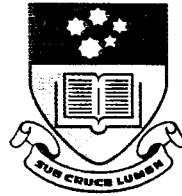


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THE UNIVERSITY OF ADELAIDE

**School of Earth & Environmental Sciences,
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**NEOTECTONICS
OF THE MOUNT LOFTY RANGES
(South Australia)**

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TABLE OF CONTENTS

Table of Contents	i
List of Figures	v
Abstract	vii
Disclaimer	viii
Acknowledgments	ix
CHAPTER 1: INTRODUCTION	1
1.1 Aim and Objectives	1
1.2 Geological, Tectonic and Geomorphological Backgrounds	2
1.3 Thesis Outline	6
CHAPTER 2: METHODS	8
2.1 Digital Elevation Model (DEM).....	8
2.2 Use of Geological and Geomorphological Cross-sections	12
2.3 Analysis of Planation Surfaces	12
2.4 Lithostratigraphic Analysis of Tertiary and Quaternary Sediments	13
2.5 Use of Global Sea-Level Curve.....	13
2.6 Combined Method of Palaeoreconstructions.....	14
CHAPTER 3: PRE-TERTIARY BASEMENT: GEOLOGY AND TECTONICS	15
3.1 Introduction.....	15
3.2 Proterozoic Complex	15
3.3 Late Proterozoic to Early Paleozoic Complex.....	16
3.3.1 Delamerian Structure	17
3.4 Late Paleozoic Complex	20
3.5 Mesozoic Development	24
3.5.1 Triassic through to Middle Jurassic	24
3.5.2 Mid-Jurassic through to the Cretaceous.....	25
3.5.3 Mesozoic Igneous Activities	27
3.5.4 Summary of Mesozoic Development.....	30
3.6 Mesozoic Plate Reorganisation since the Gondwanan Breakup.....	32
3.6.1 Study Region since the Gondwanan Breakup	34
3.7 Separation of the Australian and Antarctic Plates: Potoroo Extensional Tectonic Regime (~99Ma and ~43Ma).....	36
3.7.1 Study Region between 99Ma and 43Ma	39
3.8 Early Tertiary Environment.....	40
3.9 Pre- Middle Eocene Palaeoplain.....	41

CHAPTER 4: REGIONAL PALAEORECONSTRUCTIONS: THE MOUNT LOFTY RANGES AND FLANKING ST. VINCENT AND WESTERN MURRAY BASINS43

4.1 Introduction.....	43
4.2 Regional Stages	44
4.3 Johannian Stage (~43-37Ma).....	47
4.3.1 Johannian Stage in the St. Vincent Basin.....	48
North Maslin Sand.....	48
Clinton Formation.....	51
South Maslin Sand.....	52
4.3.2 Johannian Stage in the Western Murray Basin	56
Olney Formation.....	57
4.3.3 Johannian Stage: Conclusion	59
4.4 Aldingan (~37Ma) through to Balcombian Stages (~14Ma).....	60
4.5 Aldingan Stage (~37-34Ma)	60
4.5.1 Aldingan Stage in the St. Vincent Basin.....	61
Tortachilla Limestone.....	61
Blanche Point Formation	64
Chinaman Gully Formation	66
4.5.2 Aldingan Stage in the Western Murray Basin.....	69
Bucleuch Formation.....	69
4.5.3 Aldingan Stage: Conclusion.....	72
4.6 Willungan Stage (~34-29Ma)	73
4.6.1 Willungan Stage in the St. Vincent Basin	73
Aldinga Member of the Port Willunga Formation	74
Ruwarung Member of the Port Willunga Formation.....	76
4.6.2 Willungan Stage in the Western Murray Basin.....	77
Bucleuch Beds	77
4.6.3 Willungan Stage: Conclusion.....	78
4.7 Early Janjukian Stage (~29-24Ma).....	79
4.7.1 Early Janjukian Stage in the St. Vincent Basin.....	79
4.7.2 Early Janjukian Stage in Intramontane Basins.....	80
4.7.3 Early Janjukian Stage in the Western Murray Basin	88
Compton Conglomerate.....	88
Ettrick Formation.....	92
4.7.4 Early Janjukian Stage: Conclusion.....	94
4.8 Late Janjukian Stage (~24-21Ma).....	95
4.8.1 Late Janjukian Stage in the St. Vincent and Intramontane Basins.....	95
4.8.2 Late Janjukian Stage in the Western Murray Basin	97
4.8.3 Late Janjukian Stage: Conclusion	98
4.9 Longfordian Stage (~21-16Ma).....	99
4.9.1 Longfordian Stage in the St. Vincent and Intramontane Basins	99
4.9.2 Longfordian Stage in the Western Murray Basin	101

