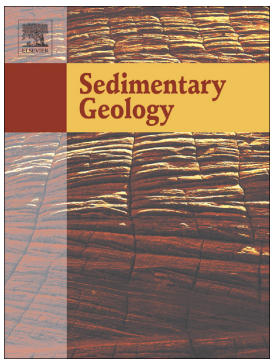

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Sandstone provenance and sediment dispersal in a complex tectonic setting: Taranaki Basin, New Zealand

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Abstract

Mineralogical, geochemical and detrital zircon data from key reservoir intervals in Taranaki Basin are integrated with paleogeography and basement maps to provide a synthesis of changes in sediment provenance and sandstone composition through time. Results show that sandstone composition and quality in Taranaki is strongly related to sediment provenance and basin history. Late Cretaceous syn-rift deposits display clear evidence for first-cycle erosion from local basement rocks, dominated by granites of the Median Batholith. A NE-SW trending shoreline belt developed through the Paleocene, which was associated with a gradual increase in sandstone maturity that peaked during the Eocene passive margin phase. Sediment provenance continued to be primarily from granitoids with transport directions from the S/SW to N/NE. Progressive quartz enrichment is interpreted to be a result of cleaning through longshore drift/longer transport distances, and enhanced chemical weathering due to warmer paleoclimates. We also evoke a component of eroded and recycled Cretaceous-Paleocene sediment linked to an episode of uplift in the south.

A transition period ensued from the Late Eocene to Early Miocene associated with a change in basin tectonics from passive margin to active margin. Compositional and detrital zircon U-Pb data indicate that rocks to the east of Taranaki Basin became emergent, with progressive erosion of Cretaceous-Eocene cover rocks and underlying basement terranes. Minor, southward-propagating uplift of the eastern basin margin was initiated in the latest Eocene, and by the Late Oligocene, provenance and sedimentation patterns had clearly changed with the earliest Miocene strata sourced from eastern metasedimentary basement rocks. The Eastern Province continued to be a major sediment source through the active margin phase, but mixed with the re-appearance of granite (?reworked) sources and Miocene volcaniclastic detritus. These changes in sediment provenance through time are displayed on a set of eight sediment dispersal maps, which can be used to help predict composition, and hence reservoir quality, in undrilled parts of the basin.

Keywords: sediment provenance; petrography; mineralogy; zircon geochronology