AAPG International Conference
Barcelona, Spain
September 21-24, 2003

Suzanne Hunt[1], Peter Boult[2] (1) NPCGG Adelaide University, Adelaide, Australia (2) PIRSA, St. Morris, Australia

2D and 3D Discrete Element Stress Modelling in the Otway Basin, Australia

Faults and horizon boundaries can greatly affect the magnitude and orientation of the in-situ rock stress state, which can, in turn, give rise to top seal breach.

UDEC (ITASCA-2D) and 3DEC (3D) discrete element codes have been applied to model stress perturbation around three simple fault configurations. The results show rotation in the principal stress orientation and stress magnitudes of the regional stress field about the faults. The degree of rotation of the principal stress direction and the stress magnitude are dependant on the fault friction angle parameter, the angle of maximum principal stress to the fault plane and the ratio of maximum to minimum principal stress. The degree of perturbation is demonstrated graphically in the surrounding rock mass along the fault strike, the perturbation generated by the fault can be up to 1.4 times the magnitude of the maximum principal regional stress and is highly dependent on friction angle.

Examples are given from the Katnook graben region of the Otway Basin, South Australia area there are 4 gas fields full-to-spill, 4 partially breached and one fully breached accumulation. By applying a simple 2D model, in which the major graben bounding faults are assumed to 1) be less strong than their host rocks and 2) perturb stress trajectories in accordance with previously described numerical modelling, the location of zones of high stress appear to coincide with breached and partially breached hydrocarbon accumulations. A simplified 3D fault model is applied which shows general agreement with the 2D model results.