4.9.3	Longfordian Stage: Conclusion.....	103
4.10	Batesfordian-Balcombian Stages (~16-13Ma).....	104
4.10.1	Batesfordian and Balcombian Stages in the St. Vincent and Intramontane Basins.....	104
	Munno Para Clay Member of the Port Willunga Formation	105
4.10.2	Batesfordian-Balcombian Stages in the Western Murray Basin	106
4.10.3	Batesfordian-Balcombian Stages: Conclusion.....	107
4.11	Bairnsdalian and Mitchellian Stages (~13-5.5Ma).....	108
4.11.1	Late Miocene Sedimentary Termination, Uplift and Erosion.....	108
4.11.2	Nature of Miocene/Pliocene Unconformity, Erosion and Exhumation ...	110
4.11.3	Marine Bed-load Erosion.....	112
4.11.4	Bairnsdalian and Mitchellian Stages: Conclusion	114
4.12	Cheltenhamian and Kalimnan Stages (~5.5-2Ma)	114
4.12.1	Cheltenhamian and Kalimnan Stages in the St. Vincent Basin	115
	Kooyonga Formation	115
	Dry Creek Sand.....	115
	Hallett Cove Sandstone.....	117
4.12.2	Cheltenhamian and Kalimnan Stages in the Western Murray Basin.....	118
	Loxton Sand.....	120
	Parilla Sand.....	122
	Karoonda Surface	123
	Norwest Bend Formation.....	124
	Blanchetown Clay.....	125
4.12.3	Cheltenhamian and Kalimnan Stages: Conclusion.....	127
4.13	Werrikooian Stage (~2Ma to Present).....	128
4.13.1	Werrikooian Stage in the St. Vincent Basin	133
	Burnham Limestone.....	133
	Point Ellen Formation.....	134
	Hindmarsh Clay	134
	Keswick Clay.....	137
	Gley Clays and Black Earths	138
	Glanville Formation.....	138
	Carbonate Pedoderm.....	139
	Pooraka Formation of the St. Vincent Basin	141
	St. Kilda Formation	143
4.13.1.1	Werrikooian Stage in the St. Vincent Basin: Conclusion	144
4.13.2	Werrikooian Stage in the Western Murray Basin.....	145
4.13.2.1	North-Western Murray Basin.....	145
	Blanchetown Clay.....	146
	Bungunnia Limestone	146
	Pooraka Formation in the Western Murray Basin	146
	Woorinen Formation.....	148
	Molineaux Sand.....	150

