

Petrel Sub-basin 3D Geological Modelling and Simulation for CO₂ Storage Assessment

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Geoscience Australia has recently completed the Bonaparte CO₂ Storage project, a regional assessment of the CO₂ storage potential of the Petrel Sub-basin. In 2009, two greenhouse gas assessment areas were released, PTRL-01 and PTRL-02, under the Offshore Petroleum and Greenhouse Gas Storage Act (2006). Both are proximal to the developing LNG market in Darwin, as well as a number of hydrocarbon accumulations in the Bonaparte Basin. These permits define the area of interest for the project.

A key component of the project was geological modelling to test CO₂ injection scenarios. Initial 3D seismic horizon surfaces were generated to create a “simple” geological model. A “complex” geological model was then built by integrating a structure model, which was depth converted. Subsequently, the models were populated with reservoir properties such as Vshale, porosity and permeability. Palaeogeography maps were generated for all pertinent stratigraphic units and were used to populate the model where well control was lacking.

Using Permedia™ modelling software, CO₂ migration simulations with randomly located injection wells were run on a high resolution model to study the migration pathways, major accumulations and the effects of vertical anisotropy. Smaller areas of interest were then identified to reduce the size of the model and allow fluid flow reservoir simulations study using Permedia™ and CMG-GEM™. The latter study estimated the practical injectivity, storage volume, reservoir pressure during and after CO₂ injection.