

## CURRICULUM VITAE

### Meredith R. Townsend

Department of Earth Sciences

University of Oregon

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## Professional Appointments

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### Lillis Assistant Professor of Volcanology

Department of Earth Sciences

University of Oregon

September 2019 - present

### Postdoctoral Research Associate

Department of Earth, Environmental, and Planetary Sciences

Brown University

2017-2019

## Education

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### Ph.D. in Geological Sciences, Stanford University

Ph.D. Minor in Feminist, Gender, and Sexuality Studies

Advisor: Prof. David D. Pollard

Dissertation: *Host-rock deformation around magmatic dikes: integrating field observations and mechanical models*

2017

### BS in Geology, Washington and Lee University

Minor in Mathematics

Magna Cum Laude, Phi Beta Kappa

Thesis Advisor: Prof. Chris Connors

Thesis: *Kink-band and velocity boundary interference*

2011

## Funding

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### NSF Frontier Research in Earth Sciences (FRES), EAR-2120872

*Ice forcing in arc magma plumbing systems*

Total Award Amount: \$2,800,000 (\$303,508 to M. Townsend)

Lead PI: Brad Singer, University of Wisconsin

09/01/21 -

08/31/26

### NSF Earth Sciences, Petrology and Geochemistry, EAR-2123211

*Investigating the role of topography and magma properties on dike pathways: combining field data, analogue experiments, and numerical modeling*

Total Award Amount: \$362,821 (\$308,426 to M. Townsend)

Lead PI: Meredith Townsend, University of Oregon

08/01/21 -

07/31/24

## Peer-Reviewed Publications

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**Townsend M.**, *Linking surface deformation to thermal and mechanical magma chamber processes*. Earth and Planetary Science Letters (2022) [doi.org/10.1016/j.epsl.2021.117272](https://doi.org/10.1016/j.epsl.2021.117272)

Caricchi L., **Townsend M.**, Rivalta E., and Namiki A., *The build-up and triggers of volcanic eruptions*. Nature Reviews Earth and Environment (2021) [doi.org/10.1038/s43017-021-00174-8](https://doi.org/10.1038/s43017-021-00174-8)

**Townsend M.** and Huber C., *A critical magma chamber size for volcanic eruptions*. Geology (2020) [doi.org/10.1130/G47045.1](https://doi.org/10.1130/G47045.1)

**Townsend M.**, Huber C., Degruyter W. and Bachmann O., *Magma chamber growth during intercaldera periods: insights from thermo-mechanical modeling with applications to Laguna del Maule, Campi Flegrei, Santorini, and Aso*. Geochemistry, Geophysics, Geosystems (2019) [doi.org/10.1029/2018GC008103](https://doi.org/10.1029/2018GC008103)

Huber C., **Townsend M.**, Degruyter W. and Bachmann O., *Optimal depth of subvolcanic magma chamber growth controlled by volatiles and crust rheology*. Nature Geoscience (2019) [doi.org/10.1038/s41561-019-0415-6](https://doi.org/10.1038/s41561-019-0415-6)

**Townsend M.**, *Modeling thermal pressurization around dikes using temperature-dependent hydraulic properties; implications for deformation around intrusions*. Journal of Geophysical Research (2018) [doi.org/10.1002/2017JB014455](https://doi.org/10.1002/2017JB014455)

Pollard D.D. and **Townsend M.**, *Fluid-filled fractures in Earth's lithosphere: gravitational loading, interpenetration, and stable height of dikes and veins*. Journal of Structural Geology (2018) [doi.org/10.1016/j.jsg.2017.11.007](https://doi.org/10.1016/j.jsg.2017.11.007)

**Townsend M.**, Pollard D.D. and Smith R.P., *Mechanical models for dikes: a third school of thought*. Tectonophysics, vol. 703-704, pp 98-118 (2017) [doi.org/10.1016/j.tecto.2017.03.008](https://doi.org/10.1016/j.tecto.2017.03.008)

**Townsend M.**, Johnson K., Culha C. and Pollard D.D., *Jointing around Magmatic Dikes as a Precursor to the Development of Volcanic Plugs*. Bulletin of Volcanology, vol.77:92 (2015) [doi.org/10.1007/s00445-015-0978-z](https://doi.org/10.1007/s00445-015-0978-z)

## Selected Conference Presentations

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*\*Oral Presentation \*\*Invited*

**\*\*Townsend M.**, A new model linking magma chamber processes to surface deformation *AGU Fall Meeting (New Orleans, Louisiana)* 2021