Coonambidgal Formation	150
4.13.2.2 South-Western Murray Basin.....	151
Coomandook Formation	151
Bridgewater Formation	153
4.13.3 Werrikooian Stage in the Western Murray Basin: Conclusion.....	155
4.14 Regional Palaeoreconstructions: Conclusion	156
CHAPTER 5: NEOTECTONICS OF THE MOUNT LOFTY RANGES AND FLANKING ST. VINCENT AND WESTERN MURRAY BASINS.....	159
5.1 Introduction.....	159
5.2 Neotectonic Plate Reorganisation.....	162
5.3 Neotectonic Settings	165
5.3.1 Tertiary Extensional Setting: Crustal Segmentation	174
5.3.2 Tertiary Extensional Setting: Strain Accommodation and Transfer Zones	175
5.3.3 Lake Bungunna: A New Assumption	179
5.3.4 Nature and Regional Significance of Tertiary Strain Transfer Zone	180
5.3.5 Compressional Neotectonic Setting	185
5.4 Neotectonic Setting: Independence versus Inheritance (Discussion).....	191
CHAPTER 6: GEOMORPHOLOGY AND LANDSCAPE EVOLUTION OF THE MOUNT LOFTY RANGES	197
6.1 Introduction.....	197
6.2 Geomorphological Setting of the Mount Lofty Ranges.....	199
6.2.1 Major Watershed of the Mount Lofty Ranges	207
6.3 Palaeodrainage Reconstructions	210
6.3.1 Palaeodrainage of the Eastern Portion of the Mount Lofty Ranges.....	211
6.3.2 Palaeodrainage of the Western Portion of the Mount Lofty Ranges	223
6.4 Landscape Evolution of the Mount Lofty Ranges	235
6.4.1 Drainage Initiation (Middle-Late Eocene)	236
6.4.2 Subtle Erosion (Oligocene-Middle Miocene)	237
6.4.3 Landscape Relaxation (Late Miocene–Early Pleistocene).....	241
6.4.4 Vigorous Erosion (Mid-Pleistocene-Recent)	243
CHAPTER 7: SYNTHESIS & CONCLUSIONS	246
7.1 Introduction.....	246
7.2 Three Stage Neotectonic Model	247
7.2.1 Neotectonic Stage I: Crustal Extension (~43Ma to ~15Ma).....	247
7.2.2 Neotectonic Stage II: Transitional regime (~15Ma to ~1Ma).....	252
7.2.3 Neotectonic Stage III: Crustal Compression (~1Ma to Present).....	246
7.3 Conclusion	258

ABSTRACT

The Mount Lofty Ranges resulted from long-term interaction mainly between neotectonic movements and fluvial processes. This thesis presents an original comprehensive neotectonic study incorporating a structural analysis, lithostratigraphic data interpretations, and various geomorphological investigations. This study begins by introducing a multidisciplinary approach to neotectonic analysis including traditional and advanced methods such as Digital Elevation Models (DEMs). Regional stages were used as an appropriate time-framework for palaeoreconstructions and correlations of basin sedimentation with fluvial stream competence (erosion and sedimentary supply).

In contrast to the traditional hypothesis that Tertiary uplift of the Ranges was due to compressional reactivation of Delamerian structures (~500Ma), this study reveals three principal neotectonic stages associated with specific tectonic regimes: 1) Extensional Stage (Middle Eocene to Middle Miocene); 2) Transitional Stage (Late Miocene to Early Pleistocene); and 3) Compressional Stage (Early Pleistocene to the Present). Several lines of evidence are provided showing the independence of neotectonic structure from basement fabric.

A large region of South Australia was represented by a gently undulating and deeply weathered Palaeoplain during the early Tertiary. In a methodological/analytical first, the global eustatic curve was used to evaluate the altitude of this Palaeoplain (~250-300m above the present sea-level). This study also revealed that the effect of sea-level change onto the landscape during the Tertiary was more significant than previously considered. The initial crustal segmentation (Middle-Late Eocene) involved subsidence of the St. Vincent and Western Murray Basins while remnants of the high-standing Palaeoplain became the Mount Lofty Ranges. Further crustal segmentation and subsidence resulted in the formation of embayments, and intramontane basins such as Meadows-Myponga, Hindmarsh Tiers and Barossa. Fundamental attributes of extensional tectonics such as strain transfer and accommodation zones, tilting and crustal segmentation recognised in the Tertiary tectonic setting.

The major compressional tectonic activity was associated with steep reverse faults on both sides of the Ranges. This compressional neotectonic regime resulted in Pleistocene uplift of the Mount Lofty Ranges that resulted in a major lithological change in the sediments of both the St. Vincent and Western Murray Basins. The young and dissected landscape with a number of stream gorges and waterfalls on both marginal sides of the Ranges is correlated with stream gravels including cobbles, pebbles and slope debris. This compressional neotectonic uplift of the Ranges mainly occurred during the Pleistocene (~1Ma) and continues today as indicated by seismic activity and insitu stress measurements.