# TRACKING THE EVOLUTION OF MID CENOZOIC SILICIC MAGMA SYSTEMS IN THE SOUTHERN CHOCOLATE MOUNTAINS REGION, CALIFORNIA USING ZIRCON GEOCHEMISTRY AND QUARTZ AND ZIRCON GEOTHERMOMETRY

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Submitted to the faculty of the University Graduate School
in partial fulfillment of the requirements
for the degree
Master of Science
in the Department of Earth Sciences
Indiana University

August 2009

Accepted by the Faculty of Indiana University, in partial
fulfillment of the requirements for the degree of Master of Science.

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ACKNOWLEDGEMENTS

It would be more fitting to put this on the very first page, but format rules exist for a reason, so it is relegated here. Thank you to my committee members, Doctors Andrew Barth, Gabriel Filippelli, and Jeffrey Wilson. Andrew Barth has been my advisor for six years and I give him many thanks for all the resources he has devoted to me during that time. The attention he gives students while still maintaining high scientific output and other tasks required of professors is truly amazing. Gabriel Filippelli provided a much needed second geologic opinion and excellent input on writing style, although it will take a little time before those changes become permanent habits. Jeffrey Wilson may have saved my computer from destruction several times with a few clicks of his Arc Map trained mouse and helped my writing maintain clarity for the non-geologist. I thank all three of them for their hard work, diligent guidance, and encouragement.

I have met many professionals along the way who helped my research and let me use their labs as my personal classroom. Thank you to Joe Wooden and Frank Mazdab for great discussions, hospitality, and assistance. Thanks to Dr. Carl Jacobson for lending me an integral sample to my thesis and answering the questions that went along with it. Thanks to Dr. Thomas Vogel and lab assistant Matt Parsons, for their patience and hospitality during our Michigan State visit, as well as working through our problematic samples. Thanks to Dr. Dave Sherrod for input on previous work which was the groundwork for this study, as well as an important map from which my field work was based off of. I also owe the Geologic Society of America a great deal of thanks for their generous award of the Graduate Student Research Grant, which provided funding for many of my analyses. Several groups at IUPUI also provided funding for meetings and research and I thank the Graduate Student Organization for their Educational Enhancement Grant, as well as the School of Science Graduate Student Council for their Travel Award.

Thanks to my field assistants, Mark Sparks and Jennifer Roell, for braving boiling temperatures, timely bees, and gusting winds to help me collect samples within just a few miles of a prison and eons away from everywhere else (except Border Patrol).

I also thank the first group of friends I made at IUPUI, a group of the smartest, strongest women I know outside of my family. Thank you to Nicole Fohey, Kristin Hellem Hughes, and Jennifer Nelson for your friendship and guidance throughout the years. You ladies are role models in every sense of the word.

I finally thank my family. Your never-ending love, encouragement, and support continue to amaze and steady me. Thank you to my parents, Edward and Kathleen Needy, for the family you created and work so hard to bring together on a regular basis. Listing my siblings, sibling-in-laws, seven nieces and nephews, and all they individually mean to me would take up more space than the thesis itself. Suffice it to say I love having the big family I do and am grateful for it every second of every day. I recommend a big family to anyone who can manage it. They bring a sense of place to my life I can't imagine being without and continue to shape who I am and where I want to go. Thank you.

ABSTRACT

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TRACKING THE EVOLUTION OF MID CENOZOIC SILICIC MAGMA SYSTEMS IN THE SOUTHERN CHOCOLATE MOUNTAINS REGION, CALIFORNIA USING ZIRCON GEOCHEMISTRY AND QUARTZ AND ZIRCON GEOTHERMOMETRY

During the mid Cenozoic, the Chocolate Mountains region of southeastern California experienced crustal extension slightly before, during, and after the main pulse of magmatism. This combined with mid-late Cenozoic faulting to locally uplift plutonic rocks interpreted to represent the plumbing system(s) for volcanic units, allowing an examination of both the extrusive and intrusive result of magmatism.

Zircon U-Pb ages of from six magmatic units yield late Oligocene to early Miocene ages and correlate better with stratigraphic relationships than previously compiled ages. These units are four silicic volcanic units – Quechan volcanic rocks, tuff of Felipe Pass, ignimbrite of Ferguson Wash, and tuff of Black Hills – and two plutonic units – the granites of Mount Barrow and Peter Kane Mountain. Regarding contemporaneous plutonic systems as baseline comparisons, zircons from the volcanic units commonly record plutonic temperatures; interpreted to be solidus or near solidus temperature. Remobilization may be a common process leading to eruption.

Quartz and zircon thermometers reveal the ignimbrite of Ferguson Wash and tuff of Black Hills magmatic systems evolved differently. Quartz yields temperatures of 700°C to ~750°C in both units with no core-rim trends. Cores of zircons from the

ignimbrite of Ferguson Wash yield temperatures between 750°C and 890°C. Zircon rim temperatures are between 875°C and 950°C. Tuff of Black Hills zircon cores generally record temperatures of ~850°C and zircon rim temperatures are ~700°C. Rims from tuff of Black Hills zircon record the same temperature range as zircons from coeval granites.

The temperature increase from core to rim in zircons from the ignimbrite of Ferguson Wash indicates reheating and that zircon grew later than and at higher temperatures than quartz. The low zircon temperatures from tuff of Black Hills reveals a system that was growing quartz and zircon at the same low, nearly solidus temperatures. Reasons for its eruption are not readily apparent in the thermal history of zircon and quartz. These two systems record different thermal histories than previously studied, younger systems like the Bishop tuff, in which quartz records late reheating just prior to eruption and a system that was growing quartz later and at higher temperatures than zircon.

Andrew Barth, Ph.D., Committee Chair

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