**\*\*Townsend M.**, Huber C., Scholz K., O'Hara C., Bachmann O., Troch J., Thermomechanical models as a framework to study the evolution of magma chambers using constraints from petrology, geophysics, and geodesy, *GSA Annual Meeting (virtual)* 2020

<b>Townsend M.</b> , Huang M., Probing magma storage during the May 2018 Kilauea eruption using coupled dike-chamber models, <i>AGU Fall Meeting (virtual)</i>	2020
<b>**Townsend M.</b> , Huber C., Scholz K., Understanding the response of magma plumbing systems to changes in stress using a coupled dike-chamber model, <i>AGU Fall Meeting (San Francisco, California)</i>	2019
<b>**Townsend M.</b> , Huber C., Degruyter W., Bachmann O., The influence of magma chamber evolution and dike mechanics on the extrusive:intrusive ratio and the growth of magmatic systems, <i>International Union of Geodesy and Geophysics General Assembly (Montréal, Canada)</i>	2019
<b>*Townsend M.</b> , Huber C., Degruyter W., Effects of volatile exsolution on the long-term growth and stability of magma chambers, <i>AGU Fall Meeting (Washington D.C.)</i>	2018
<b>**Townsend M.</b> , Gravity and the mechanics of dike intrusion, <i>AGU Fall Meeting (New Orleans, Louisiana)</i>	2017
<b>*Townsend M.</b> , Huber C., Wiebe R., Huang S., Bachmann O., Fiedrich A., Investigating the rheology and dynamics of three-phase crystal mush using microstructural analysis from plutons of the Coastal Maine Magmatic Province, <i>AGU Fall Meeting (New Orleans, Louisiana)</i>	2017
<b>*Townsend M.</b> , Pollard D., Re-examining the “level of neutral buoyancy” and its role in dike stability, <i>International Association of Volcanology and Chemistry of the Earth’s Interior (IAVCEI) Scientific Assembly (Portland, Oregon)</i>	2017
<b>*Townsend M.</b> , Pollard D., Smith R., Mechanical models for dikes: a third school of thought, <i>AGU Fall Meeting (San Francisco, California)</i>	2016

### **Invited Seminars and Public Talks**

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<b>Rotary Club of Eugene: “Oregon Volcanoes: What does the future hold?”</b>	2021
<b>Cascade Volcano Observatory</b>	2020
<b>University of Nevada</b>	2020
<b>University of Washington</b>	2019
<b>University of Wisconsin</b>	2019
<b>Portland State University</b>	2019
<b>University of Maryland</b>	2018
<b>Wesleyan University</b>	2018
<b>Lamont-Doherty Earth Observatory</b>	2018
<b>Cornell University</b>	2018
<b>University of Rhode Island</b>	2018
<b>US Geological Survey Menlo Park</b>	2016

## Field research campaigns

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**Summer Coon, Colorado** – Drone surveys, geologic mapping, and petrofabric analysis of igneous dikes to infer magma propagation dynamics within stratovolcanoes

**Central Oregon Cascades** – Fracture mapping, drone surveys, and petrofabric analysis to learn about ice-magma interactions in arc settings

**Coastal Maine Magmatic Province** – Petrologic and petrofabric analysis in layered mafic intrusions to learn about dynamics of crystal mush

**Navajo Volcanic Field, New Mexico** – Dike and fracture mapping, hydraulic property analysis to learn about vent erosion and transitions between fissures and conduit-fed eruptions

## Advising

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### Primary graduate adviser (Current):

**Gui Aksit**, *PhD Candidate*, Dike propagation beneath stratovolcanoes using field work and numerical modeling

**Kathryn Scholz**, *PhD student*, Surface loading effects on volcanism and source mechanisms for deep long-period earthquakes beneath volcanoes

**Rebecca Bussard**, *PhD Candidate* (Co-advised with Prof. Josef Dufek), InSAR data and thermal modeling of pyroclastic deposits from 1980 Mount St. Helens

### Primary graduate adviser (Graduated):

**Ana Mercedes Colón Umpierre**, *Master's student*, Ice-magma interactions in Oregon Cascades

### Graduate committee member:

Nate Klema, Monse Cascante Matamoros, Amanda Peng, Paul Regensburger, Kathy Trafton, PJ Zrelak, Sydney Dybing, Annika Dechert, Avigyan Chatterjee\*, Rachel Hampton, Allison Kubo, Uriel Hernandez, Kevin Gardner, Larry Hartman, Christina Cauley, Martin Uwiringiyimana

*\*graduated*

### Undergraduate advising:

**Madeline Bruce**, Honors Thesis (in progress)

**Catherine O'Hara**, Honors Thesis: Constraining magma storage and recharge beneath South Sister Volcano using numerical modeling (2021)

## Teaching

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**Summer Geology Field Camp “Fire and Ice” (ERTH 406/506):** Volcanic and glacial geology in the Oregon Cascades and Wallowa Mountains. For two weeks, students learn modern mapping techniques applied to physical volcanology and volcanic-hydrologic interactions.

