

# Miocene–Pliocene paleogeographic reconstructions of the eastern Taranaki Basin, New Zealand

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Paleogeographic reconstructions of New Zealand's central-western North Island sedimentary basins (Taranaki, Wanganui and King Country basins) are illustrated in a series of paleogeographic maps that span the Early Miocene (Otaian Stage, c. 20 Ma) to Late Pliocene (Waipipian Stage, c. 3.4 Ma). The maps integrate existing published, unpublished and open-file petroleum datasets with the results of a new basin analysis of the Early Miocene to Pliocene succession in onshore eastern Taranaki Peninsula and southern King Country.

The establishment of the stratigraphic architecture of the onshore outcrop section involved a combination of geological mapping, sequence stratigraphic analysis and well-log interpretation, combined with a chronostratigraphic template established through macrofaunal and microfaunal biostratigraphy and paleomagnetic dating.

Evidence of tectonic and eustatic events that occurred during the Miocene-Pliocene are more clearly expressed in the stratigraphic succession exposed onshore than in offshore parts of the Taranaki Basin, as the eastern parts of the basin were more proximal to the plate boundary and sediment sources. A revised sequence stratigraphic framework has aided interpretation of the linked depositional systems and paleogeographic zones across the onshore and offshore parts of the Taranaki Basin.

The paleogeographic synthesis has revealed a close relationship

between the formation of depocentres along the western North Island (eastern Taranaki) and the position beneath the Australian lithosphere of the leading edge of the subducted slab of Pacific oceanic plate, which migrated progressively southwestward during the Neogene. The paleogeographic maps 'flesh out' the detail of the broad tectonic elements of the evolving western North Island foreland to back-arc system.

Three tectonic phases are evident in this region:

- 1) a phase of crustal shortening, uplift and erosion across the North Island reflecting the development of the new transpressional plate boundary zone, and expressed as basement overthrusting along the Taranaki Fault and related faults;
- 2) a phase of basin formation (up to 100 km wide) in the overriding Australian lithosphere immediately behind the leading edge of the subducted slab of Pacific plate, forming Middle Miocene to Pleistocene sub-circular depocentres (King Country and Wanganui basins); and,
- 3) a phase of broad, flexural upwarping driven by thermal buoyancy of low-density mantle resulting in domal uplift, basin inversion and erosion of much of the basin fill.

The paleogeographic maps provide a framework to understand Taranaki Basin deep-water depositional fairways, including the Moki (Early-Middle Miocene), Mount Messenger (Late Miocene) and Mangaa (Pliocene) formations, and their correlative up-slope sediment-transport systems. The maps also allow a better prediction of the stratigraphy and petroleum system elements (reservoir distribution, timing, characteristics of burial-maturation-migration-charge-seal) to reduce exploration risk for those areas of the Taranaki Basin that have been lightly explored.

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