The role of IT

The Digital Geoscience Spatial Model

The shape of the BGS of the future

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All geoscientists work with models, which might be defined as descriptions of reality from the perspectives of a particular theme or discipline. Models are classified in many ways, including spatial, numerical, statistical, process and descriptive models. A geoscience spatial model is an attempt to portray the rock-mass, as defined by bounding surfaces such as tops, bottoms, unconformities or faults, and by the properties of unit volumes that can be derived from seismic or tomographic surveys. It refers to a discrete object that is readily visualised and that can reference almost all other models, data and inferences associated with it.

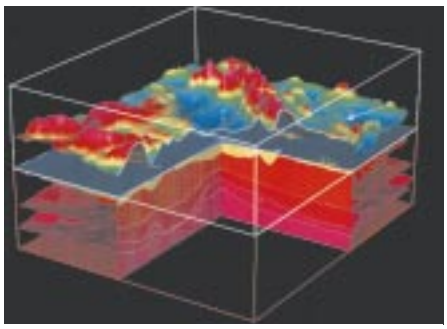
The reconciliation of different models is an essential part of improving the understanding of a geoscientific problem. Most of us will have experienced the difficulty of trying to convince a colleague about our interpretation, to find that theirs differs for any number of reasons. How enlightening it is when these differences are identified and understood. The difficulty we often have in sharing the information may be because it had been collected and analysed in different ways, or had been described using different parameters. If we can bring that knowledge into a consistent working environment, we have a greater chance of identifying the crucial differences between models that lead to an improved understanding of reality.

As a strategy for providing such a working environment, the BGS is developing the Digital Geoscience Spatial Model (DGSM), with additional funding from the Natural Environment Research Council. The DGSM is much more than just a spatial model: it is a computer-based environment that gives access and context to all geoscientific information, referenced through spatial models that have been developed at appropriate resolutions for defined scientific objectives. It will encapsulate the BGS's knowledge of the UK and its surrounding continental shelf and foster a model-centred ethos within the BGS, in which all geoscience disciplines will contribute to, and continually enhance, a set of multidimensional coherent, integrated geoscience models.

The initial tasks will be to define corporate standards for modelling. These will include a database structure in which the geometrical information is stored. The database will accommodate the basic elements used to build the model (such as points, lines, surfaces and volumes, together with a wide range of attribution) and the completed models. The spatial models will be associated with a wide range of metadata that will enable them to be identified, classified and evaluated. The wide range of modelling applications used in the BGS will be assessed to ensure that they are appropriate, cost-effective and accessible. The 'best practice' strategies for modelling and a method for determining the indicator of confidence with which the model approaches reality will be established. Procedures will be defined for analysing existing digital documents and composing new text, in order to allow accurate and reliable referencing and access. Having set the standards for some of these issues, the project will determine how to link together the models and other data, including text descriptions, photographs, images and statistics, as well as the observational data. This will allow 'drilling-down' through metadata to see the full range of information on the model.

Having established the framework described above, the population of the DGSM for the UK can proceed. Six pilot schemes have been set up to create DGSM-format information from recent studies. One is to convert existing digital geological maps into fully attributed 3D geological elements. The others will examine a range of resolutions from a detailed Holocene and Quaternary succession in a coastal zone, regional studies of Mesozoic and Palaeozoic successions beneath urban and industrial concentrations, the dynamics of a Permo-Triassic sedimentary basin and the offshore oil province. As the pilot schemes develop, it is expected that other aspects of the BGS's work will be merged into the DGSM.

Linking the models and the data in a single environment will create a platform for identifying the conflicts and similarities in interpretations. It will provide a means for investigating complex issues and will fuel challenging debate. It will be a source of modelled data for our clients and visualisation of the models, supported by comprehensive information, will help to enhance the public understanding of geoscience. Access to the information will increasingly use World Wide Web technology. Although conceived for geoscience models, the structure is planned to be generic and to handle any model type from any discipline: the DGSM should foster collaboration between scientists from different disciplines who are addressing problems in common.



A 3D crustal model of the Atlantic margin showing six geological layers. Their calculated gravity response is compared against the observed field.