



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

Applied geoscience for our  
changing Earth

# 3D Geological Models for Teaching

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# The Potential of 3D Geological Models as a Teaching Resource

- How can 3D geological models help students learn geology?
- What geological concepts can the models show?
- How have 3D models been used in the past for teaching?
- What do Universities want from these models?



# How Can 3D Models help Learning in the Geosciences?

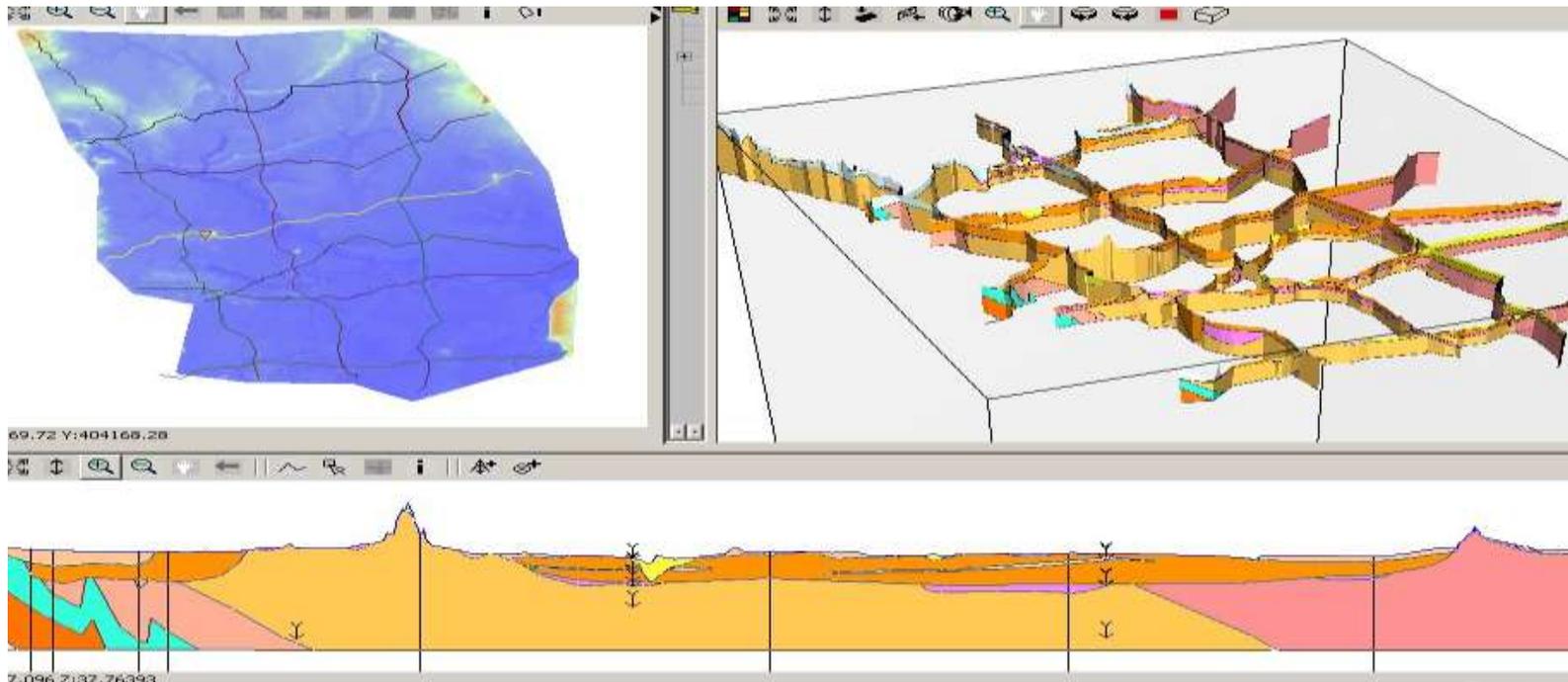
- 3D geological models enable a student to observe, manipulate and interpret geology; in particular the models convert 2D geology (maps, boreholes and cross-sections) into 3D.
- Models can be used to teach geoscience to students of varying experience and abilities.
- 3D models as an educational package can easily be utilised by students unable to attend university conventionally.
- 3D educational geological models can be used repeatedly and in such a way as to continually build on geoscience aspects – this improves geospatial skills.



