

# Christopher W. Hamilton

## PLANETARY VOLCANISM AND EXPLORATION

Professor, Lunar and Planetary Laboratory and Department of Geosciences, University of Arizona

Adjunct Professor, Institute of Earth Sciences, University of Iceland

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## RESEARCH

I study volcanic processes on Earth and across the Solar System, from active eruptions in Iceland to lava plains on Mars, Venus, the Moon, and Io. My group studies eruptions such as the 2014–2015 Holuhraun and 2021–2023 Fagradalsfjall events in Iceland and supports mission development through field-based planetary analog research, remote sensing, and numerical modeling.

### Key Themes

**Geologic surface processes:** lava emplacement, magma–water interactions, volcano-tectonics, aeolian processes, megaflooding, and impact cratering.

**Astrobiology:** microbial colonization of volcanic terrains, biosignature detection, and habitability.

**Geoinformatics:** remote sensing, information theory, Bayesian inference, machine learning, and computer vision.

**Exploration technology:** unoccupied aircraft systems (UAS), light detection and ranging (LiDAR), and radar.

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## EDUCATION

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| 2010 | <b>Ph.D., Geology and Geophysics</b> , University of Hawai‘i at Mānoa. Dissertation: “Explosive lava–water interactions on Earth and Mars.” Advisor: Sarah A. Fagents. Visiting student, University of Edinburgh (2007–2008).                            |
| 2004 | <b>B.Sc., Earth Sciences</b> (First Class Honours, Minor in Physics), Dalhousie University. Thesis: “Ice-contact volcanism in the Vífilsfell Region, southwest Iceland.” Advisor: D. Barrie Clarke. Visiting student, University of Iceland (2002–2003). |

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## APPOINTMENTS

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| 2026–present | <b>Professor</b> , Lunar and Planetary Laboratory and Department of Geosciences, University of Arizona                                   |
| 2019–present | <b>Adjunct Professor</b> , Institute of Earth Sciences, University of Iceland                                                            |
| 2020–2026    | <b>Associate Professor</b> , Lunar and Planetary Laboratory and Department of Geosciences, University of Arizona                         |
| 2021–2024    | <b>Associate Department Head</b> , Lunar and Planetary Laboratory, University of Arizona                                                 |
| 2018–2023    | <b>Adjunct Associate Professor</b> , Lamont–Doherty Earth Observatory, Columbia University                                               |
| 2014–2020    | <b>Assistant Professor</b> , Lunar and Planetary Laboratory (2014–2020) and Department of Geosciences (2015–2020), University of Arizona |
| 2013–2014    | <b>Associate Researcher</b> , Planetary Geodynamics Laboratory, NASA Goddard Space Flight Center                                         |
| 2011–2013    | <b>NASA Postdoctoral Program Fellow</b> , NASA Goddard Space Flight Center. Advisor: Lori S. Glaze                                       |
| 2010         | <b>Postdoctoral Researcher</b> , Hawai‘i Institute of Geophysics and Planetology, University of Hawai‘i                                  |

## HONORS AND AWARDS

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|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2021 | <b>Fulbright–NSF Arctic Scholar</b> , University of Iceland                                                                                               |
| 2020 | <b>Scialog Fellow</b> , “Signatures of Life in the Universe,” Research Corporation for Science Advancement and Heising–Simons Foundation                  |
| 2018 | <b>Early Career Award</b> , Geological Society of America, Mineralogy, Geochemistry, Petrology, and Volcanology Division                                  |
| 2018 | <b>SN 10: Scientists to Watch</b> , <i>Science News</i>                                                                                                   |
| 2018 | <b>Faculty Fellowship</b> , NASA Marshall Space Flight Center                                                                                             |
| 2017 | <b>Invited contributor</b> , Iceland’s UNESCO World Heritage nomination of the Central Highlands (inscribed 2019)                                         |
| 2015 | <b>Early Career Fellowship</b> , NASA                                                                                                                     |
| 2011 | <b>Postdoctoral Program Fellowship</b> , NASA                                                                                                             |
| 2010 | <b>Doctoral Research Achievement Award</b> , University of Hawai‘i Research Council                                                                       |
| 2005 | <b>Léopold Gélinas Medal</b> , Geological Association of Canada, for the best undergraduate thesis in Canada (Volcanology and Igneous Petrology Division) |

