DIRT TALK

PALEOENVIRONMENTAL AND DIAGENETIC CONTROLS ON THE PETROLEUM GENERATION CHARACTERISTICS OF THE LATE PALEOCENE WAIPAWA FORMATION OF THE EAST COAST BASIN, NEW ZEALAND

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The Late Paleocene Waipawa Formation is the most prospective source rock unit of the East Coast Basin (ECB). We examine the paleoenvironmental and diagenetic controls responsible for variations in the richness and type of organic matter throughout a freshly exposed road cut in the Taylor-White section, upper Angora Road, southern Hawke's Bay. This section preserves transitional contacts with the underlying and overlying Whangai and Wanstead formations, respectively. Samples spanning a continuous ~56 m thickness of the Waipawa Formation were analysed for stratigraphic changes in geochemistry and compared with other ECB outcrop samples from the Raukumara Peninsula, Hawke's Bay, and Wairarapa. Multiple proxies indicate cyclical changes affected the quantity and type of organic matter preserved. C_{30} 24-*n*-propylcholestanebiomarkers from bitumens diagnostic of marine chrysophyte algae were correlated positively with pulses of increased total organic carbon (TOC) and hydrogen index (HI). Kerogens also display similar cyclical variations of elevated phenol concentrations, likely derived from land-plant remains. Independent of biotic inputs there is evidence of early diagenetic variations affecting the preservation of organic matter. Total sulphur (TS) concentrations correlate positively with TOC and HI and may indicate enhanced preservation associated with sulphurisation. T_{max} values correlate negatively with TS, suggesting relatively weak sulphur-carbon bonds were preferentially cleaved at lower temperatures, which may induce earlier and shallower generation of petroleum. Reduced sulphur species were formed by bacterial sulphate reduction (BSR). Sulphur isotope values adjusted for Late Paleocene seawater sulphate signatures are consistent with active BSR, which requires at least dysoxic conditions at shallow sediment depths. BSR rates were variable and where highest, likely resulted in up to a 2 wt.% reduction in preserved marine organic matter, with concomitant reduction in oil potential. The diverse and highly variable nature of these geochemical processes requires dramatic changes to have occurred during the deposition of the Waipawa Formation.