Faults as Barriers and Conduits to Flow: Investigating the Dual Influence of Faulting on Hydrocarbons in the Kupe Field, South Taranaki, New Zealand

Samuel Hemmings-Sykes
University of Victoria, Geological Sciences Department
Wellington, New Zealand
sam.hemmings.sykes@gmail.com

Faults can act as both barriers and conduits to the flow of hydrocarbons. An understanding of the dual behaviour of faults within oil and gas bearing basins is required to assess hydrocarbon charge together with reservoir compartmentalisation and seal integrity. These factors can significantly impact on the economic potential of hydrocarbon reservoirs and thus the ability to predict fluid and gas flow in fault zones in offshore regions based primarily on seismic reflection data is becoming increasingly important.

During exploration assessing the effects of faulting on the migration of hydrocarbons is critical for understanding the charge history of prospective traps and for determining where accumulations of hydrocarbons are likely to occur. Faults and fractures within seals may increase the risk of leakage and profoundly influence reservoir prospectivity. In addition, fault seal has the potential to compartmentalise a reservoir on both production and geological timescales.

While methods for predicting across-fault flow are well advanced, current geomechanical and geometrical methods for predicting updip hydrocarbon migration (and leakage) due to faulting are relatively untested. This M.Sc. thesis will test available updip hydrocarbon migration methods and examine the following key questions in the Kupe Field, South Taranaki, New Zealand:

1. Can the seismic expression of hydrocarbon flow be correlated with, and confirmed by, surface physical expressions?
2. Under what circumstances do faults impact on the migration of hydrocarbons?
3. Can we successfully predict where flow will occur along faults using existing geometrical or geomechanical models?