

# Emily S. Martin

## Curriculum Vitae

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Research Physical Scientist, Center for Earth and Planetary Studies,  
National Air and Space Museum, Smithsonian Institution  
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### Education

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**Ph.D.** Geological Sciences, University of Idaho, 2014  
**M.S.** Earth and Planetary Science, Northwestern University, 2009  
**B.A.** Physics and Astronomy, Wheaton College. Norton, MA, 2006

### Professional Experience

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2018-Present **Research Physical Scientist**—*Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution.*  
2014-2018 **Post-Doctoral Research Fellow**—*Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution.*  
2012-2013 **Visiting Researcher**—*Center for Earth and Planetary Studies, National Air and Space Museum, Smithsonian Institution.*  
2010-2014 **Graduate Research Assistant**—*University of Idaho, Dept. of Geological Sciences*  
2007-2009 **Graduate Research Assistant**—*Northwestern University, Dept. of Earth and Planetary Science.*  
2006 **Undergraduate Research Assistant**—*National Radio Astronomy Observatory, Green Bank, WV.*  
2005 **Undergraduate Research Assistant**—*Wheaton College, Norton, MA.*  
2005 **Undergraduate Research Assistant**—*Lowell Observatory, Flagstaff, AZ.*  
2004 **Intern** —*Christa McAuliffe Planetarium, Concord, NH.*  
2003-2006 **Observatory Assistant** —*Wheaton College Observatory, Norton, MA.*

### Mission Experience

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2019 **Collaborator on NASA mission concept study (Official)**  
Flagship Concepts for Astrobiology at Enceladus  
2018- **Co-I on NASA Discovery mission team proposal (Official)**  
Science team member for mission proposal to explore Neptune's moon Triton  
2018- **Participation on NASA Instrument team (Unofficial)**  
Funded research associate on the Lunar Reconnaissance Orbiter Camera from the Lunar Reconnaissance Orbiter through Dr. Thomas R. Watters.

## Teaching Experience

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### **Graduate Teaching Assistant**, *Northwestern University, Dept. of Earth and Planetary Science*

2009            Climate Catastrophes, Earth's Interior  
2008            Geological Hazards, The Ocean, Atmosphere, & Our Climate.

### **Undergraduate Teaching Assistant**, *Wheaton College, Dept. of Physics and Astronomy*

2004            The Universe, Introduction to Geology  
2003            The Solar System

## Projects

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**Project Title:** Enhancing SatStressGUI: Simplifying stress calculations for satellites

**Principal Investigator:** Robert T. Pappalardo

**Science PI/Co-Investigator:** D. Alex Patthoff

**Collaborators:** Emily S. Martin, Geoffrey C. Collins

**Project Title:** Unraveling the early tectonic history of Enceladus and Dione

**Principal Investigator:** Thomas R. Watters

**Science-Principal Investigator:** Emily S. Martin

**Co-Investigator:** D. Alex Patthoff

**Collaborators:** Amanda Nahm

**Project Title:** Building a geologic map of Neptune's moon Triton

**Principal Investigator:** Emily S. Martin

**Co-Investigator:** Michael Bland, D. Alex Patthoff, Thomas R. Watters

**Collaborators:** Geoffrey Collins, Tammy Becker

**Project Title:** Characterizing the mysterious linear virgae across the mid-size satellites in the Saturn System.

**PI of Award:** Emily S. Martin

**Co-Investigator:** D. Alex Patthoff

**Project Title:** Geologic Evidence for a South Polar Impact on Enceladus

**PI of Award:** Dr. James Roberts (APL)

**Co-Investigator:** Kathleen Craft, D. Alex Patthoff, Angela Stickle

## Awards and Honors

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2015            Peer Recognition Award, National Museum of Natural History  
2011-2012      Outstanding Graduate Student, Dept. Geological Sci. U. of Idaho  
2011            University of Idaho's Alumni Award for Excellence  
2010            University of Idaho's Dr. Indu Meshri Memorial Scholarship  
2006            Wheaton College's H. M. Pastra-Landis Prize in Physics

