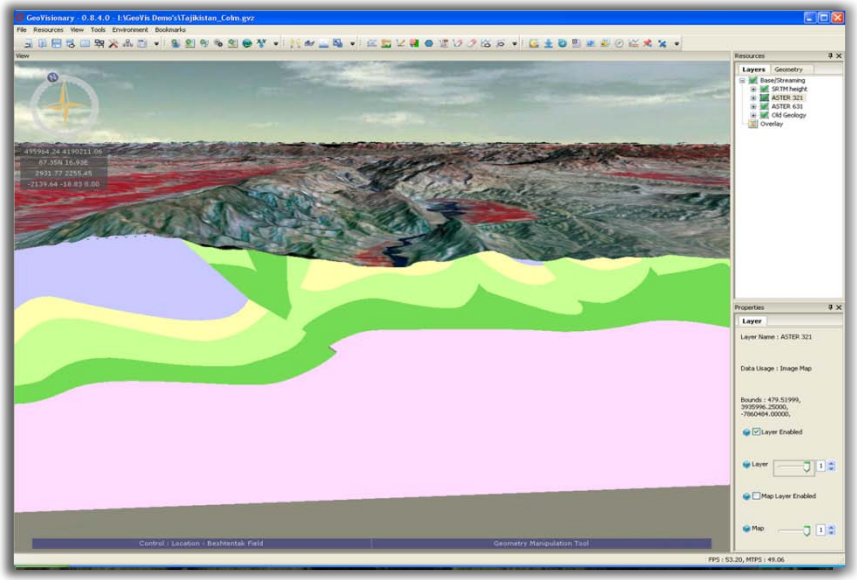
The following are generally polygon-closing lines.

Style in map key	Text in map key
————	Geological boundary, Bedrock, observed
— — — — —	Geological boundary, Bedrock, inferred
– – – – –	Geological boundary, Bedrock, conjectural
. . . . .	Geological boundary, Bedrock, gradational



