

Stephen Judson Turner

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Department of Earth, Geographic, and Climate Sciences

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Positions Held

Lecturer, University of Massachusetts Amherst, Department of Earth, Geographic, and Climate Sciences, 2019 - present

Fossett Postdoctoral Fellow, Washington University in St. Louis, Department of Earth and Planetary Sciences, 2017 - 2019

Postdoctoral Researcher, University of Oxford, Department of Earth Sciences, 2015 - 2017

Education

Ph.D., Earth and Planetary Sciences, Harvard University, Cambridge MA, 2015

Major element, trace element, and isotopic constraints on arc magma generation from local, regional, and global perspectives. Adviser: Charles H. Langmuir

M.A., Earth and Planetary Sciences, Harvard University, Cambridge MA, 2011

B.A., Cognitive Science, Religious Studies, Rice University, Houston TX, 2007

Peer-Reviewed Journal Publications

(*advised or co-advised student or postdoc)

Turner, S. J., *Barickman, M. H., *Rodriguez, J., Fike, D. A., Jones, C. M., Wang, K., ... & Parai, R. (2023). Boron isotopes in Central American volcanics indicate a key role for the subducting oceanic crust.

Earth and Planetary Science Letters, 619, 118289.

Barry, P. H., et al. (2022). The helium and carbon isotope characteristics of the Andean Convergent Margin.

Frontiers in Earth Science, 10, 897267.

Turner, S. J., & Langmuir, C. H. (2022c). A quantitative framework for global variations in arc geochemistry.

Earth and Planetary Science Letters, 584, 117411.

Turner, S. J., & Langmuir, C. H. (2022b). Sediment and ocean crust both melt at subduction zones. *Earth and Planetary Science Letters*, 584, 117424.

Turner, S. J., & Langmuir, C. H. (2022a). An evaluation of five models of arc volcanism. *Journal of Petrology*, 63(3), egac010.

Bekaert, David V., Gazel, E., Turner, S., et al., (2021). High $^3\text{He}/^4\text{He}$ in central Panama reveals a distal connection to the Galápagos plume. *Proceedings of the National Academy of Sciences* 118.47.

Iveson, A. A., Humphreys, M. C., Savov, I. P., de Hoog, J. C., Turner, S. J., Churikova, T. G., ... & Cooper, G. F. (2021). Deciphering variable mantle sources and hydrous inputs to arc magmas in Kamchatka. *Earth and Planetary Science Letters*, 562, 116848.

Bekaert, D. V., Turner, S. J., Broadley, M. W., Barnes, J. D., Halldórsson, S. A., Labidi, J., ... & Barry, P. H. (2021). Subduction-Driven Volatile Recycling: A Global Mass Balance. *Annual Review of Earth and Planetary Sciences*, 49.

- Kirstein, L. A., Kanev, S., Fitton, J. G., & Turner, S. J. (2020). Volcanic spherules condensed from supercritical fluids in the Payenia volcanic province, Argentina. *Journal of the Geological Society*, 178(1).
- *Wieser, P. E., Turner, S. J., Mather, T. A., Pyle, D. M., Savov, I. P., & Orozco, G. (2019). New constraints from Central Chile on the origins of enriched continental compositions in thick-crustal arc magmas. *Geochimica et Cosmochimica Acta*.
- Barry, P. H., et al. (2019). Forearc carbon sink reduces long-term volatile recycling into the mantle. *Nature* 568.7753: 487.
- Turner, S. J., Langmuir, C. H., Dungan, M. A., & Escrig, S. (2017). The importance of mantle wedge heterogeneity to subduction zone magmatism and the origin of EM1. *Earth and Planetary Science Letters*, 472, 216-228.
- Turner, S. J., Langmuir, C. H., Katz, R. F., Dungan, M. A., & Escrig, S. (2016). Parental arc magma compositions dominantly controlled by mantle-wedge thermal structure. *Nature Geoscience*, 9(10), 772-776.
- Turner, S. J., & Langmuir, C. H. (2015b). What processes control the chemical compositions of arc front stratovolcanoes? *Geochemistry, Geophysics, Geosystems*, 16(6), 1865-1893.
- Turner, S. J., & Langmuir, C. H. (2015a). The global chemical systematics of arc front stratovolcanoes: Evaluating the role of crustal processes. *Earth and Planetary Science Letters*, 422, 182-193.
- Turner, S. J., Izbekov, P., & Langmuir, C. H. (2013). The magma plumbing system of Bezymianny Volcano: Insights from a 54-year time series of trace element whole-rock geochemistry and amphibole compositions. *Journal of Volcanology and Geothermal Research*, 263, 108-121.
- Le Roux, V., Lee, C. T., & Turner, S. J. (2010). Zn/Fe systematics in mafic and ultramafic systems: Implications for detecting major element heterogeneities in the Earth's mantle. *Geochimica et Cosmochimica Acta*, 74(9), 2779-2796.

