

High-Resolution Outcrop-Subsurface Correlation Using Biostratigraphy: Unlocking the Late Miocene, Mount Messenger Enigma in Taranaki Basin, New Zealand

Arnot, Malcolm J., and Martin Crundwell, GNS Science, Lower Hutt, New Zealand

The Mount Messenger Formation represents a highly dynamic deep-water system comprising slope to basin floor fan deposits that occur within stacked 4th to 5th order cycles deposited over timescales of 100-25 kyr. The late Miocene sedimentary patterns reflect a complex history of shelf progradation, tempered by sediment supply and accommodation, and tectonic controls within and adjacent to the basin. The variable nature of the system poses problems for exploration within the Mount Messenger interval, because rapid lateral and vertical variation in facies make it difficult to correlate, date and predict the spatial distribution of intervals containing potential reservoir facies.

In this presentation, we outline the application of new high resolution biostratigraphic data and tools that have been developed by GNS, specifically to address correlation problems associated with the late Miocene Mt Messenger interval. This work has enabled correlation from rocks exposed along the north Taranaki coast to the subsurface at Pukearuhe-1. Currently we are extending the correlation into the onshore Taranaki Peninsula region. In addition, extremely high estimated rates of sedimentation are recognised at intervals within the Mount Messenger succession, based on weight standardized counts of planktic and benthic forams, and sub-millennial scale dating of deep-water sediments, using a non-linear age interpolation method and dynamic facies analysis, based on minimum paleodepth data. When applied in combination, the new biostratigraphic tools provide a robust temporal and paleoenvironmental framework that enables the stratigraphic architecture of Late Miocene depositional systems to be correlated between wells at a level of resolution similar to seismic.