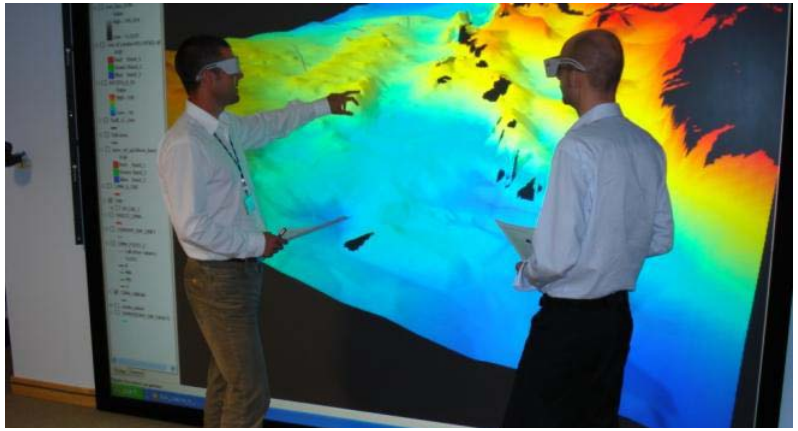
Integrated approach / workflow

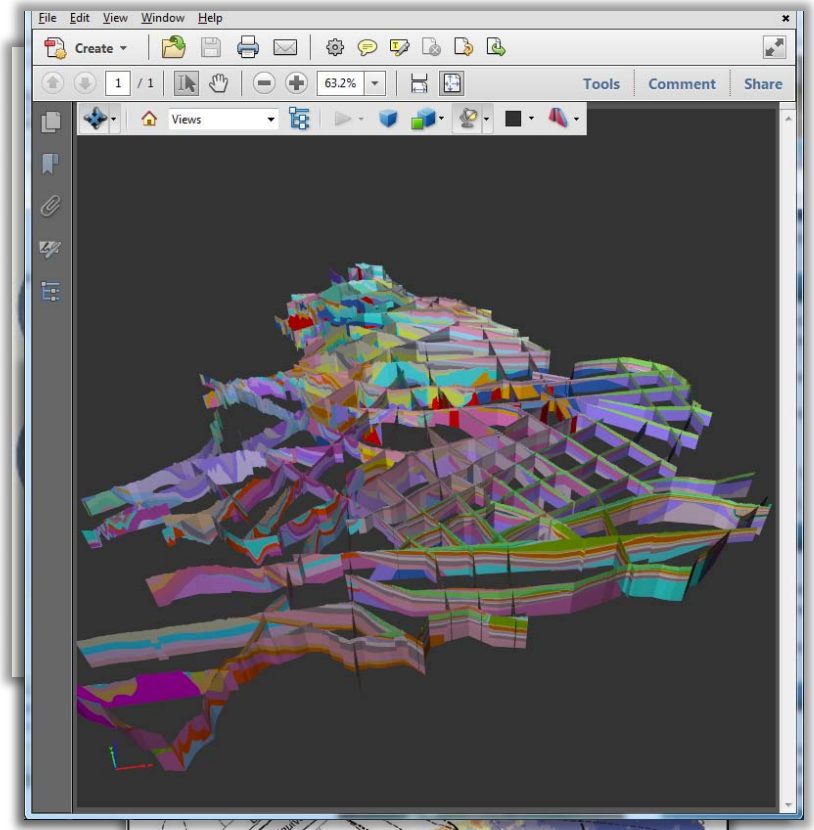
- Make the modelling process geologist-led
- Remember you're a geologist:
  - integrate fieldwork
  - test the model
  - don't recycle to pencil
- Keep it "real":
  - model in context
  - think "process"
- Treat data with caution / open mind

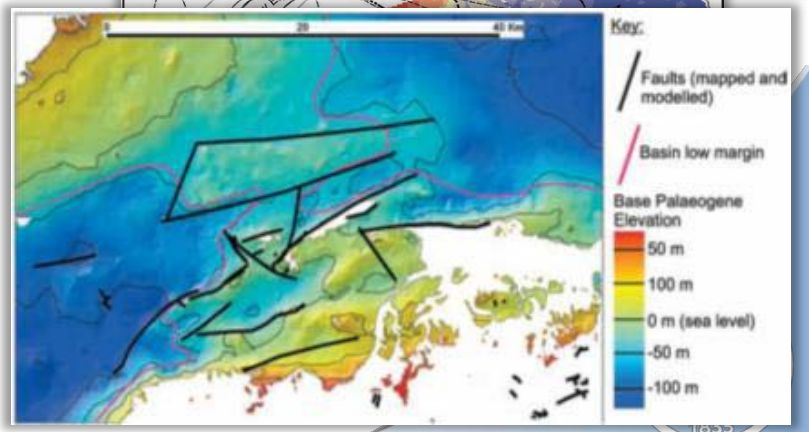


Recognition

- Establish a clear context
- Apply rigorous QA / peer-review
- Share experiences *good* and *bad*
- Seek independent validation
- Encourage 3D model scientific discovery...
- ...and support collaboration
- Capture moments of “realisation”







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New insights from 3D geological models at analogue CO_2 storage sites in Lincolnshire and eastern Scotland, UK

Alison Monaghan[1]*, Jonathan Ford[2], Antoni Milodowski[2], David McInroy[1], Timothy Pharaoh[2], Jeremy Rushton[2], Mike Browne[1], Anthony Cooper[2], Andrew Hulbert[2] & Bruce Napier[2]

[1]British Geological Survey, Murchison House, West Mains Road, Edinburgh, EH9 3LA, UK
[2]British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham, NG12 5GG, UK
*Corresponding author (e-mail: als@bgs.ac.uk)

SUMMARY: Subsurface 3D geological models of aquifer and seal rock systems from two contrasting analogue sites have been created as the first step in an investigation into methodologies for geological storage of carbon dioxide in saline aquifers. Development of the models illustrates the utility of an integrated approach using digital techniques and expert geological knowledge to further geological