Manuscripts currently undergoing peer-review

- Turner S. J., Langmuir C. H., An alternative to the ocean crust fluid + sediment melt paradigm for arc lava geochemistry. (*Science Advances*)

Manuscripts in preparation

- Turner, S. J., Savov, I, Mather T., Pyle, D. Integrated chemical geodynamics reveals shear heating and slab melting beneath Chile and Argentina
- Turner, S. J., Savov, I, Mather T., Pyle, D. Boron isotope and trace element evidence for slab melt channelization in subduction zones
- *Hammerstrom, A., Parai, R., Carlson, R., Turner, S. J. High-precision triple strontium isotopes as a unique tracer of carbonate recycling and subduction dynamics: a case study from Central America
- Hudak, M. R., et al. Olivine and pyroxene-hosted fluid inclusions record high arc nitrogen fluxes and multiple slab sources

Selected Conference Abstracts

- Turner, S. J., Mather, T. A., Pyle, D., Savov, I. P., *Hammerstrom, A., Barry, P. H., ... & Hudak, M. R. Geochemical evidence for shear heating, slab melting, and slab melt channelization in the South Andean subduction zone, *Goldschmidt*, 2023
- *Hammerstrom, A., Parai, R., Carlson, R., Turner, S. J. Stable Sr Isotope ($\delta^{88}\text{Sr}$) Constraints on Nicaraguan arc subduction fluxes and carbonate recycling, *AGU*, 2022

- *Brigham, K., Brueseke, H, Turner, S. J. Geochemistry of Wrangell Arc lavas indicate a mantle origin for voluminous high-Mg# andesites, *AGU*, 2022
- Turner, S.J., *Justus, S., *Hammerstrom, A., *Brigham, K., Global trends in silica (and other major element) abundances among high-Mg# arc-front stratovolcanoes, *Goldschmidt*, 2022
- Turner, S.J., Langmuir, CH., *Wieser, P., Deciphering crust, mantle, and slab controls on arc magma compositions: A global perspective, *AGU*, 2020
- *Wieser, P., Turner, S.J., Mather, T., Pyle, M., Savov, I., Orozco, G., Deciphering crust, mantle, and slab controls on arc magma compositions: A case study from Central Chile, SVZ (33–46° S), *AGU*, 2020
- Turner, S.J., Langmuir, CH., An Internally Consistent Framework for the Global and Regional Chemical Variability of Parental Arc Magmas, *Goldschmidt*, 2020
- *Barickman, M. H., Turner, S. J., Parai, R. P., Fike, D. A., Krawczynski, M., Wang, K. Boron isotopic constraints on slab and mantle-derived fluid and melt sources of Nicaraguan volcanics, *AGU*, 2019
- Turner, S.J., Langmuir, C., Cerpa, N., Does the ocean crust always melt at convergent margins? *State of the Arc Meeting*, 2018
- Turner, S.J., Humphreys, M., Matzen, A., Di Genova, D., Iveson, A., Smythe, D., Mather T., Pyle, D., Fe-redox in olivine-hosted melt inclusions and embayments across the Andean Southern Volcanic Zone, *Goldschmidt*, 2018
- Turner, S.J., Mather T., Pyle, D., Savov, I., Humphreys, M., Matzen, A., Di Genova, D., Whole-rock and melt inclusion chemistry of basalts and andesites from the southern Andes indicate mantle wedge hydration (and oxidation?) via melts from a slab mélange, *NERC Deep Volatiles Fall Program*, 2017
- Turner, S.J., Mather T., Pyle, D., Humphreys, M., Matzen, A., Savov, I., Trace element, volatile element, boron isotope, and XANES analyses of olivine-hosted melt inclusions from Chile and Argentina indicate a mantle wedge hydrated and oxidized primarily by hydrous melts of subducting sediment and oceanic crust, *Goldschmidt*, 2017
- Turner, S.J., Langmuir, C., Dungan, M., Escrig, S., The importance of mantle wedge heterogeneity to arc geochemistry, *Goldschmidt*, 2016
- Turner, S.J., Langmuir, C., Dungan, M., Escrig, S., Global geochemical insights from the Chilean Southern Volcanic Zone, *Goldschmidt*, 2015

Invited Talks

- 2023: University of Florida, Florida Atlantic University, University of Houston
- 2022: National Museum of Natural History, Cornell, Institut de Physique du Globe de Paris
- 2021: Carnegie Institute Department of Terrestrial Magnetism
- 2020: AGU Fall Meeting, Goldschmidt Conference, Woods Hole Oceanographic Institute
- 2019: Princeton University, New Mexico Tech, Lamont-Doherty Earth Observatory
- 2018: State of the Arc Meeting
- 2017: University of Oregon
- 2016: Goldschmidt Conference
- 2015: Cambridge University

