

Table of contents

Abstract	3
Riassunto	5
Chapter 1. Introduction	13
1.1. Background	13
1.2. Objectives of the thesis	17
1.3. Geological setting	17
1.4. Structure of the thesis	19
References	20
Chapter 2. Protracted near-solidus storage and pre-eruptive rejuvenation of large magma reservoirs	25
2.1. Introduction	27
2.2. Zircon-titanite age and temperature systematics	27
2.3. Thermal state of supereruptive magma bodies	31
2.4. Thermal effect of rejuvenation	33
2.5. Methods	35
2.5.1. Sample preparation and characterisation	35
2.5.2. Dissolution and U-Pb chemistry	35
2.5.3. Mass spectrometry and data reduction	36
2.5.4. Common Pb correction in titanite	37
2.5.5. Initial ^{230}Th - ^{238}U disequilibrium correction	38
2.5.6. Hf isotope analysis	38
2.5.7. Mineral thermometry	39
Acknowledgements	39
References	40
Chapter 3. Maturation and rejuvenation of a silicic magma reservoir: high-resolution chronology of the Kneeling Nun Tuff	45
3.1. Introduction	47
3.2. Kneeling Nun Tuff	48

3.3. Samples	50
3.4. Analytical Methods	50
3.5. Results	53
3.5.1. Whole-rock compositions and crystallinity	53
3.5.2. Feldspars	53
3.5.3. Amphibole	54
3.5.4. Zircon	55
3.5.4.1. Textures	55
3.5.4.2. High-precision U-Pb geochronology	55
3.5.4.3. Trace elements	57
3.6. Discussion	59
3.6.1. Magmatic architecture and storage conditions determined from major mineral phases	59
3.6.2. Time-resolved record of magmatic storage and rejuvenation	61
3.6.3. Coeval environments of variable cooling history	64
3.6.4. Sampling eruption-age zircons	66
3.7. Conclusions	67
Acknowledgements	67
References	68
Chapter 4. Isotope-dilution anchoring of zircon reference materials for accurate Ti-in-zircon thermometry	73
4.1. Introduction	75
4.2. Materials	76
4.2.1. Zircon 91500	76
4.2.2. Zircon GZ7	77
4.3. Analytical methods	77
4.3.1. LA-ICP-MS trace element analyses	77
4.3.2. SIMS trace element analyses	78
4.3.3. ID-ICP-MS Ti concentration analyses	78
4.4. Results	80
4.4.1. Homogeneity testing	80

4.4.1.1. Zircon 91500	80
4.4.1.2. Zircon GZ7	82
4.4.2. Isotope dilution ICP-MS analyses	82
4.4.2.1. Zircon 91500	82
4.4.2.2. Zircon GZ7	83
4.5. The importance of using matrix-matched reference materials	85
4.6. Secondary calibration of additional zircon reference materials by LA-ICP-MS	86
4.7. Conclusions and recommendations	90
Acknowledgements	90
References	91
Chapter 5. Summary and outlook	95
5.1. The accessory-mineral perspective	95
5.2. Open questions	98
References	101
Acknowledgements	103
Appendix A	105
Appendix B	117
Appendix C	133