## Professional Service

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- 2019 Joint Technical Programming Committee for annual fall meeting of the geological society of America
- 2019 Chair of the Geological Society of America Planetary Geology Division
- 2018 Session Organizer & Co-Chair: *Friends of Hoth: Episode III—Bodies of the Outer Solar System*, Fall Meeting of the Geological Society of America, Indianapolis, Indiana.
- 2018 Peer Reviewer Nature Geoscience
- 2018 First Vice Chair of the Geological Society of America Planetary Geology Division
- 2018 Peer Reviewer Geophysical Research Letters
- 2018 Co-convener of the Cryovolcanism in the Solar System workshop held at the Lunar and Planetary Institute in Houston.  
<https://www.hou.usra.edu/meetings/cryovolcanism2018/organizers/>
- 2018 Session Organizer & Co-Chair (with D. Alex Patthoff): *Friends of Hoth: Episode*
- 2017 Second Vice Chair of the Geological Society of America Planetary Geology Division
- 2017-*Geophysical Research Letters* reviewer
- 2017 Session Organizer & Co-Chair (with D. Alex Patthoff): *Friends of Hoth: Episode II—Bodies of the Outer Solar System*, Fall Meeting of the Geological Society of America, Seattle, Washington.
- 2016 Secretary/Treasurer of the Geological Society of America Planetary Geology Division
- 2016 Session Organizer & Co-Chair: *Friends of Hoth: Satellites of the Outer Solar System*, Fall Meeting of the Geological Society of America, Denver, Colorado.
- 2016 Session Co-Chair (With Michael Bland): *Ziggy Faultscarps: Tectonics of the Outer Satellites* (F705).
- 2015 Session Organizer & Co-Chair: *Oceans, Fire, and Ice of the Outer Solar System (T175)*, Fall Meeting of the Geological Society of America, Baltimore, Maryland.
- 2014-*Icarus* reviewer
- 2014- NASA Grant Review Panel: External Reviewer
- 2014 NASA Grant Review Panel: Panelist
- 2014 Session Organizer & Co-Chair: *Ice in the Solar System: Mars to Pluto and Icy Worlds in Between (T227)*, Fall Meeting of the Geological Society of America, Vancouver, British Columbia, Canada.
- 2013 Session Organizer & Co-Chair: *Voyager to New Horizons: Exploring the Surfaces and Interior Processes of Icy Worlds (T12)*, Fall Meeting of the Geological Society of America, Denver, Colorado.
- 2013 AAS Division of Planetary Sciences Federal Relations Subcommittee, Capitol Hill visits.
- 2012 Session Organizer & Co-Chair *Tectonics of Icy Bodies and Their Analogs (T147)*, Fall Meeting of the Geological Society of America, Charlotte, North Carolina.
- 2011-2012 Graduate student representative to the Faculty of Department of Geological Sciences at University of Idaho.

- 2012 Graduate student representative for performance review of the Chair of the Department of Geological Sciences at the University of Idaho.
- 2010 JPL Planetary Science Summer School participant: Program Manager.