Teaching/Advising

2022-present	Undergraduate research adviser for student Kristina Bardfield
2021-present	Instructor for “Subduction Zone Geochemistry” (GEO-723), UMass Amherst
2021-2022	Undergraduate research adviser for Kurt Lawson and Eli Nauda, UMass Amherst
2021-present	MS project adviser for students Sarah Justus and Kelly Brigham, UMass Amherst
2020-present	PhD Adviser for Alexander Hammerstrom
2019-present	Instructor for Mineralogy (GEO-311), And Petrology (GEO-312), UMass Amherst
2019-present	Instructor for Petrology Seminar (GEO-SCI-821), UMass Amherst
2019-present	Instructor for Mineralogy Honors Colloquium (GEO-H311), UMass Amherst
2019	“Boron Isotopes” seminar, Wash U St. Louis
2018-2022	MS co-adviser for Mattison Barickman, Wash U St. Louis
2017-2018	Seminar leader, “Geochemistry of Subduction Zones,” Wash U St. Louis
2017-2018	Undergraduate Honors adviser for Julian Rodriguez, Title: “Boron isotopes of ‘HIMU’ mid-ocean ridge basalts,” Wash U St. Louis
2016-2017	MS adviser for Penny Wieser, Title: “Don Casimiro: An EM1 Arc-Front Volcano,” University of Oxford
2015-2016	Guest lecturer, “Topics in Volcanology,” University of Oxford
2009-2014	TA section leader for: How to Build a Habitable Planet (SPU-14) (three cumulative sections), Energy and Climate: Vision for the Future (ENVR-103), Natural Disasters (SPU-12), Introduction to Geological Sciences (EPS-7), Harvard University

Research Support

In prep for resubmission	NSF OCE, Investigating lithosphere formation and modification in Alaska and western Canada from subduction to accretion: Integrating seismic and geochemical datasets
Pending	NSF CH, Bubble Trouble - Reevaluating olivine melt inclusion barometry and trace-element geochemistry in the Cascades
2019	NSF CH, “Development and application of Sr stable isotopes as a novel tracer of carbonate through subduction”
2016	UK Diamond Light Source facilities allotment, “Fe K-edge XANES on olivine-hosted melt inclusions in subduction zones”
2015	UK Ion Microprobe facilities allotment, “Constraining volatile fluxes in the Chilean Southern Volcanic Zone”

Field Experience

2021	Washington/Oregon	Expeditions to Mt. Rainier, Mt. Baker, and the Oregon High Lava Plains
2018	Costa Rica/Panama	Sampling of monogenetic cones and Volcán Barú
2017	Costa Rica/Nicaragua	Expedition to Telica Volcano, Nicaragua, and various sites in CR
2016	Kamchatka, Russia	Expedition to Bakening, Shiveluch, Kluchevskoy, and Avachinsky
2015	Argentina	Two separate expeditions (Spring/Fall) to various volcanic sites in Neuquén and Mendoza, Argentina, and Southern Chile
2012	Southern Chile	Expeditions to Chillan, Callaqui, Mocho-Choshuenco, Antillanca, Villarica, and Osorno Volcanoes
2011	Southern Chile	Expeditions to Llaima, Sierra Nevada Tolguaca, Lonquimay, and Sollipulli Volcanoes

2010 Kamchatka, Russia Expeditions to Bezymianny and Zimina Volcanoes
2009 Kamchatka, Russia Expeditions to Shiveluch and Bezymianny Volcanoes

Department/Professional Service

2022 Co-organizer for the 2022 New England Intercollegiate Geologic Conference
2022 Co-organizer for the 2022 UMass Panel on Accessible Fieldwork
2021-present UMass Amherst Geosciences Diversity, Equity, and Inclusion Committee
2020-Present UMass Amherst Geosciences Graduate Admissions Committee
2019-2020 UMass Amherst Geosciences Classroom Renovation Committee
2020 Convener “Chalcophile, Siderophile, and Other Redox-Sensitive Elements in the Solid Earth” at the Goldschmidt 2020 Fall Meeting
2018 Convener “Magma Dynamics and Timescales in Volcanic Environments” at the Goldschmidt 2018 Fall Meeting

24 reviews (past 5 years) for *EPSL*, *Geology*, *Lithos*, *Chemical Geology*, *G³*, *Science Advances*, *Journal of Petrology*, *Nature*, *Nature Communications*, *Gondwana Research*, *Earth Science Reviews*, *NSF Petrology and Geochemistry*