# Occurrence and Palaeohydrological Significance of Authigenic Kaolinite in the Aldebaran Sandstone, Denison Trough, Queensland, Australia

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**Abstract:** Thin section, XRD, SEM, and isotopic techniques have been used to study authigenic kaolinite occurring in reservoir sandstones of the Lower Permian Aldebaran Sandstone. Where the unit is no longer an active aquifer, kaolinite is an intermediate-stage phase, and is highly depleted in deuterium ($\delta D_{SMOW}$ = −115 to −99‰) and $^{18}O$ ($\delta^{18}O_{SMOW}$ = +7.8 to +8.9‰), indicating that precipitation must have been from meteoric water. Deep penetration of this water is linked to Late Triassic deformation and uplift of the Denison Trough sequence, an event which led to exposure of the Aldebaran Sandstone by the Early Jurassic prior to its re-burial beneath Jurassic and Cretaceous sedimentary rocks. The same water was probably involved in the creation of secondary porosity in the interval.

Where the Aldebaran Sandstone is presently undergoing meteoric flushing, kaolinite is relatively enriched in deuterium ($\delta D_{SMOW}$ = −104 to −93‰) and $^{18}O$ ($\delta^{18}O_{SMOW}$ = +11.7 to +14.6‰), reflecting precipitation largely from post-Mesozoic meteoric water which was isotopically heavier than the Mesozoic water involved in intermediate-stage kaolinite precipitation. This temporal shift in meteoric water isotopic composition is related to the northward drift of the Australian continent to lower latitudes since the Mesozoic Era.

**Key Words:** Aquifer • Diagenesis • Kaolinite • Petrography • Secondary porosity • Stable isotope analysis