## Publications

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- Whitten, J. L. and **E. S. Martin**, (2019) Iceland pit chains as planetary analogs: Using morphologic measurements of pit chains to determine regolith thickness. *Journal of Geophysical Research*, (in Press) doi:10.1029/2019JE006099.
- Martin, E. S.**, D. A. Patthoff, (2018) Mysterious linear features across Saturn's moon Dione. *Geophysical Research Letters*, 45, 10,978-10,986 doi:10.1029/2018GL079819.
- Martin, E. S.**, S. A. Kattenhorn, G. C. Collins, R. L. Michaud, R. T. Pappalardo, D. Y. Wyrick (2017). Pit chains on Enceladus signal the recent tectonic dissection of the ancient cratered terrains. *Icarus*, 294, 209-217.
- Martin, E. S.** (2016). The distribution and characterization of strike-slip faults on Enceladus. *Geophysical Research Letters* 43, 2456-2464. doi:10.1002/2016GL067805.
- Jacobsen, S. D., Holl, C. M., Adams, K. A., Fischer, R. A., **Martin, E. S.**, Bina, C. R., Lin, J. F., Prakapenka, V. B., Kubo, A., and Dera, P. (2008). Compression of Single-Crystal Magnesium Oxide to 118 GPa and a Ruby Pressure Gauge for Helium Pressure Media. *American Mineralogist*, 93, 1823-1828.
- Hunter, D. A., Elmegreen, B. G., **Martin, E.** (2006). Mid-Infrared Images of Stars and Dust in Irregular Galaxies. *The Astronomical Journal*, Volume 132, Issue 2, pp. 801-818.

## Book Chapters

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- Buczowski, D. L.**, E. S. Martin, A. L. Nahm, Tectonic Landforms Across the Solar System, *in* Planetary Tectonism across the Solar System eds. C. Klimczak, G. C. Collins, P. Byrne. Elsevier Comparative Planetology Book Series.

## Outreach Activities

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- 2019 Discover the Moon Day and Apollo50 festival for the National Air and Space Museum on the National Mall
- 2019 Presented Live show of Airspace Podcast at South by Southwest in Austin, TX *When Failure is an Option*
- 2018 Awesome Con panelist, Washington DC (March 30<sup>th</sup>): *Science, Science Fiction, and Space Stations*.
- 2017 Space Talk at Brightest Young Things *Found in Space* party at the National Air and Space Museum (November 5<sup>th</sup>).
- 2017 Awesome Con panelist, Washington DC (June 16<sup>th</sup>): *The Museum on the Moon*.
- 2017- National Air and Space Museum *Mars Day!*
- 2016- Co-Host *AirSpace* the podcast for the National Air and Space Museum.  
<https://airandspace.si.edu/learn/airspace-podcast>

2018- Social Media coordinator for the *AirSpace* Podcast @airspacepodcast (Instagram)

### **Invited Talks & Selected Presentations**

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- 2019 Northern Virginia Astronomy Club *Cold Case: Unsolved mysteries of the Outer Planet Satellites.*
- 2018 Potomac Geophysical Society monthly meeting *How holes in Iceland's rocks help us understand the ocean on Saturn's tiny moon Enceladus.*
- 2018 Ask and Expert on Facebook Live at The National Air and Space Museum [Watch at <https://www.facebook.com/airandspace/videos/316375415777979/>]
- 2017 University of Maryland colloquium. *Enceladus's history from pit chains across the tectonized terrains.*
- 2017 Tristate Astronomy Club Hagerstown, MD. *The success of the Cassini mission.*
- 2017 Ask and Expert on Facebook Live. *Cassini's Finale* [Watch at <https://www.youtube.com/watch?v=4TzwjiN6fD4>]
- 2017 Almost Heaven Star Party, Spruce Knob, WV. *Cassini and its 'grand' tour of the Saturn System.* [Watch at <https://www.youtube.com/watch?v=mS5tKJfPSPg>]
- 2017 ICE Lunch Seminar, Jet Propulsion Laboratories *Pit chains on Enceladus: Implications for thermal and geophysical history.*
- 2016 National Air and Space Museum, Ask an Expert series. *The Europa Mission.*
- 2016 National Air and Space Museum, What's New in Aerospace series. *The Mars Generation: A Conversation with Christina Koch.* [Watch at <https://airandspace.si.edu/events/mars-generation-conversation-astronaut-christina-koch>]
- 2015 National Air and Space Museum, Ask an Expert series. *Expecting the Unexpected with New Horizons.*
- 2014 National Air and Space Museum, Smithsonian Stars Lecture Series, Albert Einstein Planetarium. *Far Out! A Tour of the Icy Bodies of the Outer Solar System.*
- 2013 Applied Physics Laboratory Planetary Science Brown-Bag Seminars, *Beyond Enceladus's South Polar Terrain: Establishing a Global Tectonic History.*
- 2013 University of Maryland, Planetary Geology Group, *Beyond Enceladus's South Polar Terrain: Establishing a Global Tectonic History.*
- 2013 National Air and Space Museum, Center for Earth and Planetary Studies, *Beyond Enceladus's South Polar Terrain: Establishing a Global Tectonic History.*

