Dr. Samuel M. Howell
Europa Clipper Project Science Postdoctoral Affiliate
JPL/Caltech Postdoctoral Scholar in Planetary Science,
Geochemistry and Astrobiology
samuel.m.howell@jpl.nasa.gov

EDUCATION

University of Hawai'i at Mānoa
Honolulu, Hawai'i
PhD Geology and Geophysics 2016
MS Geology and Geophysics 2013
Geodynamic numerical modeling
Statistical analysis of large datasets
Seafloor mapping and analysis

Rose-Hulman Institute of Technology
Terre Haute, Indiana
B.S. Engineering Physics 2010
Minor: Thermal Fluid Mechanics
Concentration: Mech. Engineering

EXPERIENCE

NASA Jet Propulsion Laboratory
JPL/Caltech Postdoctoral Scholar 2017 – Present
Clipper Project Science Postdoc Affiliate 2018 – Present

University of Hawai'i at Mānoa
Research Assistant 2010 – 2016
Teaching Assistant 2011

Research Cruise TN273, *The tectonics, igneous activity, and mineralization of the southern Mariana Forearc*
Sonar Tow Pilot, R/V Thomas G. Thompson 2012

Research Cruise ARGGH2010, *Aegir Ridge Geology, Geophysics, and Hotspot Interaction*
Shipboard Scientist, R/V Haakon Mosby 2010

AWARDS AND ACTIVITIES

2018 **Europa Clipper Science Team Postdoctoral Affiliate in Project Science**, NASA Europa Clipper Mission
2017 **Outstanding Postdoctoral Research in Planetary Science and Life Detection**, Jet Propulsion Laboratory
2017 **Keck Institute for Space Studies** workshop participant, *Accessing the Subsurface Oceans of Icy Worlds*
2017 **NASA Planetary Science Summer Seminar**, Principal Investigator
2016 ***Popular Mechanics* Breakthrough Award** for study on vertical motions of the San Andreas Fault System
2015 **Graduate Achievement Award**, Dept. of Geology and Geophysics/ UH Mānoa Graduate Division

PUBLICATIONS

Howell, S., R.T. Pappalardo (2019), *Can Earth-like plate tectonics occur in the outer ice shells of icy satellites?* Icarus, doi:10.1016/j.icarus.2019.01.011

Howell, S., J-A. Olive, G. Ito. M. D. Behn, J. Escartin, B. Kaus (2019, *in review*), *Seafloor expression of oceanic detachment faults reflects gradients in mid-ocean ridge magma supply*, Earth and Planetary Science Letters

Howell, S., L. Chou, 18 others (2018), *Centaur reconnaissance mission concept: Chariklo flyby and impact*, Planetary and Space Science, doi:10.1016/j.pss.2018.07.008

2017 JPL Outstanding Postdoctoral Research Award Recipient
Howell, S., R.T. Pappalardo (2018), *Band formation and ocean-surface interaction on Europa and Ganymede*, Geophysical Research Letters, doi:10.1029/2018GL077594

Howell, S., G. Ito, M. D. Behn, F. Martinez, J.-A. Olive, and J. Escartín (2016), *Magmatic and tectonic extension at the Chile Ridge: Evidence for mantle controls on ridge segmentation*, Geochem. Geophys. Geosyst., doi:10.1002/2016GC006380

2016 *Popular Mechanics* Breakthrough Award Recipient
Howell, S., B. Smith-Konter, N. Frazier, X. Tong, D. Sandwell (2016), *The vertical fingerprint of earthquake cycle loading in Southern California*, Nature Geoscience, doi:10.1038/ngeo2741

Olive, J.-A., M. D. Behn, G. Ito, W. R. Buck, J. Escartín, **S. Howell** (2016), *Response to Comment on "Sensitivity of seafloor bathymetry to climate-driven fluctuations in mid-ocean ridge magma supply"*, Science, doi:10.1126/science.aaf2021

Olive, J.-A., M. D. Behn, G. Ito, W. R. Buck, J. Escartín, **S. Howell** (2015), *Sensitivity of seafloor bathymetry to climate-driven fluctuations in mid-ocean ridge magma supply*, Science, doi:10.1126/science.aad0715.

Howell, S., G. Ito, A.J. Breivik, A. Rai, R. Mjelde, B. Hanan, K. Sayit, P. Vogt (2014), *The origin of the asymmetry in the Iceland hotspot along the Mid-Atlantic Ridge from continental breakup to present-day*, Earth Planet. Sci. Lett., doi:10.1016/j.epsl.2014.02.020.

B. Boston, **S. Howell**, J. Sleeper, A. Anderson, M. Cameron, T. Sigurdardottir, J. Tree, H. Togia, B. Smith-Konter, G. F. Moore, (2018), *Seafloor Mapping at Your Fingertips: Setting Sail on Sonar Education with an Interactive Exhibit*, The Earth Scientist, 34, 1, 11-15.