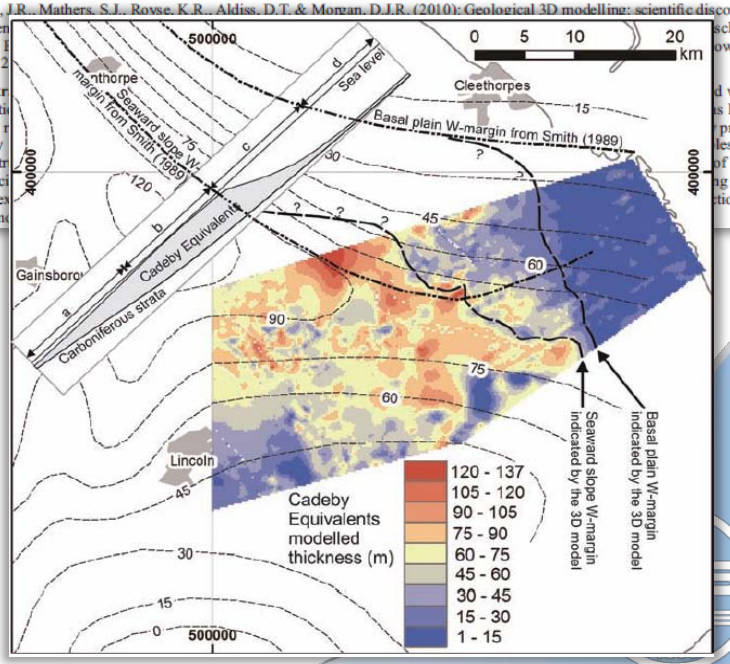
Z. dt. Ges. Geowiss., 161/2, p. 205–218, 17 figs., 1 tab.
Stuttgart, June 2010

Article

Geological 3D modelling: scientific discovery and enhanced understanding of the subsurface, with examples from the UK

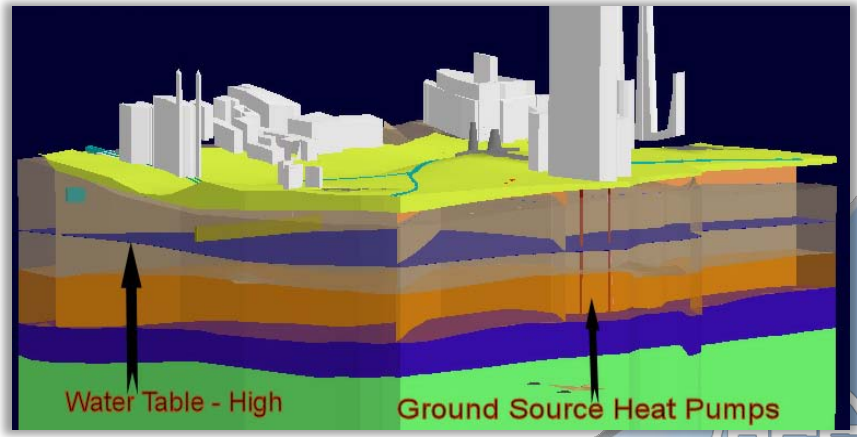
Jonathan R. Ford, Stephen J. Mathers, Katherine R. Royse, Donald T. Aldiss & David J.R. Morgan*

Ford, J.R., Mathers, S.J., Royse, K.R., Aldiss, D.T. & Morgan, D.J.R. (2010): Geological 3D modelling: scientific discovery



Building confidence in models

- Significant progress made
- Opportunity increase:
  - control
  - trust
  - sense of ownership
- Translate enthusiasm from 2D to 3D
- Better geology captured in 3D
- Meet stakeholder/individual expectations/demands...
- ...benefit from feedback and increased funding



Conclusions

- 3D modelling is effective
- Stakeholder community is increasingly ready for 3D
- Need to build *geologists'* confidence and buy-in to 3D
- Need to be proactive in supporting cultural change:
  - technology
  - integrated approach
  - recognition
- This will result in increased and enhanced tacit knowledge capture and uptake of 3D models

