

Dryland Sequence Stratigraphy of Fluvial-Lacustrine-Aeolian Depositional Systems – Examples from the Neales River, Western Lake Eyre, Australia

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Sequence stratigraphy in dryland successions has important implications for exploration and reservoir correlation in continental basins. A useful outcrop analogue is the Neales River, western Lake Eyre, Australia. A high-resolution record of fluvial, aeolian and lacustrine deposits (10m thick) of Late Pleistocene is exposed along the Neales Cliffs. Five major sedimentary units (equivalent to systems tracts) have been identified, reflecting a variety of changes in sedimentary processes, depositional environment and base level illustrating preservation of a complex stratigraphic architecture.

Following the ~200ka interglacial maximum, a drying-up systems tract is represented by a fluvial fining-upward trend, with palaeosols at the top (Unit 1). A wetting-up systems tract followed when lake level rises to +10m AHD during the last interglacial resulting in a lacustrine succession (Unit 2), but punctuated by regular dessication events. During the following drying-up systems tract, progressive lake level fall resulted in deep incision around 100 Ka, followed by enhanced fluvial deposition of fine-grained sediments (Unit 3). A brief rise in base level resulted in a wetting-up systems tract comprising a thin veneer of fluvial/alluvial sediments (Unit 4). During the last glacial maximum (peaking at 18ka), aridity increased in the tropical belt globally. This was accompanied by increasing strength and activity of the trade winds, and led to increased dune build up and gibber plain development, stabilised in association with lake level rise around 8 Ka. Subsequent lake level fall to the present lake level of -17 m AHD, resulted in deep incision (~10 m) of the Neales River.