

Barbara C. Ratschbacher

California Institute of Technology
Division of Geological and Planetary Sciences
barbara.ratschbacher@gmail.com / +1 (213) 880-6710
www.bratschbacher.com

RESEARCH INTERESTS

Chemical and physical processes of continental crust formation; timescales of magma reservoir formation and melt percentages; redox evolution of arc magmas; amphibole chemistry, structure and $\text{Fe}^{3+}/\text{Fe}_T$ ratios; interaction of magmatism and deformation in the arc crust; tempos and mass balance of magmatic flare-ups in arcs

EDUCATION

- August 2017 **Ph.D.**, University of Southern California, USA
Depth-dependent physical, chemical and temporal evolution of crustal differentiation in magmatic arcs
Thesis advisor: Prof. Scott R. Paterson
- June 2012 **Diploma (B.S and M.S.)**, Eberhard-Karls Universität Tübingen, Germany
Petrogenesis of the nepheline syenitic lujavrites within the Ilímaussaq alkaline complex, SW Greenland
Thesis advisors: Prof. Dr. Gregor Markl and Dr. Michael Marks

PROFESSIONAL EXPERIENCE

- 2017 – present Postdoctoral Fellow, California Institute of Technology, USA
- 2014 – 2015 Graduate Research Assistant, USC, CA, USA
- 2009 – 2009 Research Internship at Institute for Crustal Studies, UCSB, CA, USA
- 2007 – 2008 Graduate Research Assistant, Eberhard-Karls Universität Tübingen, Germany
- 2006 – 2006 Research Internship, Staatliches Museum für Naturkunde, Stuttgart, Germany

FELLOWSHIPS & ACADEMIC AWARDS

- 2017 *CIDER (Cooperative Institute for Dynamic Earth Research) grant*
NSF-funded CIDER grant to continue research on CIDER projects
- 2016 *WiSE (Women in Science and Engineering) Merit Award*
University of Southern California
- 2016 *Adam Fischer International Travel Award*
University of Southern California
- 2015 – 2016 *USC Graduate School Research Enhancement Fellowship*
University of Southern California
- 2015 *EarthScope Award for Geochronology Student Research*

- 2014 NSF-sponsored EarthScope Program
Graduate Research Award
University of Southern California
- 2013 *Graduate Research Award*
University of Southern California
- 2013 *GSA Graduate Student Research Grant & Outstanding Mention*
Geological Society of America

TEACHING EXPERIENCE

- GEOL 464: Field Geology
Teaching Assistant at University of Southern California
Semester-long classes and a field trip involving student mapping projects to Argentina in cooperation with the University of La Rioja, Argentina and CRILAR
January – June 2015, January – June 2017
- GEOL 130: Nature of Scientific Inquiry and GEOL 315: Mineralogy
Teaching Assistant at the University of Southern California
Preparation, setup and introduction to lab exercises; trip to the Los Angeles County Natural History Museum and weekend field trip to Death Valley
August 2012 – August 2014 (4 semester)
- Mineral and Rock Identification
Teaching Assistant at the Eberhard-Karls Universität Tübingen, Germany
Setting up of lab material and supervision of student exercises
October 2007 – February 2011 (7 semester)

MENTORSHIP

- *Supervision of Undergraduate Research project in Petrology/Geochemistry* of Leslie Insixingmay: Characteristics of early mafic magmatism in crustal reservoirs from ~ 5 to 30 km depth in the Cascades Core, Washington.
Academic year 2016 - 2017
- *Supervision of Undergraduate Research project in Structural Geology* of Geoffrey Degrande: Structures and Kinematics of a newly discovered > 4km wide shear zone in Cuesta de Randolpho, Argentina.
Academic year 2015 - 2016

RESEARCH SKILLS

- Synchrotron-based Mössbauer spectroscopy of amphibole single grains (Advanced Photon Source, Argonne National Laboratory, USA)
- Single mineral XRD (California Institute of Technology, USA)
- Sample preparation and analyses for U-Pb ID-TIMS-TEA geochronology and trace element measurements in zircon (Princeton University, USA)
- In-situ trace element LA-ICP-MS analyses of zircon (UCSB, USA)
- In-situ trace element LA-ICP-MS analyses of amphibole, pyroxene and titanite (Texas Tech University, USA)

