Paper Number: 1673

Modelling the geology of the GeoEnergy Test Bed, East Midlands UK

Pharaoh, T.C.[1], Ambrose, K.[1], Vincent, C.J [1, 2], Pearce, J.M.[1], and Hall, M.R [1, 2].

[1] British Geological Survey, Keyworth, UK tcp@bgs.ac.uk
[2] University of Nottingham, UK

The British Geological Survey and University of Nottingham are founding partners of the GeoEnergy Research Centre (GERC) and play a lead role in the G-ERA (Geoscience component, Energy Research Accelerator) programme. The GeoEnergy Test Bed, a unique research site, is being established on land owned by the University of Nottingham in the English Midlands, to evaluate a number of geoscientific issues relevant to the British national Carbon dioxide Capture and Storage (CCS) research programme. Future CCS schemes in the UK are likely to involve exploitation of saline aquifer or depleted offshore gas reservoirs in the North Sea and Irish Sea, with the early Triassic Sherwood Sandstone Group (Bunter Sandstone equivalent) playing a key role.

At the test site, both the Sherwood Sandstone and the Mercia Mudstone seal/caprock can be accessed at relatively shallow depth (<300 m). The purpose of the test site will be to develop and evaluate sensor technologies and fluid flow modelling techniques that can be deployed around the world. Various processes that control CO_2 migration within the storage reservoir, and above the storage site in the unlikely event of a leak, will be investigated. Such processes include the transport of fluids through fault seals, the impact of deformation bands on shallow fluid movement, the potential for natural attenuation of migrating fluids and the mechanical and mineralogical changes in the storage complex, including the caprock caused by CO_2. Experiments will be conducted on extracted core samples. The site will also provide large-scale data sets to validate the sensors and software under development. Several instrumented boreholes, geochemical and geophysical experiments are planned to study these processes and the site will provide a unique test facility for the development of advanced sensors for monitoring the shallow subsurface, as well as samples for a range of physical, chemical and mineralogical investigations.

The 3D model presented represents the first step in the geological characterisation of the test site. It was constructed from 2D seismic reflection data acquired during exploration for hydrocarbon and coal resources during the 1980s, constrained by deep boreholes that lie near the research site which have extensive geophysical log suites. The model incorporates all relevant and deeper stratigraphic horizons, and fault surfaces. Development of the model illustrates the workflow necessary for characterising the shallow subsurface driven by the need to reduce risks. It is already clear that a 3D seismic survey with better near-surface resolution will be required to adequately characterise the site.