## RESEARCH PROJECTS

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### Active

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|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2026–present | <b>Dynamic topography and lava flow emplacement: implications for eruption hazards and flow-field development.</b> National Science Foundation, Chemical Evolution of the Solid Earth and Volcanology program. Co-PI with Brett Carr (NAU) |
| 2026–present | <b>American-built drones for planetary exploration science.</b> University of Arizona Technology and Research Initiative Fund. PI                                                                                                          |
| 2025–present | <b>The magmatic evolution of Elysium Planitia, Mars.</b> NASA Mars Data Analysis Program. Co-I (PI: Laura Kerber, JPL)                                                                                                                     |
| 2024–present | <b>Magmatic and tectonic processes in Amazonis Planitia, Mars.</b> NASA Mars Data Analysis Program. PI                                                                                                                                     |
| 2024–present | <b>Simultaneous Localization and Mapping (SLAM) LiDAR for lunar exploration.</b> University of Arizona Space Institute. PI                                                                                                                 |
| 2024–present | <b>Revealing the geologic history of Amazonis Planitia, Mars.</b> NASA Mars Data Analysis Program. Collaborator (PI: Katie Stack, JPL)                                                                                                     |
| 2024–present | <b>Landscape terraformation science: a digital twin of Biosphere 2.</b> University of Arizona Research and Partnerships. Collaborator (PI: Scott Saleska, UArizona)                                                                        |
| 2024–present | <b>Planetary Data Training Workshops.</b> NASA Topical Workshops, Symposia, and Conferences program. Collaborator (PI: David Williams, ASU)                                                                                                |
| 2023–present | <b>Cryovolcanism and space weathering on Europa.</b> CNRS–University of Arizona International Research Center. Co-PI with Alexis Bouquet (AMU)                                                                                             |
| 2023–present | <b>PANTHER: Passive Autonomy, Navigation, Topography, and Habitability Exploration Radar.</b> NASA Planetary Science and Technology Through Analog Research program. Co-I (PI: Sean Peters, CU Boulder)                                    |
| 2023–present | <b>From olivine to feldspar: tracing martian crustal evolution with Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) data.</b> NASA Mars Data Analysis Program. Co-I (PI: Michael Phillips, [institution])                     |
| 2023–present | <b>Rheology and eruptibility of three-phase cryovolcanic magmas.</b> NASA Solar System Workings program. Co-I (PI: Christine McCarthy, Columbia)                                                                                           |
| 2023–present | <b>VERITAS: Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy.</b> NASA Discovery Program. Collaborator (PI: Sue Smrekar, JPL)                                                                                          |

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| 2023–present     | <b>Silicic lunar volcanism and the Wildcat Hills, Utah.</b> NASA Solar System Workings program. Collaborator (PI: Kristen Bennett, USGS)                                                             |
| <b>Completed</b> |                                                                                                                                                                                                      |
| 2023–2025        | <b>Rocky roads: flow pathways and chemical evolution in vesicular lava and pumice.</b> Heising-Simons Foundation, Science Dialog (Scialog) program. PI                                               |
| 2022–2025        | <b>Planetary Data Training Workshops.</b> NASA Topical Workshops, Symposia, and Conferences program. Co-I (PI: David Williams, ASU)                                                                  |
| 2021–2025        | <b>Volcanic eruptions, climate, and ice distribution on Late Amazonian Mars.</b> NASA Solar System Workings program. Co-I (PI: Laura Kerber, JPL)                                                    |
| 2024             | <b>Follow the light: light penetration into astrobiologically relevant media.</b> Arizona Astrobiology Center seed grant. PI                                                                         |
| 2024             | <b>Biosignature distribution in Mars analog environments.</b> Arizona Astrobiology Center seed grant. Co-I (PI: Solange Duhamel, UArizona)                                                           |
| 2024             | <b>Microbial dispersal in sandsheets as a planetary analog.</b> Arizona Astrobiology Center seed grant. Co-I (PI: Nathan Hadland, UArizona)                                                          |
| 2022–2024        | <b>Infrastructure for planetary analog research using unoccupied aircraft systems.</b> University of Arizona Technology and Research Initiative Fund. PI                                             |
| 2022–2024        | <b>Automating hyperspectral image analysis for aerial exploration.</b> Royal Society of New Zealand Catalyst Fund. Co-I (PI: Ingrid Ukstins, University of Auckland)                                 |
| 2020–2024        | <b>RAVEN: Rover–Aerial Vehicle Exploration Network.</b> NASA Planetary Science and Technology Through Analog Research program. PI                                                                    |
| 2019–2024        | <b>Three-dimensional modeling of a secondary ancient lunar atmosphere.</b> NASA Solar System Workings program. Co-I (PI: Igor Aleinov, Columbia)                                                     |
| 2022–2023        | <b>Artemis III geology team proposal development.</b> University of Arizona Space Institute. Co-I (PI: Jessica Barnes, UArizona)                                                                     |
| 2021–2022        | <b>Response to the 2021 Reykjanes earthquake swarm, Iceland.</b> National Science Foundation Rapid Response Research program. PI                                                                     |
| 2019–2022        | <b>Magma–cryosphere interactions and outflow channel activity in Hebrus Valles, Mars.</b> NASA Mars Data Analysis Program. Co-I (PI: Jack Holt, UArizona)                                            |
| 2019–2022        | <b>Self-secondary craters on Copernican impact ejecta.</b> NASA Lunar Data Analysis Program. Co-I (PI: Natalia Artemieva, PSI)                                                                       |
| 2021             | <b>LIFE: Lava-Induced Fumarolic Environments.</b> European Network of Observatories and Research Infrastructures for Volcanology (EUROVOLC) Transnational Access program. PI                         |
| 2018–2021        | <b>Pattern to process: flood basalt emplacement and cross-sectional morphologies.</b> JPL Strategic University Research Partnership program. PI (Co-PI: Laura Kerber, JPL)                           |
| 2019–2020        | <b>Io Volcano Observer (IVO), Phase A.</b> NASA Discovery Program. Co-I (PI: Alfred McEwen, UArizona)                                                                                                |
| 2015–2019        | <b>Lunar impact melt flows: mapping, experimental simulation, and numerical modeling.</b> NASA Solar System Workings program. PI                                                                     |
| 2018             | <b>Tidal heating: lessons from Io and the Jovian system.</b> W. M. Keck Institute for Space Studies. Participant (study leads: Katherine de Kleer, Caltech; Ryan Park, JPL; Alfred McEwen, UArizona) |
| 2014–2018        | <b>Volcanism and interior heating processes on Io.</b> NASA Outer Planets Research program. PI                                                                                                       |
| 2013–2018        | <b>Sinuuous channels in volcanic provinces on Earth and Mars.</b> NASA Planetary Geology and Geophysics program. PI                                                                                  |
| 2016–2017        | <b>Tephrostratigraphy in Iceland.</b> W. M. Keck Foundation. Co-I (PI: Andrew de Wet, Franklin & Marshall College)                                                                                   |
| 2015–2017        | <b>Field investigation of basaltic lava flows in Iceland.</b> NASA Early Career Fellowship program. Collaborator (PI: Colin Dundas, USGS)                                                            |