- Electron microprobe analyses of major elements in silicate minerals (UCLA, USA and Eberhard-Karls Universität Tübingen, Germany)
- Sample preparation and XRF analyses (Eberhard-Karls Universität Tübingen, Germany and Pomona College, USA)

FIELD EXPERIENCE

2015, 2016, 2017	Famatinian Arc, Argentina – Structural Geology
2013, 2015, 2016	North Cascades, Washington, USA – Igneous Petrology
2014	Khantaishir Arc, Mongolia – Igneous Petrology
2013	Talkeetna Arc, Alaska – Igneous Petrology
2013	Sierra Nevada Arc, USA – Igneous Petrology
2011	Ilímaussaq intrusion, Greenland – Igneous Petrology

SERVICES, ACTIVITIES AND PROFESSIONAL AFFILIATION

- *Session Convener*
 - Igneous Processes throughout the Arc Crustal Column and Oceanic Mantle, Goldschmidt Conference, 2018, Boston, USA
 - Dance of Arcs: Causes of Arc Migrations, Flare-ups, and Magmatic Focusing, GSA Annual Meeting 2017, Seattle, USA
 - Causes and Consequences of magmatic and tectonic tempos in Continental and Oceanic Arcs, GSA Cordillera Section Meeting, 2016, Ontario, USA
- *Seminar Coordinator*
 - Lithosphere Dynamic Seminar, University of Southern California Academic year 2013 – 2014
 - Department Seminar, University of Southern California Academic year 2014 – 2015
- *Graduate Student Representative*
University of Southern California, Academic year 2014 - 2015
- *Memberships*
Mineralogical Society of America (MSA), Geochemical Society (GS), Geological Society of America (GSA), American Geophysical Union (AGU), German Mineralogical Society (DMG), Association of Women Geoscientist (AWG), IAVCEI (International Association of Volcanology and Chemistry of Earth's Interior)

INVITED ORAL PRESENTATIONS

- University of Washington, Seattle, USA – Department seminar (April 2018)
- Lamont-Doherty Earth Observatory, USA – Geodynamic Seminar (November 2017)
- California State University, Fullerton, USA – Geology Seminar (October 2017)
- GSA Annual Meeting 2017, Seattle – Invited speaker
- California Institute of Technology, USA – Geoclub Seminar (January 2017)

PUBLICATIONS

Published or submitted:

Ratschbacher B., Paterson, S., Fischer, T.: Spatial and depth-dependent variations in magma volume addition and addition rates to continental arcs: Application to global CO₂ fluxes since 750 Ma. *Submitted to Geochemistry, Geophysics, Geosystems.*

Ratschbacher, B., Keller, C. B., Schoene, B., Paterson, S. R., Anderson, J. L., Okaya, D., Putirka, K., and Lippoldt, R. (2018) A new workflow to assess emplacement duration and melt residence time of compositionally diverse magmas emplaced in a sub-volcanic reservoir. *Journal of Petrology*, v. 1, p. 23.

Larrovere, M.A., Suzaño, N., **Ratschbacher, B.**, Sola, A., Alasino, P.H., Fuentes, M.G., Weinberg, R.F., Paterson, S.R., Becchio, R. y Finch, M.A. 2017. Las fajas de cizalla dúctil del basamento ígneo-metamórfico del NOA. *In: Muruaga, C.M. y Grosse, P. (Eds.), Ciencias de la Tierra y Recursos Naturales del NOA. Relatorio del XX Congreso Geológico Argentino, San Miguel de Tucumán: 579-601. ISBN 9789874266668.*

Ratschbacher, B., Marks, M., Bons, P. and Markl, G. 2015: Emplacement and geochemical evolution of highly evolved syenites investigated by a combined structural and geochemical field study: The lujavrites of the Ílímaussaq complex, SW Greenland. *Lithos*, v. 231, p. 62-76.

In preparation:

Ratschbacher B., Keller B., Schoene B., Paterson S., Anderson L., Putirka K.: Evaluating the extent of in-situ differentiation, magma mixing and mingling in a subvolcanic, bimodal magma reservoir

Ratschbacher B., Cawood, T., Larrovere, M., Paterson S., Lusk, A., Alasino P.: A ~ 10 km wide mylonite zone in the granitoids of the Cuesta de Randolpho: The role of arc magmatism in strain (de)-localization.

Ratschbacher, B., Paterson S., Anderson L.: Temporal and depth-dependent characteristics of flare-up magmatism in a thick continental arc crustal column.

