

DR. SAMUEL M. HOWELL

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EDUCATION

- 2016 PhD, Geology and Geophysics, University of Hawai'i at Mānoa, Honolulu, Hawai'i
- 2013 MS, Geology and Geophysics, University of Hawai'i at Mānoa, Honolulu, Hawai'i
- 2010 BS, Engineering Physics, Rose-Hulman Institute of Technology, Terre Haute, Indiana
Minor: Thermal Fluid Mechanics; Concentration: Mechanical Engineering

PROFESSIONAL POSITIONS

- 2019 - Pres Research Scientist, Ocean Worlds Strategic Hire, Planetary Interiors and Geophysics, JPL
- 2019 JPL Postdoctoral Fellow, Ocean Worlds, JPL/Caltech
- 2016 – 2018 Caltech Postdoctoral Scholar, Planetary Chemistry and Astrobiology, JPL/Caltech

PROFESSIONAL EXPERIENCE

- 2019 – Pres Project Staff Scientist, NASA Europa Clipper Mission
- 2019 – Pres Deputy Principle-Investigator & Concept Scientist, JPL Probe using Radioisotopes for Icy Moon Exploration (PRIME)
- 2017 Principal Investigator, NASA Planetary Science Summer Seminar
- 2017 – 2019 Postdoctoral Affiliate in Project Science, Europa Clipper Science Team
- 2012 Sonar Tow Pilot, Research Cruise TN273, The tectonics, igneous activity, and mineralization of the southern Mariana Forearc, R/V Thomas G. Thompson
- 2010 Shipboard Scientist, Research Cruise ARGGH2010, Aegir Ridge Geology, Geophysics, and Hotspot Interaction Shipboard Scientist, R/V Haakon Mosby

SELECTED PROJECTS

- Principle Investigator, NASA Solar System Workings, 2021-2023, Europa's Icy Tectonics: First-Principles and Higher-Order Modeling,
- Co-Investigator, NASA Solar System Workings, 2020-2022, Did Solid Tides Prevent the Thermodynamic Death of Europa?
- Co-Investigator, NASA Solar System Workings, 2020-2022, Compositions of Ice Shells on Ocean Worlds
- Co-Investigator, NASA Scientific Exploration Subsurface Access Mechanism for Europa (SESAME), 2019-2021, Search for Life Using Submersible Heated Drill (SLUSH)

SELECTED ACTIVITIES

- 2020 Selected Participant, Principle Investigator Launchpad (Mission-focused), NASA SMD
- 2020 Study Scientist, Radioisotope Power Systems for pressure vessels, NASA RPS Program
- 2019 Study Scientist, Radioisotope Power System considerations for Ocean Worlds, NASA RPS Program
- 2019 Primary Convener, Passing Through Purgatory: Architectures, Technologies, and Considerations for Accessing Ocean World Interiors, AGU Fall Meeting
- 2017 Subject Matter Expert, Keck Institute for Space Studies: Accessing the Subsurface Oceans of Icy Worlds

AWARDS

- 2017 Outstanding Postdoctoral Research in Planetary Science and Life Detection, JPL
2016 *Popular Mechanics* Breakthrough Award for study on motions of the San Andreas Fault System
2015 Graduate Achievement Award, Dept. of Geology and Geophysics/ UH Mānoa Graduate Division

SELECTED PUBLICATIONS (†outreach and public engagement)

Howell, S., Stone, W. C., Craft, K., German, C., Murray, A., Rhoden, A., & Arrigo, K. (2020). Ocean Worlds Exploration and the Search for Life, submitted to the 2023-2032 Decadal Survey in Planetary Science and Astrobiology, arXiv:2006.15803.

Howell, S., R.T. Pappalardo (2020), *NASA's Europa Clipper—a mission to a potentially habitable ocean world?* Nature Communications, doi:10.1038/s41467-020-15160-9

Howell, S., Stone, W. C., Craft, K., German, C., Murray, A., Rhoden, A., & Arrigo, K. (2020). Ocean Worlds Exploration and the Search for Life, submitted to the 2023-2032 Decadal Survey in Planetary Science and Astrobiology, arXiv:2006.15803.

†**Howell, S.**, (2020), Diving into Ocean Worlds, ECO Magazine, June Issue, 27-29

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), *Seafloor expression of oceanic detachment faults reflects gradients in mid-ocean ridge magma supply*, Earth and Planetary Science Letters, doi:10.1016/j.epsl.2019.04.001

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

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

†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.

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

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

†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

INVITED TALKS AND LECTURES

- Howell, S. (2020), *The Likely Thickness of Europa's Icy Shell*, Europlanet Science Congress (EPSC), virtual.
- Howell, S. (2020), *Linking ice shell deformation to Europa's habitability: Material transport through ice tectonics and implications for surface-ocean exchange*, The Second Annual Winter School on Aquaplanetology, Aso, Japan, 28 Feb.
- Howell, S., M.E. Cameron (2020), *The Exploration of Europa, an Alien Ocean World*, Department of Earth Sciences Seminar Series, University of Hawai'i at Mānoa, Honolulu, 21 Feb.
- Howell, S. (2019), *Europa's habitability: Dynamic ice processes and future Ocean World exploration*, Alternative Earths Astrobiology Seminar, University of California, Riverside, Riverside, CA, 3 May.
- Howell, S. (2019), *Europa's ice shell dynamics: Salty tree rings and stumpy tails*, Yuk Lunch Seminar, California Institute of Technology, Pasadena, CA, 13 Feb.
- Howell, S. (2019), *Exploring Europa: A dynamic ocean world*, Astronomy Lecture Series/NPR, Boise State University/KBSX, Boise, ID, 1 Feb.
- Howell, S. (2019), *Ocean world ice shell transport processes*, NASA Astrobiology Institute Titan Meeting, Pasadena, CA, 24 Jan.
- 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), *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. (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.

SELECTED ORAL PRESENTATIONS

- Howell, S., C. Sotín, K. Zacny, J.-P. Fluerial, D. Woerner (2019), *Environmental Considerations for Accessing the Interior Oceans of Ocean Worlds*, Astrobiology Science Conference (AbSciCon), Bellvue, WA, 24 Jun.
- Howell, S., R. T. Pappalardo (2019), *The Fate of Icy Slabs on Europa: Implications for Detecting Active Convergent Margins in Ocean World Ice Shells*, Ocean Worlds 4, Columbia, MD, 21-22 May.
- 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 (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.