### **Blogposts**

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November 26, 2019: Conducting Planetary Research Here on Earth, <https://airandspace.si.edu/stories/editorial/conducting-planetary-research-here-earth> (National Air and Space Museum)

June 22, 2018: What an Accidental Discovery Told Us About Pluto, <https://airandspace.si.edu/stories/editorial/what-accidental-discovery-told-us-about-pluto> (National Air and Space Museum)

- September 14, 2017: Saying Goodbye to the Saturn-Exploring Cassini,  
<https://airandspace.si.edu/stories/editorial/saying-goodbye-saturn-exploring-cassini>  
(National Air and Space Museum)
- September 15, 2017: *Contributions to Our Favorite Saturn Discoveries from Cassini*,  
<https://airandspace.si.edu/stories/editorial/our-favorite-saturn-discoveries-cassini>  
(National Air and Space Museum)
- August 22, 2015: Inside Look: Celebrating New Horizons with the Mission Team,  
<https://airandspace.si.edu/stories/editorial/inside-look-celebrating-new-horizons-mission-team> (National Air and Space Museum)

### **Presented Conference Abstracts**

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- E. S. Martin**, D. A. Patthoff, M. Bland, T. R. Watters, G. C. Collins, T. Becker, (2019). Mapping Neptune's Moon Triton. Planetary Geologic Mappers Meeting, Flagstaff, AZ. Abs. No. 7020.
- J. D. Clark, T. R. Watters, C. H. van der Bogert, **E. S. Martin**, T. J. Thompson, N. R. Williams, A. L. Nahm, (2019). The Moon has its faults. Geological Society of America Abstracts with Programs. Vol. 51, No. 5, ISSN 0016-7592. doi: 10.1130/abs/2019AM-340956.
- E. S. Martin**, D. A. Patthoff, M. Bland, T. R. Watters, G. C. Collins, (2019). Creating a detailed geologic map of Neptune's moon Triton. Geological Society of America Abstracts with Programs. Vol. 51, No. 5. ISSN 0016-7592. doi: 10.1130/abs/2019AM-339114.
- E. S. Martin**, D. A. Patthoff, M. Bland, T. R. Watters, G. C. Collins, T. Becker, (2019)
- E. S. Martin**, T. R. Watters, (2019), Evaluating the mascon tectonic model with high-resolution topography. 50<sup>th</sup> Lunar and Planetary Science Conference, Abs. No. 2011.
- E. S. Martin**, J. L. Whitten, (2019). Analyzing pit chains in Iceland to constrain regolith thickness on Enceladus. 50<sup>th</sup> Lunar and Planetary Science Conference, Abs. No. 1997.
- E. S. Martin**, T. R. Watters, (2018). Using lunar graben morphology to elucidate the origin of basin related graben. Abstract P23D-2930 presented at 2018 Fall Meeting, American Geophysical Union, Washington, D. C., 10-14 Dec.
- Patthoff, D. A., **E. S. Martin**, (2018). Enceladus: Saturn's regenerating icy moon. Geological Society of America Abstracts with Programs. Vol. 50, No. 6, ISSN 0016-7592 doi:10.1130/abs/2018AM-324116
- M. Kinczyk, P. K. Byrne, G. C. Collins, **E. S. Martin**, G. W. Patterson, (2018). Characterizing strain in Enceladus's cratered terrain. Geological Society of America Abstracts with Programs. Vol. 50, No. 6, ISSN 0016-7592 doi: 10.1130/abs/2018AM-323925
- E. S. Martin**, D. A. Patthoff, (2018). Long-term tectonic deformation of Saturn's moon Rhea, Dione, and Tethys. Geological Society of America Abstracts with Programs. Vol. 50, No. 6, ISSN 0016-7592 doi: 10.1130/abs/2018AM-324056
- J. L. Whitten, **E. S. Martin**, (2018). Analyzing pit chains in Iceland to constrain regolith thickness on Enceladus. *European Planetary Science Congress*, Vo. 12, EPSC2018-53.
- E. S. Martin**, J. L. Whitten (2018). Using Icelandic Pit Chains to Constrain Regolith Thickness on Saturn's Moon Enceladus. 49<sup>th</sup> Lunar and Planetary Science Conference, Abstract #2209.
- K. A. Nunez, **E. S. Martin** (2018). Do chaos, domes, pits, and spots contribute to changing morphology of Europa's ridges?. 49<sup>th</sup> Lunar and Planetary Science Conference, Abstract #2473.

