GEOCHEMICAL CHARACTERISTICS
OF THE LOWER MESOZOIC
SEDIMENTS IN THE MOUNT
FREELING AREA, NORTHWESTERN
FLINDERS RANGES

Thesis submitted in accordance with the requirements of the University of Adelaide for an Honours Degree in Geology

Farid Shahin
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TITLE

Geochemical characteristic of the lower Mesozoic sediments in the Mount Freeling area, northwestern Flinders Ranges.

RUNNING TITLE

Geochemical characteristics of Mount Freeling

ABSTRACT

An increased resource demand is largely due to the exhaustion of mineral deposits that are from predominantly shallow exposed settings, hence, in Australia there is a growing need for exploration techniques that provide an improved understanding of areas of deep transported cover. A case study conducted on lower Mesozoic sediments overlying the Mount Painter Inlier, NW Flinders Ranges (Mount Freeling area), using combined geochemical analysis, detrital zircon provenance data and Hylogger data aims to understand the source and characteristics of the transported cover. The Mount Painter Inlier consists of predominantly Mesoproterozoic sedimentary rocks and granites. Neoproterozoic sedimentary and volcanic sequences of the Adelaide Fold Belt form a cover up to 14km thick, therefore making the overlying lower Mesozoic sediments appropriate for refining the combined exploration techniques. Hylogger core scans conducted on the Recorder Hill, Ludbrook and Trinity Well Type Sections, NW of Mount Painter Inlier, show increases in the degree of crystallisation of kaolinite implying more proximal source regions moving stratigraphically up the profiles. U–Pb dating of detrital zircons shows a maximum depositional age of 122 Ma and 400 Ma for the Ludbrook and Recorder Hill samples respectively with the most influential sources being the Mount Painter Inlier and the Gawler Craton. HyLogger and Zircon data suggest that where there is a higher degree of crystallisation, there is a younger maximum depositional age and vice versa. The geochemical data set shows that when A-CN-K plots are used to plot the degree of feldspar weathering, samples tend to fall into groups and then these sub-groups can be used to recalculate anomalous and background levels for trace elements and major elements. Through the use of geochemistry, HyLogger and detrital zircon studies it has been shown that mineralisation zones can be targeted more cost effectively and efficiently.

KEYWORDS

Geochemical, Flinders Ranges, Mount Freeling, HyLogger, Detrital Zircon, Lower Mesozoic, Regolith, Deep Basin, Geochronology, Sediment Provenance
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