**Mapping the Earth (ERTH 410/510):** Collecting and analyzing spatial data for Earth science. Topics/tools include traditional surveying, remote sensing, drone mapping, Structure from Motion photogrammetry, and QGIS.

**Mechanical Earth (ERTH 455/555):** Introduction to continuum mechanics applied to Earth processes. Includes stress and strain, elasticity, viscous fluids, constitutive laws, equations of motion, and deformation of the Earth.

**Volcanoes and Earthquakes (ERTH 306):** Mechanisms that cause earthquakes and volcanoes, relation to plate tectonics, associated hazards, examples in Oregon and the western United States.

**Seminar on Magma Plumbing Systems (ERTH 605):** Organized a weekly reading group for graduate students and faculty around the topic of subduction zone arc-type magma plumbing systems.

Teaching at previous institutions

**Physical Volcanology field course in Greece,** Teaching Assistant at Brown University, 1-week undergraduate field course in Kos and Nisyros (2019)

**Field Geology of the Aegean Region,** Adjunct Instructor at Washington and Lee University, 4-week undergraduate field course in Crete, Santorini, Naxos, and Syros (2015)

**Structural Geology and Rock Mechanics,** Teaching Assistant at Stanford University, graduate and undergraduate levels (2012, 2013)

**Historical Geology,** Teaching Assistant at Stanford University, undergraduate level (2013)

**Planetary Origins and Dynamics,** Teaching Assistant at Stanford University, graduate level (2011)

**Service**

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*Department Committees:* Seminar Series Coordinator (2020-present)  
Department Field Equipment Manager (2019 – present)  
Anti-racism lab climate working group (2020-present)

*Reviewer:* National Science Foundation, EAR CH Panel  
National Science Foundation, Ad Hoc Reviewer  
Nature Geoscience  
Scientific Reports  
Earth and Planetary Science Letters  
Journal of Geophysical Research: Solid Earth  
Journal of Geophysical Research: Planets  
Journal of Volcanological and Geothermal Research  
Geophysical Research Letters  
Geochemistry Geophysics Geosystems  
Geology  
Geophysical Journal International

Geological Society of London  
GSA Today  
Journal of Structural Geology  
Volcanica

*Convener:* Chemistry, Mechanics, Geophysics and Timescales of Magmatic Processes , AGU Fall Meeting (2018, 2019, 2021)

## **Awards and other activities**

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- 2017      **Science Teaching and Education Program:** *Lesson planning and teaching 4<sup>th</sup> grade Earth Science at Vartan Elementary School in Providence, RI*
- 2017      **PhD Minor in Feminist, Gender, and Sexuality Studies,** Stanford University: *conducted original research on gendered motivations for educational and occupational choices in geoscience*
- 2014-2016      **DARE Doctoral Fellowship** (Diversifying Academia, Recruiting Excellence) Tuition and stipend for 2 years of doctoral studies, Stanford
- 2013-2016      **Stanford Geokids Program,** Assistant director (2013) and volunteer (2014-16)
- 2014-2016      **Women in Earth Sciences at Stanford,** President
- 2014      **Vice Provost for Graduate Education Feminist-Scholar Award,** Stanford
- 2013      **McGee Foundation Award**  
\$4000 for research expenses, Stanford
- 2012      **Roy Angus MacDiarmid Award**  
\$2000 for field research, Stanford
- 2011      **Phi Beta Kappa**
- 2007-2011      **Washington Honor Scholar**  
Covers full tuition for four years, Washington and Lee University
- 2009 &  
2010      **Robert E. Lee Summer Research Scholar Award**  
Undergraduate summer research stipend
- 2010      **Marcellus H. Stow Award for geology,** Washington and Lee University
- 2009      **R. Preston Hawkins Award for excellence in field geology,** Washington and Lee University
- 2007-2008      **Student-athlete award for volleyball,** Washington and Lee University