- A. L. Nahm, M. B. Johnson, E. Hauber, T. R. Watters, **E. S. Martin**, (2018). New global map and classification of large-scale extensional structures on the Moon. *49<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #2074.
- E. S. Martin**, T. R. Watters (2018). A tectonic origin for non-mascon related lunar graben. *49<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #2846.
- E. S. Martin**, D. A. Patthoff, T. R. Watters (2017). Are the linear virgae of the Saturnian system similar to catenae of the Galilean system? *48<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #2884.
- E. S. Martin**, D. A. Patthoff, J. McDaniel, and T. R. Watters (2016). Exploring the formation of Dione's wispy terrains. *2016 GSA Annual Meeting Abstracts with Programs*. Vol. 48, No. 7, Paper No. 48-12. doi:10.1130/abs/2016AM-285329.
- J. A. F. Heitmeier, **E. S. Martin**, J. M. Bretzfelder, D. A. Patthoff, G. C. Collins, and T. R. Watters (2016). Detailed characterization of Europa's ridge morphology. *2016 GSA Annual Meeting Abstracts with Programs*. Vol. 48, No. 7, Paper No. 48-10. doi:10.1130/abs/2016AM-286453.
- K. L. Craft, D. A. Patthoff, A. R. Rhoden, **E. S. Martin** (2016). Subsurface fractures, tidal stress and opening of conduits at the Damascus tiger stripe on Enceladus. *47<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #2906.
- D. A. Patthoff, R. T. Pappalardo, A. Maue, **E. S. Martin**, H. T. Chilton, P. T. Thomas, P. Schenk. *47<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1772.
- Martin, E. S.**, D. A. Patthoff, T. R. Watters (2016). Mysterious linear virgae across the icy satellites. *47<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #2958.
- Martin, E. S.**, J. McDaniel, T. R. Watters (2015). Detailed mapping and characterization of Dione's wispy terrains. *Geological Society of America Abstracts with Programs*.
- Craft, K. L., D. A. Patthoff, **E. S. Martin**, A. J. Dombard, A. Rhoden (2015). Ridges on Enceladus: Initial models of formation and flexure. *Geological Society of America Abstracts with Programs*.
- Patthoff, D. A., R. T. Pappalardo, A. D. Maue, H. Chilton, K. L. Craft, **E. S. Martin** (2015). Ridges of Enceladus, Europa, and other icy worlds. *Geological Society of America Abstracts with Programs*
- Martin, E. S.**, T. R. Watters, D. A. Patthoff (2015). Ancient ridges and troughs on Enceladus. *46<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1620.
- Martin, E. S.** and T. R. Watters (2014). Enceladus's tectonic history in deep time. *Geological Society of America Abstracts with Programs*, Vol. 46, No. 6 p.220 Paper #84-12.
- Martin, E. S.** and S. A. Kattenhorn (2014). A history of pit chain formation within Enceladus's cratered terrains suggests a nonsynchronous rotation stress field. *45<sup>th</sup> Lunar and Planetary Science Conference*, Abstract #1083.
- Martin, E. S.** and S. A. Kattenhorn (2013). Global strike-slip fault distribution on Enceladus. *Enceladus Focus Group Meeting, SETI, Mountain View, California*.
- Martin, E. S.** and S. A. Kattenhorn (2013). Global strike-slip fault distribution on Enceladus reveals mostly left-lateral faults. *American Geophysical Union Fall Meeting*. Abstract P53B-1865.