- 3D geological models can be compared with that seen directly in the field.
- Student use of 3D geological models is active and the accompanying educational material deals with authentic, contemporary scientific problems - the student will have to ask questions, think critically and solve problems.



- 3D models can often be more practical and better financial alternatives to some teaching methods currently employed.
- Because 3D geological models are a visual tool they will encourage greater understanding of geoscience than text alone.



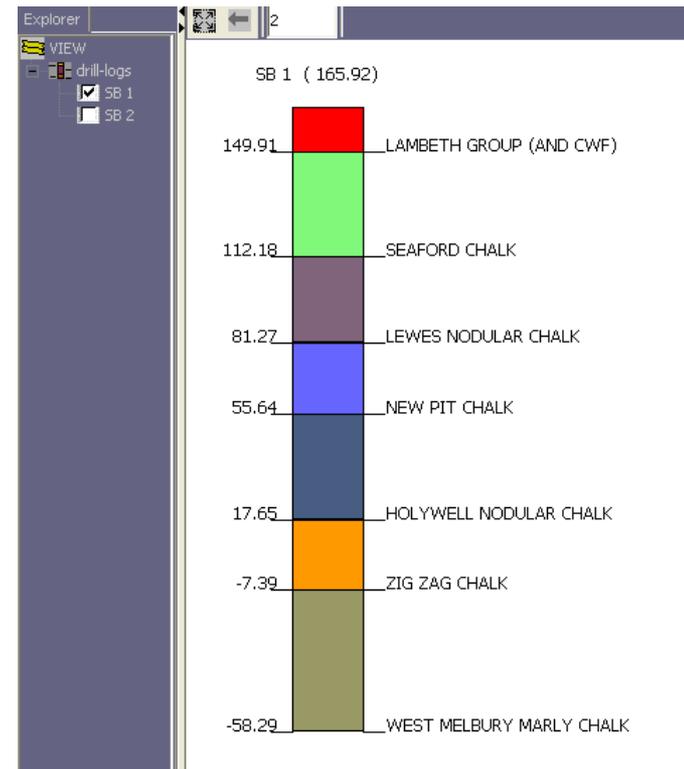
# Educational 3D Geological Model Learning Strategy.

Based on the 3 common stages of a learning cycle and packaged as a case study:

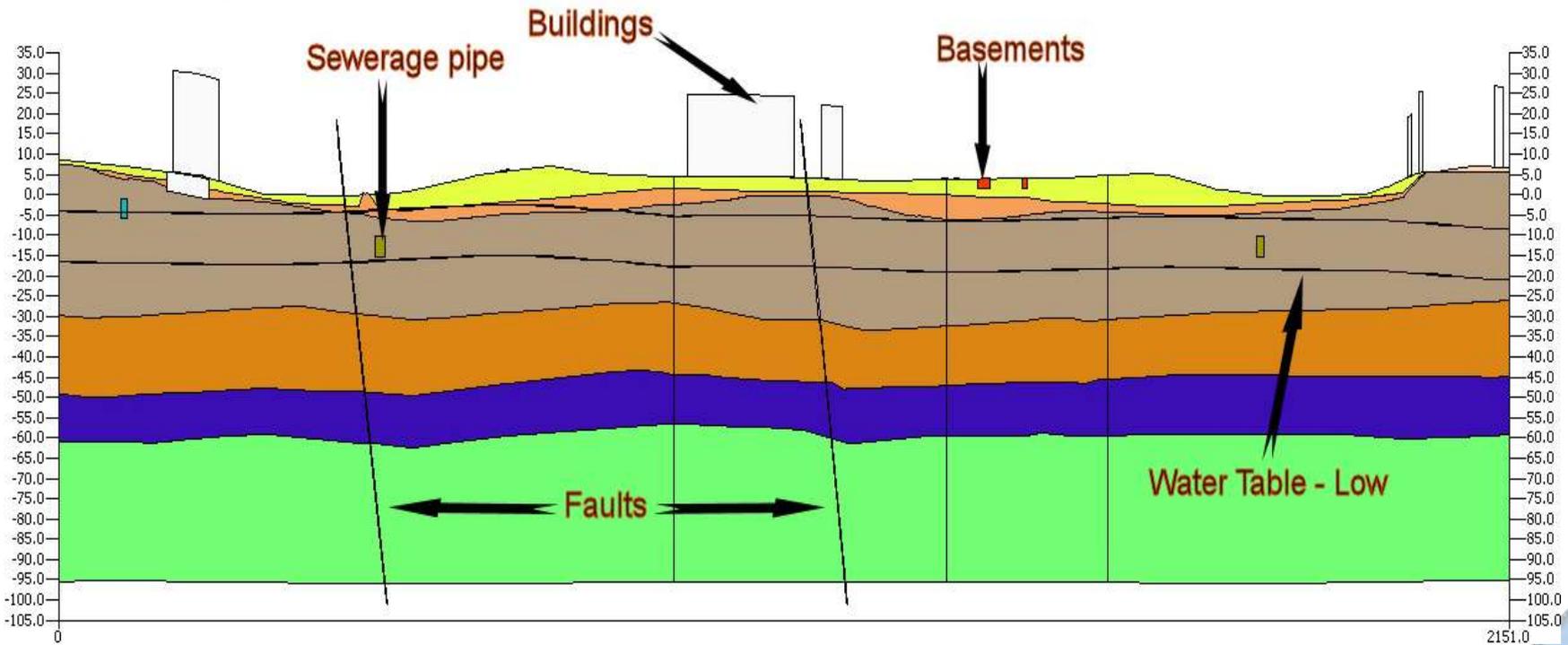
- **The Exploration Phase:** Using a student-tailored user guide let the student learn how to use the 3D model software, then let the student explore the geology shown in the models.



