

Sandstone Composition and Tectonic Setting of the Lower Permian Weller Coal Measures, Southern Victoria Land, Antarctica

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The 222-m-thick Lower Permian Weller Coal Measures are part of the Gondwana Sequence deposited along the Panthalassan Margin of Antarctica following retreat of the late Paleozoic ice sheets. The strata are now exposed in a narrow belt that extends along the edge of the Polar Plateau for at least 300 km in southern Victoria Land. During the Devonian, rocks in this area were deposited in an intracratonic basin, but by the Late Permian and into the Triassic the tectonic/depositional regime had changed to a foreland basin. Although the Weller Coal Measures have been extensively studied, there have been no attempts to use sandstone composition to elucidate the tectonic setting, and thus, the causes of Early Permian basin subsidence and accumulation of the Weller Coal Measures. This study presents the results of the analysis of 82 thin sections of medium- to granular-grained sandstones counted using traditional and Gazzi-Dickinson point counting methods, and interprets the tectonic setting of the basin during deposition of the Weller Coal Measures. Sandstone composition of Q(37-100%), F(2-40%), L(0-14%), with a typical composition of Q=80%, F=12%, L=8%, falls within the Arkosic, subarkosic and Quartzarenite fields of Folk (1968), and within the Continental Block Provenances of Dickinson and Suczek (1979). These results suggest a first cycle provenance for sandstones of the Weller Coal Measures within uplifted basement terrains. Therefore, the depositional basin has a petrographic signature of an early to late stage rift basin or of a pull apart basin in a strike slip setting. However, the apparent size of the basin favors development as a rift basin.