Ratschbacher B., Putirka K., Paterson S., Conchola J.: Chemical and physical constrains on crystal-melt segregation in a shallow crustal magma reservoir.

Ratschbacher B., Paterson S., Alasino P., Cao, W., Okaya, D., Lippoldt R.: Depth-dependent changes in deformation and magmatism in the Famatinian arc, Argentina: Implications for rates of processes, isostatic responds and mountain building.

Ratschbacher B., Paterson S., Anderson L., Miller R.B., Miller J., Kent A.: Using mineral chemical data to unravel magma chamber processes in magma storage site from 5 to 37 km depth, Cascades arc, Washington, USA.

CONFERENCE PRESENTATIONS

Ratschbacher B., Paterson S., Fischer T.P. (2018): Magma addition rates in continental arcs: A new protocol of calculation and global implications. *Talk at the Goldschmidt conference 2018, Boston, USA.*

Delph J., Shimizu K., Rasmussen D.J., **Ratschbacher B.**, Pu X. (2018): A geochemical and seismic search for deep, active MASH zones. *Invited talk at the Goldschmidt conference 2018, Boston, USA.*

Werts K., Barnes C.G., Memeti V., Paterson S., **Ratschbacher B.**, Williams D. (2018): Volcanic vs Plutonic Hornblende: Tools for Discerning Crystal Accumulation and Melt Loss. *Talk at the Goldschmidt conference 2018, Boston, USA.*

Ratschbacher B., Cawood T., Lusk A., Larrovere M., Rock C., Alasino P., Paterson S., Memeti V. (2018): Strain localization mechanisms (or lack thereof) in a ~10 km wide, syn- to post-magmatic mylonite zone in the Famatinian arc. *Poster presentation at the EGU meeting, Vienna, Austria.*

Pu X., Delph J.R., Shimizu K., Rasmussen D.J., **Ratschbacher B.** (2017): Where do arc magmas differentiate? A seismic and geochemical search for active, deep crustal MASH zones. *Poster presentation at the AGU meeting, 2017, New Orleans.*

Ratschbacher B., Paterson S., Alasino P., Larrovere M., Cao W., Okaya D. (2017): Depth-dependent changes in deformation and magmatism in the Famatinian arc. Argentina: Implications for isostatic responds and mountain building. *Invited talk at GSA Annual Meeting, Seattle, USA.*

Attia, S., Paterson S., Ardill K., Martinez A., **Ratschbacher B.**, Cao W., Cottle J. (2017): Upper crustal Evolution during an arc flare-up: Integrating sedimentary, volcanic, and plutonic records of the Triassic-early Jurassic continental arc upper crustal section, eastern-central Sierra Nevada, CA. *Poster presentation at the GSA Annual Meeting, Seattle, USA.*

Cawood T., Paterson S., **Ratschbacher B.**, Lusk A., Larrovere M., Alasino P., Rick C., Memeti V. (2017): Strain (de)-localization in the ~ 10 km wide Cuesta de Randolpho mylonite zone, Famatinian arc. *Poster presentation at the GSA Annual Meeting, Seattle, USA.*

Larrovere M., Paterson S., Alasino P., **Ratschbacher B.**, Lusk A., Cawood T. (2017): Architecture of a crustal scale ductile shear zone system in a hot orogen: the Ordovician Famatinian orogen, NW Argentina. *Oral presentation at the GSA Annual Meeting, Seattle, USA.*

Hartman S., Paterson S., **Ratschbacher B.** (2017): A revised loading and exhumation model for the Swakane biotite gneiss, Cascades Crystalline Core (CCC), WA: Implications for Mesozoic Tectonics. *Poster presentation at the GSA Annual Meeting, Seattle, USA.*

Lusk A., Paterson S., **Ratschbacher B.**, Larrovere M., Alasino P., Memeti V., Cawood T., Hernandez R. (2017): Deformation of the uppermost Famatinian orogen: Mapping and structural analysis from the Sierra de Narváez and Sierra de Las Planchadas, NW Argentina. *Poster presentation at the GSA Annual Meeting, Seattle, USA.*

Alasino P., Memeti V., **Ratschbacher B.**, Larrovere M., Paterson S., Lusk A., Cawood T. (2017): Geochemical architecture and evolution of the Famatinian magmatic arc crustal section in NW Argentina. *Poster presentation at the GSA Annual Meeting, Seattle, USA.*

