

INSIGHTS INTO THE TECTONIC STRESS HISTORY AND REGIONAL 4D NATURAL FRACTURE DISTRIBUTION IN THE AUSTRALIAN COOPER BASIN USING ETCHECOPAR'S CALCITE TWIN STRESS INVERSION TECHNIQUE, 2D/ 3D SEISMIC INTERPRETATION AND NATURAL FRACTURE DATA FROM IMAGE LOGS AND CORE

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Abstract

The Cooper Basin is Australia's largest onshore hydrocarbon basin with tremendous value for unconventional resources. Optimization of these resources will benefit from an understanding of the paleo-stress, current stress, natural fracture distribution and orientation, and a modern tectonic history model. The timing and magnitude of polyphase tectonic activity will be the primary focus, with outcomes to include constraining the paleo-stress and natural fracture distribution sustained by rocks with change in time, as well as the potential to extrapolate findings between wells and comment on likely reservoir quality variations. This research will aim to reconstruct the stress history of the Cooper Basin through the integration of current regional tectonic models with two-dimensional and three-dimensional seismic interpretation and Etchecopar's calcite twin stress inversion technique (CSIT). The CSIT, unlike conventional stress analysis, determines not only a current day stress orientation but also paleostress orientations and magnitudes. Calcite that is appropriate for sampling is commonly found within matrix, or as veins in non-carbonate formations. With the successful completion of the CSIT component, a technique that incorporates CSIT results will be explored to estimate the evolution of overpressure. Our results will (1) benefit unconventional drilling programs utilizing fracture stimulation treatments to exploit natural fractures; (2) provide and test models to predict reservoir quality as a function of the structure and stress through time; (3) provide valuable data for future research; and (4) generate a modern structural model for the tectonic evolution of the Cooper Basin.

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