

Max Rudolph

ASSOCIATE PROFESSOR · EARTH AND PLANETARY SCIENCES

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employment

Assistant, then Associate Professor, University of California, Davis

DEPARTMENT OF EARTH AND PLANETARY SCIENCES

Davis, CA

2017–present

Assistant Professor, Portland State University

DEPARTMENT OF GEOLOGY

Portland, OR

2014–2017

Postdoctoral Researcher, University of Colorado at Boulder

DEPARTMENT OF PHYSICS

Boulder, CO

2012–2014

education

University of California, Berkeley

PH.D. IN EARTH AND PLANETARY SCIENCE

Berkeley, CA

2006–2012

Oberlin College

B.A. IN PHYSICS, WITH HONORS IN GEOLOGY

Oberlin, OH

2002–2006

research

I am a geodynamicist with broad interests in the evolution of the Earth and other planetary bodies and the dynamics of erupting systems (volcanoes, geysers, mud volcanoes). My recent and ongoing work in global geodynamics has examined the rheology of Earth's mantle and the evolution of lower mantle structures. I also have a long standing interest in the geodynamics of icy ocean worlds and my recent work has focused on the origin of Enceladus' tiger stripe fissures and cryo-volcanic eruptions on Europa and Enceladus. My research integrates numerical modeling, geophysical measurements, and laboratory experimentation.

selected publications

†student first author. *postdoc first author

- **Rudolph, M.L.**, Lourenço, D.L., Moulik, P., and Lekic, V.L. (2021). Long-wavelength mantle structure: geophysical constraints and dynamical models. In *Mantle Convection and Surface Expressions* (eds H. Marquardt, M. Ballmer, S. Cottaar and J. Konter). doi.org/10.1002/9781119528609.ch1.
- **Rudolph, M.L.**, Manga, M., Walker, M.E., and Rhoden, A.R. (2022). Cooling crusts create concomitant cryovolcanic conduits. *Geophysical Research Letters* 49(5), e2021GL094421
- DeSalvio, N.D.†, and **Rudolph, M.L.** (2022). A Retrospective Analysis of b-value Changes Preceding Strong Earthquakes. *Seismological Research Letters*. 93(1), 364–375.
- **Rudolph, M.L.**, Moulik, P., and Lekic, V.L. (2020). Bayesian inference of mantle viscosity from whole-mantle density models. *Geochemistry, Geophysics, Geosystems* 21(11), e2020GC009335.
- Lourenço, D.* and **Rudolph, M.L.** (2020). Shallow lower mantle viscosity modulates the pattern of mantle structure. *Geochemistry, Geophysics, Geosystems* 21(9), e2020GC008934.
- Citron, R.‡, Lourenço, D.L., Wilson, A., Grima, A., Wipperfurth, S., **Rudolph, M.L.**, Cottaar, S., and Montési, L. (2020). Effects of heat-producing elements on the stability of deep mantle thermochemical piles. *Geochemistry, Geophysics, Geosystems*, 21(4), e2019GC008895. doi:10.1029/2019GC008895.
- Hemingway, D., **Rudolph, M.L.**, and Manga, M. (2020). Cascading parallel fractures on Enceladus. *Nature Astronomy* 4(3), 234–239.

- Williams, C.D.*, Mukhopadhyay, S., **Rudolph, M.L.**, Romanowicz, B.. (2019). Primitive Helium in Oceanic Basalts Originates from Seismically Slow Regions at the Core-Mantle Boundary. *Geochemistry, Geophysics, Geosystems* 20(8), 4130-4145.
- **Rudolph, M.L.**, Sohn, R.A., and Lev, E. (2018). Fluid oscillations in a laboratory geyser with a bubble trap. *Journal of Volcanology and Geothermal Research* 368, 100-110.
- **Rudolph, M.L.** and Sohn, R. (2017). A model for internal oscillations in geysers, with application to Old Faithful (Yellowstone, USA). *Journal of Volcanology and Geothermal Research* 343, 17-24. doi: 10.1016/j.jvolgeores.2017.04.023
- Li, M.M., Black, B., Zhong, S.J., Manga, M., **Rudolph, M.L.**, and Olson, P. (2016). Quantifying melt production and degassing rate at mid-ocean ridges from global mantle convection models with plate motion history. *Geochemistry, Geophysics, Geosystems* 17(7), 2884-2904.
- **Rudolph, M.L.**, Lekić, V., and Lithgow-Bertelloni, C. (2015). Viscosity jump in Earth's mid-mantle. *Science* 350(6266), 1349-1352.
- **Rudolph, M.L.**, Manga, M., Tingay, M.R.P., and Davies, R.J. (2015). Influence of seismicity on the Lusi mud eruption. *Geophysical Research Letters* 42, 7436–7443. doi:10.1002/2015GL065310.
- Shirzaei, M., **Rudolph, M.L.**, and Manga, M. (2015). Deep and shallow sources for the Lusi mud eruption revealed by ground deformation. *Geophysical Research Letters* 42(13), 5274-5281.
- Zhong, S. and **Rudolph, M.L.** (2015). On the Temporal Evolution of Long-wavelength Mantle Structure of the Earth Since the Early Paleozoic. *Geochemistry, Geophysics, Geosystems* 16(5), 1599-1615.
- Olson, P., Deguen, R., **Rudolph, M.L.**, and Zhong, S. (2015). Core evolution driven by mantle global circulation. *Physics of the Earth and Planetary Interiors* 243, 44-55. doi:10.1016/j.pepi.2015.03.002.
- Tran, A., Rudolph, M.L., and Manga, M. (2015). Bubble mobility in mud and yield-stress fluids. *Journal of Volcanology and Geothermal Research* 294, 11-24.
- **Rudolph, M.L.** and Zhong, S. (2014). History and dynamics of the net rotation of the mantle and lithosphere. *Geochemistry, Geophysics, Geosystems* 15(9) 3645-3657. doi:10.1002/2014GC005457.
- **Rudolph, M.L.** and Zhong, S. (2013). Does degree-2 stability imply LLSVP fixity? *Nature* 503, E3-E4. doi:10.1038/nature12792 (peer-reviewed comment)
- **Rudolph, M.L.**, and Manga, M. (2012). Effects of anisotropic viscosity and texture development on convection in Ice Ih mantles. *Journal of Geophysical Research, Planets* 117, E11003.
- **Rudolph, M.L.** and Manga, M. (2009). Fracture penetration in planetary ice shells. *Icarus* 199(2), 536-541.
- Gorczyk, W., Gerya, T., Connolly, J., Yuen, D., and **Rudolph, M.** (2006). Large-scale rigid body rotation in the mantle wedge and its implications for seismic tomography, *Geochemistry, Geophysics, Geosystems* 7, Q05018.

honors

Berkeley Fellowship for Graduate Study (2006-2008), NSF Graduate Research Fellowship (2008-2011)

professional societies

American Geophysical Union (2005-present), American Association for the Advancement of Science (2016-present)

selected service

Computational Infrastructure for Geodynamics (CIG) IV Writing Committee (2021), CIG Nominating Committee (2021), UC Davis Earth and Planetary Sciences Anti-racism action committee (2020-), UC Davis College of Letters and Sciences Computing Committee (Chair, 2020-), AGU Fall Meeting Program Committee (2016-2018)