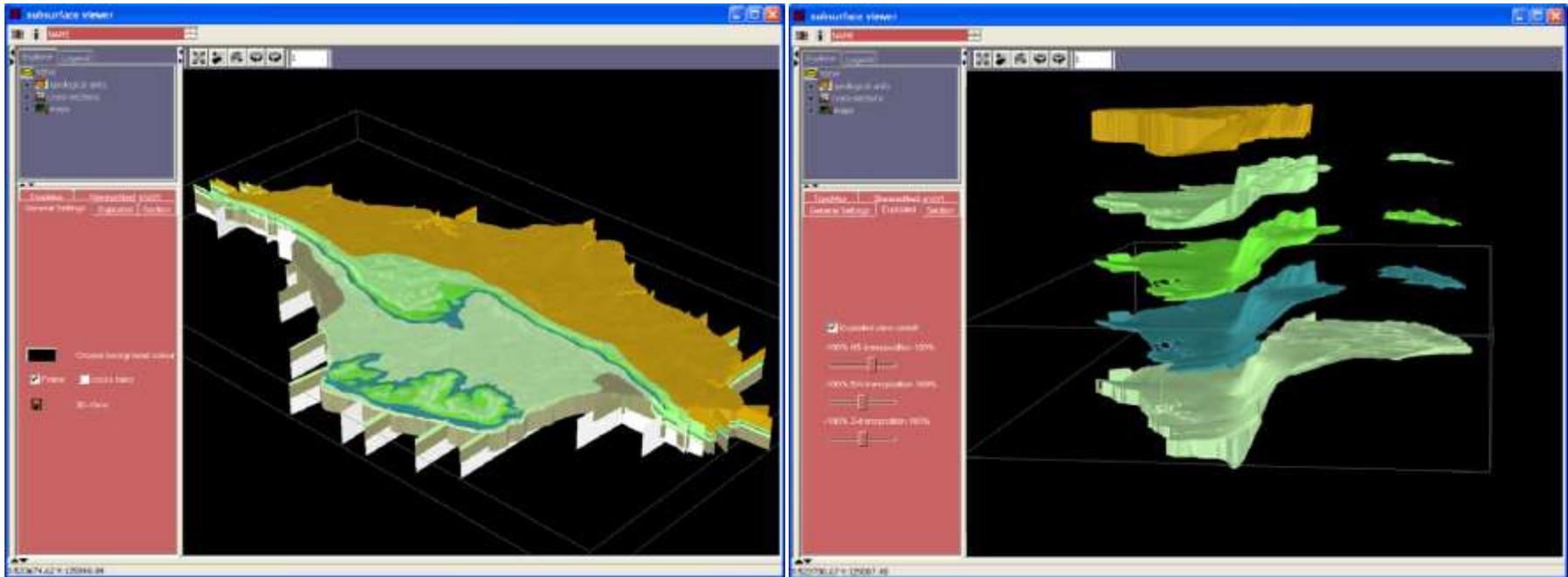
- **The Terms and Concepts Introduction Phase:** ask the student:
  - Can they identify certain rock sequences?
  - Can they identify the succession of rocks?
  - Structures or faulting?
  - Can they determine the dip and strike of certain beds?
  - Can the student draw a cross section of this area and then compare it with what the model produces?
  - Can they deduce how each of these rock units was formed? If so can they now put together a summary of the history of this area?



