

Multi-Scale Structural Analyses in a Complex Sedimentary Basin

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ABSTRACT

Understanding the evolution of stress and strain through time in a region is critical to understanding its tectonic history and structural framework. Such an understanding is particularly challenging along passive margins, where stress evolution and its relation to present day strain is poorly understood. The study area is Australia's Otway Basin, an ideal locale to address the structural and geomechanical challenges that such passive margin settings pose. The study will focus on spectacular, well-exposed outcrops along the Southern Victoria coast with the aim of determining the timing and magnitude of the tectonic events that led to the multiple phases of deformation evidenced by these rocks. The aim of the project is to develop a comprehensive model of the basin's paleo-stress, its present day strain, and the distribution and orientation of natural fractures and faults. These learnings will have significant economic benefit as the Otway is an important exploration target for both conventional and unconventional resources, geothermal energy and CO₂ storage. Specific project objectives are to reconstruct the stress history of the Otway Basin through the integration of current regional tectonic models with 2D and 3D seismic interpretation, specialised petrophysical analyses and Etchecopar's calcite twin stress inversion technique (CSIT). The expected outcomes of the research include 1) the resolution of how stress and strain have evolved through time within the complex passive margin environment of the Basin; 2) development of models to predict reservoir and seal integrity as a function of the rock geomechanical properties; 3) assist in identifying targets for hydrocarbon exploration and sites for the sequestration of CO₂.