- Martin, E. S.** and S. A. Kattenhorn (2013). Estimating regolith thickness on Enceladus using the angle of repose of individual pits within pit chains. Geological Society of America Abstracts with Programs Vol. 45, No. 7, p.704, Paper #305-4.
- Martin, E. S.** and S. A. Kattenhorn (2013). Evaluating the global tectonic histories of icy bodies: Enceladus as a case example. The Pluto System on the Eve of Exploration by New Horizons: Perspectives and Predictions: A Scientific Conference. The Applied Physics Laboratories, Columbia, Maryland.
- Martin, E. S.** and S. A. Kattenhorn (2013). Probing regolith depths on Enceladus by exploring a pit chain proxy. 44<sup>th</sup> Lunar and Planetary Science Conference, Abstract #2047.
- Martin, E. S.** and S. A. Kattenhorn (2012). Diapirism response to impacts may cause stress perturbations around craters that affect fracture growth on Enceladus. Geological Society of America Abstracts with Programs Vol. 44, No. 7, p. 328, Paper #131-7.
- Martin, E. S.** and S. A. Kattenhorn (2012). Crater Induced Fracture Reorientation on Enceladus. 43<sup>rd</sup> LPSC, Abstract #2883.
- Miller, M.S., **Martin, E.S.**, Patthoff, D.A., Kattenhorn, S.A. (2012). Pit chains on Enceladus: An experimental test of the impact of fault geometry on pit chain growth. 43<sup>rd</sup> Lunar and Planetary Science Conference Abstracts 43, #2925.
- Martin, E. S.** and S. A. Kattenhorn (2011). When Craters Attract: Crater-Fracture Interactions on Enceladus. Enceladus Focus Group Meeting, SETI, Mountain View, California.
- Martin, E. S.** and S. A. Kattenhorn (2011). Deciphering Enceladus's Tectonic History: An Analog for the Pluto and Charon System. New Horizons Workshop on Icy Surface Processes, Lowell Observatory, Flagstaff, Arizona.
- Martin, E. S.** and S. A. Kattenhorn, (2011). Crater-Fracture Interactions on Enceladus: The Control of Crater Size on Perturbations of Fracture Growth, 42<sup>nd</sup> LPSC, Abstract #2666.
- Martin, E. S.** and D. M. Jurdy, (2010). Iapetus: Construction and Analysis of a Global Crater Database. 41<sup>st</sup> LPSC, Abstract #1437.
- Martin, E. S.** and D. M. Jurdy, (2009). A Crater Database for Iapetus. 43<sup>rd</sup> Annual Meeting of the North-Central Section, Geological Society of America *Abstracts with Programs*, Vol. 41, No. 4, p. 20, Paper No. 12-4.
- Martin, E. S.**, Collins, G. C., Crawford, Z. A., Pappalardo, R. T., (2006). Computer Assisted Time Sequence Sorting of Grooves in Eastern Mysia Sulci, Ganymede, 37<sup>th</sup> LPSC, Abstract #1204.

## Professional Organizations

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Fall 2010-	American Geophysical Union.
2012-	Geologic Society of America.
2012-	GSA, Planetary Geology Division.