

# **Mudstone Depositional Processes and Sequence Stratigraphy in the Permian Icehouse-to-Greenhouse Transition, Karoo Basin, South Africa**

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## **ABSTRACT**

Recent mudstone studies have mainly focused on successions deposited during greenhouse climatic periods in low palaeo-latitudes. Conversely, only a few address mudstone deposition in high palaeo-latitudes during icehouse periods, where seasonal and eustatic sea level fluctuations are expected to be more pronounced. The Eccra Group of the Tanqua depocentre (SW Karoo Basin, South Africa) represents an exhumed basin-floor to shelf succession deposited during the Permian icehouse-to-greenhouse climatic transition in a relatively high palaeolatitude (~60-70°S). This project aims to characterize the range of mudstone microfacies, depositional processes, and stacking patterns recorded in the Lower Eccra Group.

A 950-m long core from a research borehole in the Tanqua depocentre is described for the first time in this project using a combination of macroscopic and microscopic description techniques (core description, thin-section petrography, scanning electron microscopy, QEMSCAN). The core succession is characterized by a cyclic arrangement between mudstone hyperpycnites packages and churned mudstones packages with common faecal pellets and carbonate-rich concretions. The packages grade upward into a 200-m thick churned claystone-dominated succession with common interbedded carbonate rich-concretions. The core succession is tentatively interpreted to indicate deposition during glacial/interglacial cycles in a river-influenced offshore marine setting.

Moreover, regional correlations indicate that this mudstone succession is time-equivalent to a 450 m-thick, mudstone-dominated to sandstone-dominated basin-floor fan succession lying only 70 km across strike. Therefore, this project will focus on determining the across basinmargin strike variability in mudstone microfacies, depositional processes and stacking patterns using the same methodology as for the core succession. This project will also focus on determining the expression of major changes in sand supply in a mudstone succession across basin-margin strike, in order to test the applicability of sequence stratigraphic concepts in finegrained sedimentary systems.