- **The Application Phase:** Can the student hypothesise what may happen to the geology in this area in the future? Do they think this would be a good area for the disposal of waste? What kind of waste? What kind of waste? Developing real-world skills.



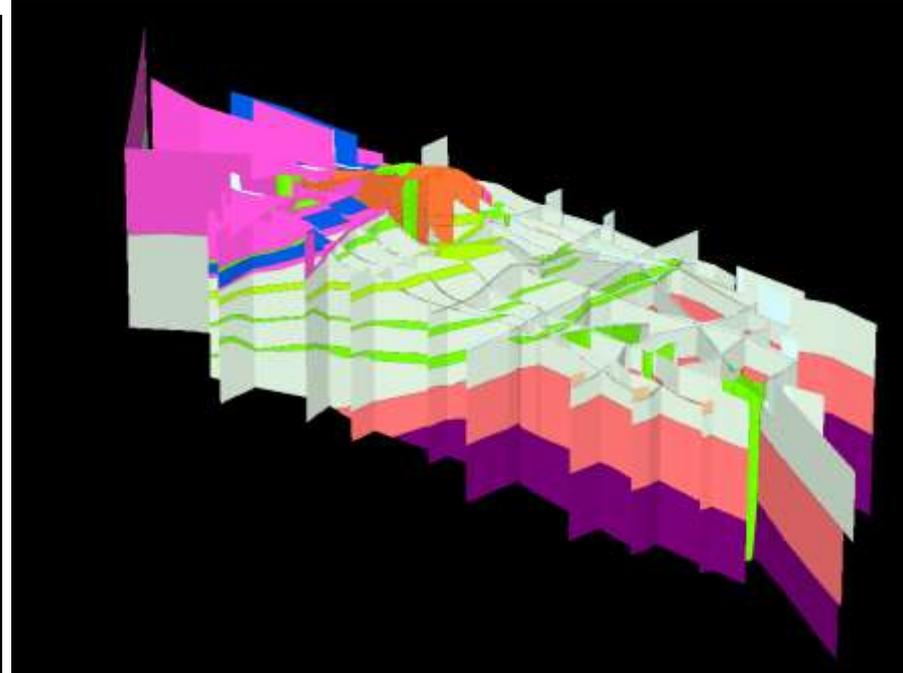
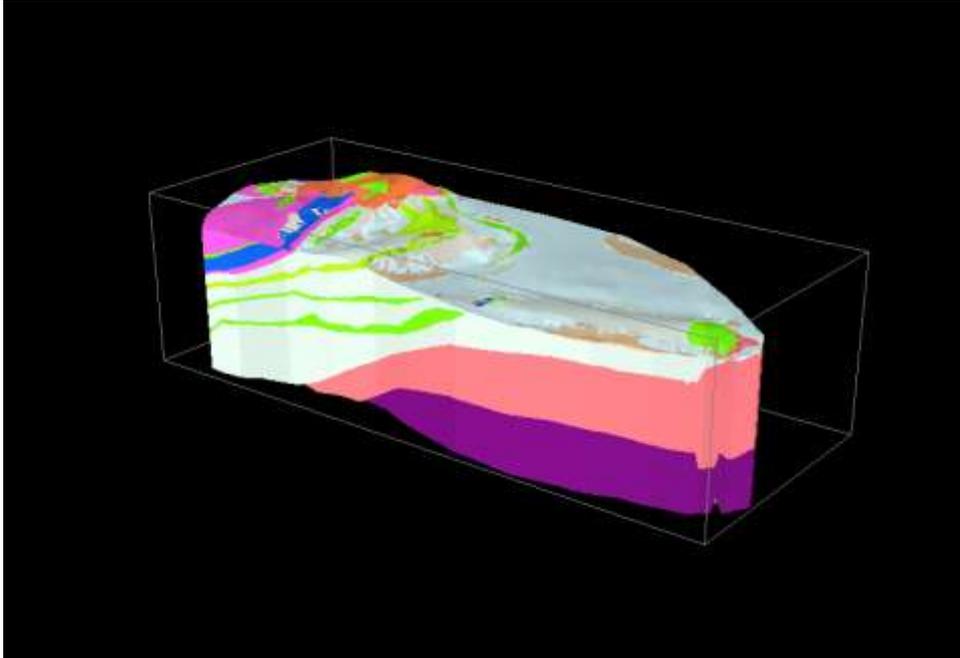
# Isle of Wight Model



