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Multi-scale stratigraphic forward modelling of the Surat Basin for geological storage of CO₂

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It is generally accepted that underground geological storage of CO₂ (GSC) in deep aquifers is the option with the highest potential storage capacity [1]. Detailed subsurface models with a high level of subsurface understanding are required for GSC site characterisation and estimation of CO₂ storage capacity and for flow simulations. To attain this high level of subsurface understanding, models need extensive well data and good 3D seismic coverage, often not available at potential GSC sites. The technology of Stratigraphic Forward Modelling (SFM) has advanced to the stage where numerical simulation of the depositional processes can be used to predict reservoir properties at appropriate scales, away from wells and below seismic resolution. With these predictive qualities, SFM could potentially provide the subsurface understanding required for GSC, even in locations with limited wells and no seismic data.

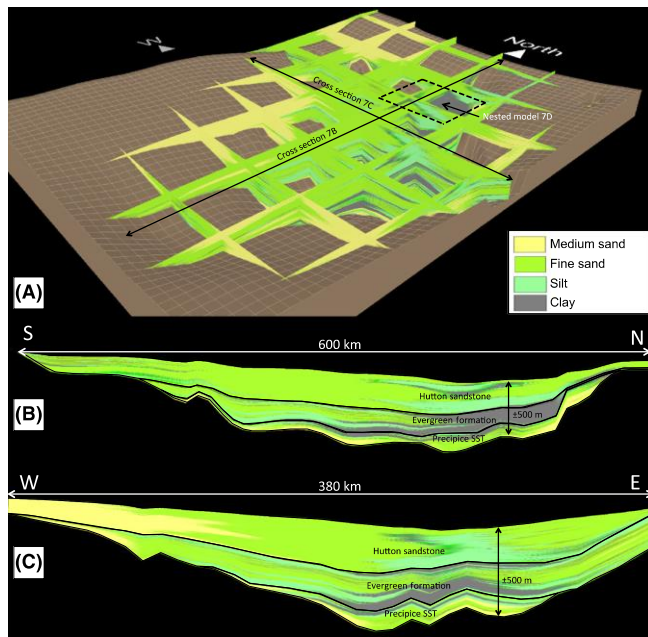


Figure 1 Stratigraphic forward model of the Jurassic of the Surat Basin, Queensland, Australia.

This study demonstrates the use of SFM in generating a static reservoir model, using limited well data, with multiple potential applications within the GSC workflow. Sedsim SFM software was used to create a static model of the Surat Basin, including a high-resolution nested model of the EPQ-7 GSC tenement within the basin. Deposition and burial of the Jurassic Precipice Sandstone, Evergreen Formation and Hutton Sandstone were simulated. Modelling results show a close match with gamma-ray well logs in the tenement area, and the model can be considered a credible model of the subsurface. The Sedsim-predicted formation thicknesses and porosity and permeability distributions meet criteria set for GSC, suggesting that the EPQ-7 tenement may be a prospective GSC location.

References:

[1] IPCC Special Report on Carbon Dioxide Capture and Storage. In: Prepared by Working Group III of the Intergovernmental Panel on Climate Change (B. Metz, O. Davidson, de Coninck H. C., M. Loos and L. A. Meyer, eds). 442 pp. Cambridge University Press, Cambridge, UK and New York, NY, USA.

[2] Ravestein, J. J., Griffiths, C. M., Dyt, C. P., Michael, K., 2015. Multiscale Stratigraphic Forward Modelling in the Surat Basin for Geological Storage of CO₂. doi: 10.1111/ter.12166 , Terra Nova, Vol 27, No. 5, 346–355

