

STRUCTURAL DEVELOPMENT OF THE WAIHAPA FIELD

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Abstract

The Waihapa structure in the Tarata thrust zone of eastern Taranaki Basin is a complex antiformal stack forming a 20 km² culmination east of Stratford. 2D seismic and well control allow good definition of tectonostratigraphic sequences and structural evolution.

Initial shortening in Waihapa occurred during the Oligocene (Lw). Stratigraphic geometries and structural modelling suggest early compressional deformation involved a component of mild positive inversion. Pre-existing extensional faults had east and trend approximately N-S as part of the Manaia Graben depocentre. Otaraoa Formation sediments form a probable passive fill thickened above the hanging wall.

Oligocene to Late Miocene (Lw to Sw) E-W shortening generated a series of dominantly westward verging frontal imbricates with a broad antiformal stack geometry. Associated back-thrusting is a widespread feature and both imbricate sets sole out near top Kapuni Formation. However, the major component of structural elevation above regional is due to inversion shortening on a deeper level detachment.

Balancing and restoration give a net shortening of 2 1/2 km across the structure. Fault trajectories and small scale structures at top Tikorangi are consistent with compressional structures being generated by a westward-directed deviatoric push. High level imbricate thrusts link eastwards with the main Taranaki Fault and were probably emergent at paleo-seabed. Lower Manganui and Moki formations form a compressional growth sequence; the Upper Manganui Formation is better regarded as a passive-fill sequence.

During the latest Miocene to Recent compression was superseded by a minor component of negative inversion with NNE-SSW trending listric extensional faulting locally seen to be hard linked back into underlying thrusts. Late dextral transtension resulted in localised compressional reactivation on constricting bends of pre-existing fault systems.

Authors

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