

## Basin reactivation associated with the mid-Cenozoic initiation of subduction, Taranaki, New Zealand

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The concept that incipient subduction processes influence basin development is applied to Taranaki Basin. It may also be applicable elsewhere in the western Pacific, where many basins occur in the vicinity of subduction zones.

Taranaki Basin, which contains all of New Zealand's producing oil and gas fields, initially formed as a series of rift basins associated with the breakup of the Gondwana supercontinent at the end of the Cretaceous. In the early Cenozoic, a subsiding landmass to the south and east was flanked by a mainly transgressive clastic system. Geohistory analysis of well sequences shows that tectonic-induced rates of subsidence within the basin began to increase from about the late Eocene, and accelerated in the mid Oligocene. The shoreline advanced across the basin margins, causing a virtual termination of clastic sediment supply by late oligocene times and consequent deposition of carbonate sediments in both shelf and bathyal settings. Clastic supply resumed in the early Miocene, resulting in depocentre infilling and sediment progradation across the basin.

We envisage that the mid Cenozoic subsidence in Taranaki

was driven by incipient subduction of the Pacific Plate beneath the northern New Zealand region. Two possible mechanisms are considered. One is hydrodynamically-linked platform subsidence of a wavelength in the order of 700–1000 km. The alternative involves a mechanical coupling between the Australia and Pacific plates resulting from shear stresses at the subduction thrust, in a manner similar to that proposed for Plio–Pleistocene subsidence within the adjacent South Wanganui Basin. This subsidence has a wavelength of around 200 km. A foreland thrust-loading model for initial mid Cenozoic subsidence in Taranaki Basin is discounted, judging from the sedimentary facies and subsidence history of areas bordering the basin. However, early subduction-related subsidence with wide regional extent was later accentuated within Taranaki by west-directed thrust loading in the early to mid Miocene, by which time subduction was well-established to the northeast.

All known hydrocarbon accumulations in Taranaki Basin are trapped in Neogene structures that formed in intra-arc or behind-arc settings with respect to Pacific Plate subduction.