Memeti V., Paterson S., Alasino P., **Ratschbacher B.**, Larrovere M., Ardill K., Cawood T., Lusk A., Insixiengmay L. (2017): Igneous architecture at the top of the Famatinian arc, NW Argentina. *Poster presentation at the GSA Annual Meeting, Seattle, USA.*

Ratschbacher B., Keller B., Schoene B., Paterson S., Anderson L., Okaya D., Putirka K., Lippoldt R. (2017): Time scales of construction and compositional evolution of a bimodal shallow crustal magma reservoir and implications for differentiation in the upper crust. *Poster presentation at the IAVCEI Scientific Assembly 2017, Portland, USA.*

Ratschbacher B., Paterson S., Anderson L. (2016): Investigating magmatic and tectonic processes from 5 to 30 km depth in a thick continental magmatic arc, ~ 90 Ma magmatism in the Cascades, Washington, USA. *Poster presentation at the EMC conference 2016 in Rimini, Italy.*

Ratschbacher B., Degrande G., Larrovere M., Paterson S. and Alasino P. (2016): A > 4 km wide ductile shear zone in the Cuesta de Randolpho: Late-stage strain localization in the Famatinian orogeny, Argentina. *Poster presentation at GSA Cordillera Section Meeting, Ontario, USA.*

Ratschbacher B., Larrovere M., Alasino P. and Paterson S. (2016): Strain accommodation at different crustal levels during the development of the Famatinian magmatic arc, Argentina. *Poster presentation at GSA Cordillera Section Meeting, Ontario, USA.*

Ratschbacher B., Paterson S., Anderson L., Miller, J., Miller R., Kent, A. (2015): Formation of continental crust in a temporally linked arc magma system from 5 to 30 km depth: ~ 90 Ma plutonism in the Cascades Crystalline Core composite arc section. *Poster presentation at AGU Fall Meeting, San Francisco, USA.*

Sherman T., Putirka K., De Los Reyes A.M., **Ratschbacher B.** (2015): Amphibole thermometry and a comparison of results from plutonic and volcanic Systems. *Poster presentation at AGU Fall Meeting, San Francisco, USA.*

Ratschbacher B., Putirka K., Paterson S. (2014): Segregation of felsic melts from a mafic crystal mush in a shallow-level magma reservoir: Implications for continental crust formation. *Oral presentation at Goldschmidt conference 2014, Sacramento, USA.*

Paterson R. S., **Ratschbacher B.**, Memeti V., Clausen B.L. (2014): Arc magmatic tempos. *Oral presentation at the Goldschmidt conference 2014, Sacramento, USA.*

Ratschbacher B., Putirka K., Paterson S. (2013): Chemical and isotopic relationship of mafic and felsic magmas in a sub-volcanic reservoir: The Guadalupe Igneous Complex (GIC), Sierra Nevada, California. *Poster presentation at AGU Fall Meeting, San Francisco, USA.*

Ratschbacher B., Marks M., Bons P., Pfaff K. and Markl G. (2011): Mineral compositions and deformation features indicating magma recharge processes in the lujavrites of the Ilímaussaq Complex, Greenland. *Oral presentation at the Goldschmidt Conference 2011, Prague, Czech Republic.*

Ratschbacher B., Pfaff K., Marks M. and Markl G. (2011): Geochemical trends within the lujavrites of the Ilímaussaq intrusion, Greenland. *Poster presentation at PERALK-CARB Workshop in Tübingen, Germany.*

REFERENCES

Scott R. Paterson

University of Southern California
3651 Trousdale Parkway
Los Angeles, CA, 90089
E-mail: paterson@usc.edu
Telephone: (213) 740-6103

Blair Schoene

Princeton University
219 Guyot Hall
Princeton, NJ, 08544-1013
E-mail: bschoene@princeton.edu
Telephone: (609) 258-5747

Claire E. Bucholz

California Institute of Technology
1200 East California Boulevard
Pasadena, CA, 91125
E-mail: cbucholz@caltech.edu
Telephone: (626) 395-6145

Pablo H. Alasino

CRILAR/ Universidad Nacional de La Rioja, Argentina
Entre Ríos y Mendoza, 5301, Anillaco, La Rioja, Argentina
E-mail: phalasino@gmail.com
Telephone: + 54 3827 49-4251