## Learning points

- Groundwater, faults, permeability and porosity, saturated and unsaturated zones, water table, aquifers and aquicludes.

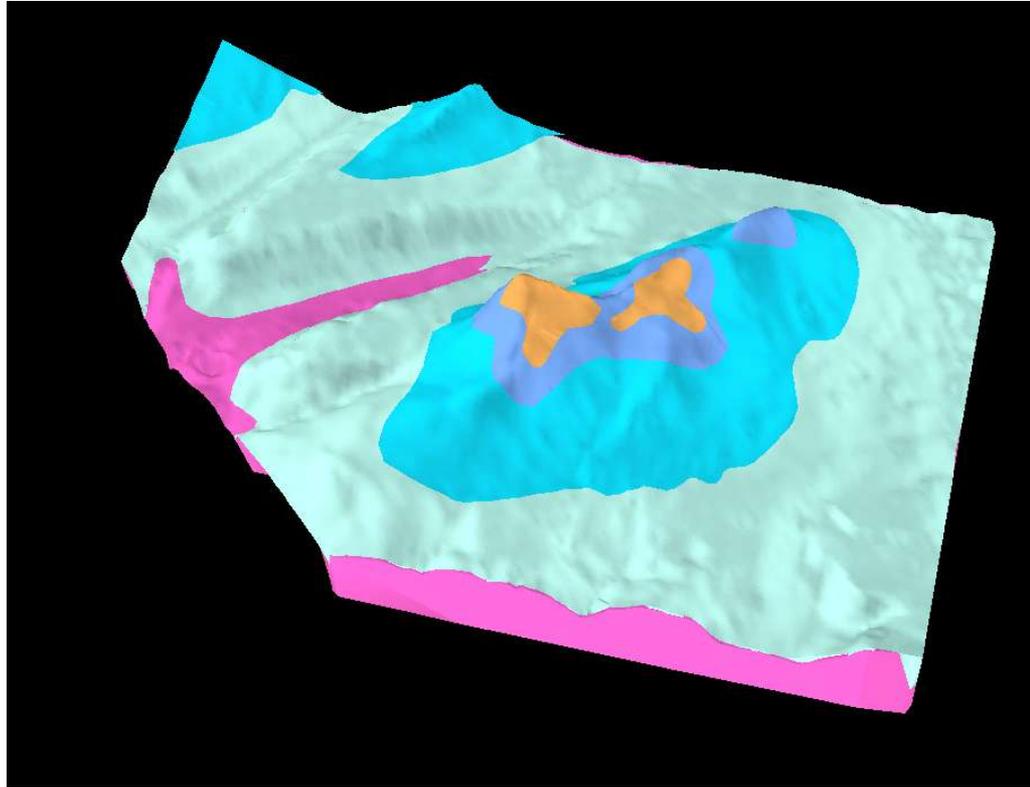
# Edinburgh Model



## Learning points

- Evidence for glaciation (crag and tail), direction of ice flow, igneous intrusions, volcanism, and geoconservation.

# Ingleborough Model



## Learning points

- Mineral resources, sequence stratigraphy, faulting and karst.

# Conclusions

- A wealth of research supports the use of digital 3D geological models as a resource for teaching and learning geoscience
- BGS is committed to producing 3D geological models for education
- Models will be created with complimentary educational material aimed at undergraduates
- These will be constructed incorporating educational strategies and case studies that encourage engaging learning and enhance geospatial skills
- **These models will be available to anyone teaching or learning geoscience free of charge**
- We are now developing models for use in schools and for wider outreach
- **We would love to hear from anyone who might be able to help us pilot these models or would like a demonstration at their university – any ideas or comments are also most welcome!**



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