B. Boston, **S. Howell**, G. Moore, University of Hawaii Geophysical Society (2014), *A miniature research vessel: A small-scale ocean-exploration demonstration of geophysical methods*, The Leading Edge, SEG, doi:10.1190/tle33121408.1

Howell, S., E. Leonard, *Incorporating ocean impurities within Europa's ice shell: Salty tree-rings?* in preparation for Geophysical Research Letters

INVITED TALKS

Howell, S. (2019), *Exploring Europa: A dynamic ocean world*, Astronomy Lecture Series/NPR, Boise State University/KBSX, Boise, ID 1 Feb.

Howell, S. (2018), *Feasibility of Earth-like plate tectonics on Europa: Implications for ocean-surface interaction*, Europa Clipper Science Series, NASA Jet Propulsion Laboratory, Pasadena, CA, 5 Oct.

Howell, S. (2018), *Facilitating ocean-surface exchange through ice shell tectonics*, NASA Astrobiology Institute Icy Worlds Meeting, Monrovia, CA, 15 Feb.

Howell, S. (2018), *Can subduction fuel tectonics in the outer ice shells of icy satellites?*, Icy Worlds Collaboration and Exchange (ICE) Seminar, Jet Propulsion Laboratory, Pasadena, CA, 7 Feb.

Howell, S. (2018), *Simulating tectonic windows into ocean worlds*, Dix Planetary Science Seminar, California Institute of Technology, Pasadena, CA, 30 Jan.

Howell, S. (2018), *Extensional Terrains: Tectonic windows into ocean worlds*, Earth, Planetary, and Space Sciences Colloquium, University of California Los Angeles, Los Angeles, CA, 6 Feb.

Howell, S. (2017), *Breaking the ice on Europa and Ganymede: Pull-apart bands and ocean-surface interaction*, TGIF Seminar Series, University of Hawai'i at Mānoa, Honolulu, 29 Sept.

Howell, S. (2017), *Tectonic modeling: You won't believe Europa's one weird trick for ocean-surface interaction!*, Icy Worlds Collaboration and Exchange (ICE) Seminar, NASA Jet Propulsion Laboratory, Pasadena, CA, 23 May.

Howell, S. (2015), *Tectonic and magmatic controls on mid-ocean ridge morphology*, Earth Science Seminar, NASA Jet Propulsion Laboratory Science Visitor and Colloquium Program, NASA Jet Propulsion Laboratory, Pasadena, CA, 12 Oct.

PENDING PROPOSALS (in Full Time Employment; 1 FTE = 1 year salary + overhead)

Science PI (1.4 FTE total / 3 years), *Understanding how Ceres' icy interior controls the formation of surface features through geodynamic modeling*, JPL/Caltech, NASA Discovery Data Analysis Program

Science PI (0.5 FTE total / 2 years), *Probe using a Reactor for Ice Melting on Europa (PRIME)*, Howe Industries, NASA Scientific Exploration Subsurface Access Mechanism for Europa (SESAME)

Co-I (0.40 FTE total / 2 years), *SLUSH: Search for Life Using Submersible Heated drill*, Honeybee Robotics, NASA Scientific Exploration Subsurface Access Mechanism for Europa (SESAME)

ORAL PRESENTATIONS

Howell, S., E. J. Leonard (2018), *Non-ice distributions in ocean world ice shells record geologic history*, GSA Fall Meeting, Indianapolis, IN, 4-7 November.

Howell, S., E. J. Leonard (2018), *Impurities in Europa's Ice Shell: Salty Tree-Rings?*, Europa Deep Dive II, Lunar and Planetary Institute, Houston, TX, 9-12 October.

Howell S., R. T. Pappalardo (2018), *Tectonic material transport within the outer ice shells of icy satellites*, COSPAR Scientific Assembly, Pasadena, CA, 14-22 July.

Howell, S., R.T. Pappalardo (2018), *Can Earth-Like Plate Tectonics Occur in the Outer Ice Shells of Icy Satellites?*, abstract 1132, 2018 Lunar and Planetary Science Conference, Houston, TX, 19-23 March.

Howell, S., R.T. Pappalardo (2017), *Extensional terrain formation in icy satellites: Implications for ocean-surface interaction*, abstract P52B-09, 2017 Fall Meeting, AGU, New Orleans, LA, 11-15 Dec.

Howell, S., R.T. Pappalardo (2017), *Band Formation and Ocean-Surface Interaction on Europa and Ganymede*, abstract 7002, Europa Deep Dive I: Ice-Shell Exchange Processes, Houston, TX, 1-2 Nov.

Howell, S., R.T. Pappalardo (2017), *Extensional terrain formation in icy satellites: Implications for ocean-surface interaction*, abstract 303956, 2017 Geological Society of America Annual Meeting, Seattle, WA, 22-25 Oct.

Howell, S., R.T. Pappalardo (2017), *Extensional terrain formation in icy satellites*, abstract 2821857, 2017 Fall Meeting, AAS Division for Planetary Sciences, Provo, UT, 15-20 Oct.