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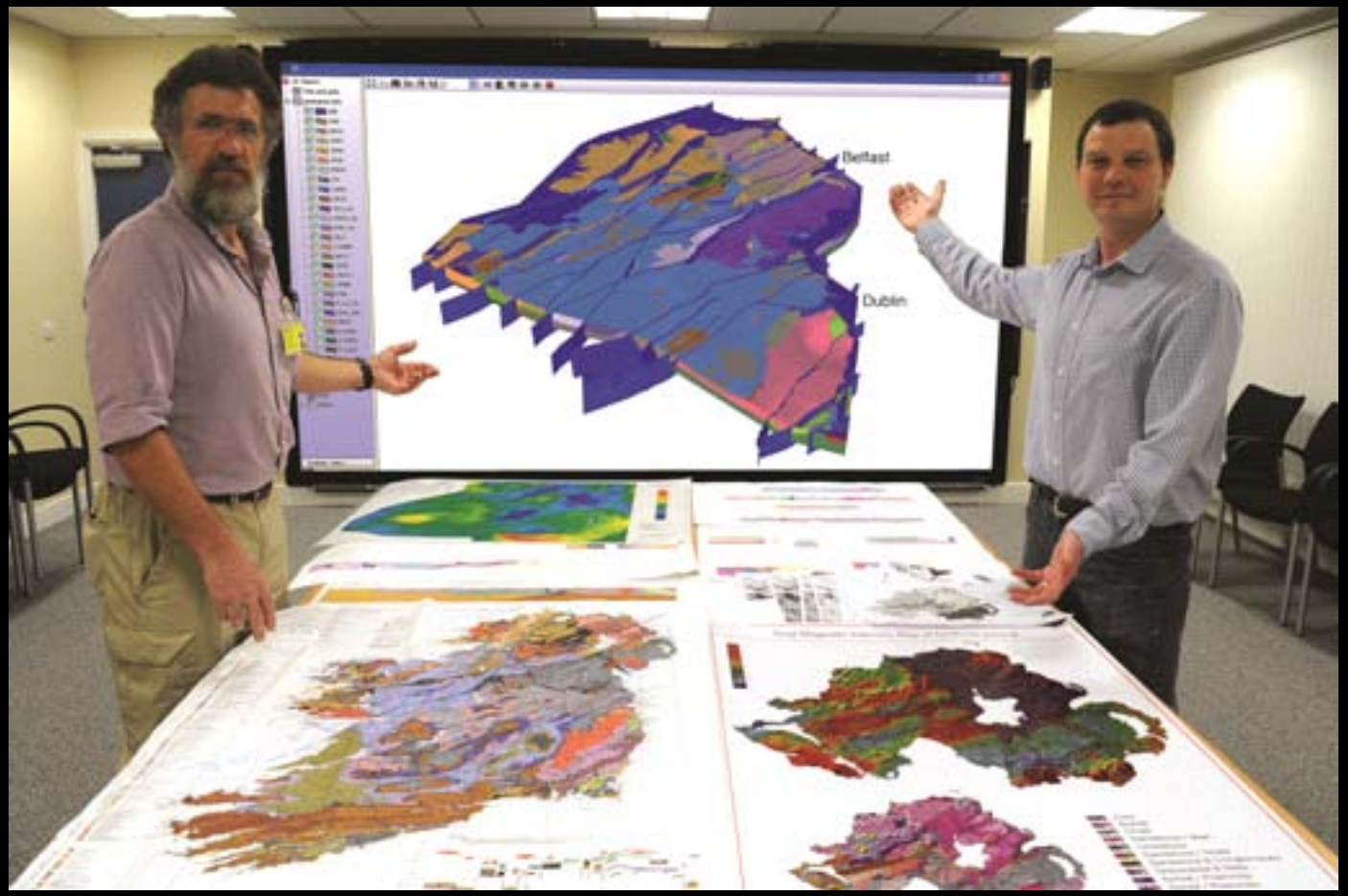

‘In *models* we trust’