

## **LOW GRADE METAMORPHIC study to PRECISE the geodynamic history and hydrocarbon migration system of THE HIKURANGI PRISM (north island, new zealand)**

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The Hikurangi subduction wedge has undergone several deformation episodes periods mainly related to subduction processes, and leading to complex stratigraphic and structural patterns: i) Initial formation of an accretionary complex on the eastern Australian margin during Triassic, Jurassic, and Early Cretaceous times; ii) a stage of tectonic quiescence during Late Cretaceous to Oligocene times; iii) and the renewal of westward subduction beneath North Island since the Early Miocene to present day. The onland exposure of Neogene trench slope basins together with their Jurassic to late Paleogene pre-subduction series permits to provide a high-resolution sampling grid including all lithostratigraphic units.

A multi-proxy approach was performed to determine organic matter (OM) maturity (organic petrography, Rock-Eval pyrolysis (REP), vitrinite (VR) and solid bitumen reflectance (BR) compared with clay mineral reaction progress (illite Kübler-Index (KI) and clay mineral paragenesis). Determining different bitumen populations and hydrocarbon migration allows a better understanding of the thermal evolution and fluid migration. The combination of clay mineral indices and organic matter reflectance and VR versus BR allows the recognition of heat flow changes during sedimentary and tectonic burial.

VR (%) and REP results show no significant maturity in the thick Neogene sedimentary cover. These measurements indicate a very low geothermal gradient during Early Miocene to Late Miocene within the Coastal Ranges. Distribution of illite/smectite interstratified phases in the Cretaceous up to the Miocene strata confirm these results.

KI determination from Late Miocene rocks from offshore wells (Titihaoa-1 and Tawatawa-1) and from onshore outcrops, indicates a clear influence of detritus using the KI from the <2 µm and <10 µm fractions. We observe that illite from Lower to Middle Miocene series are less ordered than in the Late Miocene. KI determination from Lower to Middle Miocene series reflect low-grade diagenesis while the Late Miocene series indicate an anchizonal KI grade. The deposition of detrital material can be associated with a Late Miocene erosional phase that affected the main structural highs separating the Neogene slope basins or other contemporaneous reliefs further west. At least three periods of fluids migration can be distinguished between Early Miocene to Pliocene. These are associated to bitumen migration (solid bitumen) and gas hydrate formation related to main deformational events and can be linked to the Late Cretaceous to Paleocene source rocks of the basin.