Howell, S., R.T. Pappalardo (2017), *Extensional terrain formation in icy satellites: Implications for ocean-surface interaction*, 2017 Postdoc Seminar Series, Jet Propulsion Laboratory, Pasadena, CA, 13 July.

Howell, S., G. Ito, F. Martinez, H. Escartin, M. Behn, J.A. Olive (2015), V*ariations in magmatic and tectonic extension at the Chile Ridge*, Abstract V12A-02, 2015 Fall Meeting, AGU, San Francisco, CA, 15-19 Dec.

Howell, S., G. Ito, F. Martinez, J. Escartin, M. Behn, J.A. Olive (2015), *Variations in magmatic and tectonic extension at the Chile Ridge*, Gordon Research Seminar on the Interior of the Earth, South Hadley, MA, 6-7 June.

Howell, S., B. Boston, S. Maher, J. Sleeper, H. Togia, J. Tree, UHGS (2014*), The Smallest R/V: A Small-scale Ocean Exploration Demonstration of Real-time Bathymetric Measurements*, Abstract ED44B-07

presented at 2014 Fall Meeting, AGU, San Francisco, CA, 15-19 Dec.

Howell, S., G. Ito, F. Martinez, M. Behn, J. Escartin, J.A. Olive (2013), *Quantifying the variability in tectonic vs. magmatic extension at the Chile Rise*, Abstract OS41E-03 presented at 2013 Fall Meeting, AGU, San Francisco, CA, 9-13 Dec.

SELECTED PROFESSIONAL MEETING ABSTRACTS

L. Montesi, **S. Howell**, R.T. Pappalardo (2018), *Ice thickness, upwelling, and topography in bands on Europa*, abstract 2173, 2018 Lunar and Planetary Science Conference, Houston, TX, 19-23 March.

M. Bouchard, **S. Howell**, 2017 NPSSS Team (2018), *Flyby and Impact of Chariklo: A New Frontiers Class Centaur Reconnaissance Mission Concept from the 2017 NASA-JPL Planetary Science Summer Seminar*, abstract 2087, 2018 Lunar and Planetary Science Conference, Houston, TX, 19-23 March.

L. Chou, **S. Howell**, 2017 NPSSS Team (2017), *A Centaur Reconnaissance Mission*, Abstract ED23C-03132017, 2017 Fall Meeting, AGU, New Orleans, LA, 11-15 Dec.

Howell, S., R.T. Pappalardo (2017), *The effect of fault localization assumptions on extensional terrain development in icy satellites*, Abstract 303953, 2017 Geological Society of America Annual Meeting, Seattle, WA, 22-25 Oct.

Howell, S., G. Ito, M. D. Behn, J.-A. Olive, B. Kaus, A. Popov, E. Mittelstaedt, T. Morrow (2016), *Exploring tectonomagmatic controls on mid-ocean ridge faulting and morphology with 3-D numerical models*, Abstract T33A-3013, 2016 Fall Meeting, AGU, San Francisco, CA, 12-16 Dec.

Howell, S., B. Boston, J. Sleeper, M. E. Cameron, H. Togia, A. Anderson, T.D. Sigurdardottir, J. Tree, UHGS (2015), *A miniature research vessel: A small-scale ocean-exploration demonstration of geophysical methods*, Abstract ED21A, 2015 Fall Meeting, AGU, San Francisco, CA, 14-18 Dec.

Howell, S., B. Smith-Konter, N. Frazier, X. Tong, D. Sandwell (2015), *The vertical fingerprint of earthquake cycle loading in Southern California*, 2015 EarthScope National Meeting, Stowe, VT, 14-17 June.

Howell, S., G. Ito, F. Martinez, J. Escartin, M. Behn, J.A. Olive (2015), *Variations in magmatic and tectonic extension at the Chile Ridge*, 2015 Gordon Research Conference, Interior of the Earth, South Hadley, MA, 7-12 June.

Howell, S., B. Smith-Konter, N. Frazier, X. Tong, D. Sandwell (2014), *Statistical analysis of GPS vertical uplift rates in southern California*, Abstract T41C-4660, 2014 Fall Meeting, AGU, San Francisco, CA, 15-19 Dec.

Howell, S., B. Smith-Konter, N. Frazier, X. Tong, D. Sandwell (2014), *Statistical analysis of GPS vertical uplift rates in southern California*, Poster 102, 2014 Southern California Earthquake Center Annual Meeting, Palm Springs, CA, 7-10 Sept.

Howell, S., G. Ito, A.J. Breivik, B. Hanan, K. Sayit, P. Vogt, R. Mjelde (2011), *Numerical modeling of mantle convection beneath the Aegir Ridge, a shadow in the Iceland Hotspot*, Abstract T51H-2465, 2011 Fall Meeting, AGU, San Francisco, Calif., 5-9 Dec.