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| 2013–2017 | <b>Volcanic plains on Mars: Elysium Planitia and central Tharsis.</b> NASA Mars Data Analysis Program. PI                                                                                                    |
| 2015–2016 | <b>Precision geodetic constraints for terrestrial analog studies.</b> NASA Early Career Fellowship program. PI                                                                                               |
| 2013–2016 | <b>Geologic mapping of Hrad Vallis, Mars.</b> NASA Planetary Geology and Geophysics program. Co-I (PI: Peter Mouginis-Mark, University of Hawai'i)                                                           |
| 2013–2016 | <b>Active Ionian volcanoes from Galileo, ground-based, and New Horizons data.</b> NASA Outer Planets Research program. Collaborator (PI: Julie Rathbun, PSI)                                                 |
| 2013–2016 | <b>Stereo-derived topography for the last frontier and the final frontier.</b> NASA Established Program to Stimulate Competitive Research. Collaborator (PI: Denise Thorsen, University of Alaska Fairbanks) |
| 2013–2016 | <b>Melt decompaction layers and the spacing of volcanic centers on Mars.</b> NASA Mars Fundamental Research Program. Collaborator (PI: Laurent Montési, University of Maryland)                              |
| 2012–2016 | <b>Lava flows and explosive eruption plumes on planetary bodies.</b> NASA Planetary Geology and Geophysics program. Co-I (PI: Lori Glaze, NASA GSFC)                                                         |
| 2014–2015 | <b>Thermal infrared remote sensing of active volcanic processes.</b> University of Arizona Faculty Seed Grant. PI                                                                                            |
| 2013–2015 | <b>Simulation of inflated pāhoehoe lava flows on Earth and Mars.</b> NASA Planetary Geology and Geophysics program. Co-I (PI: Stephen Baloga, Proxemy Research)                                              |
| 2011–2014 | <b>The role of external water in explosive phreatomagmatic eruptions.</b> National Science Foundation Petrology and Geochemistry program. Co-I (PI: Sarah Fagents, University of Hawai'i)                    |
| 2012–2013 | <b>Contact X-ray diffraction and fluorescence instrument for in situ rock analysis.</b> NASA Goddard Internal Research and Development program. Co-I (PI: Jacob Bleacher, NASA GSFC)                         |
| 2011–2013 | <b>Thermo-rheological modeling of pāhoehoe lava emplacement on Earth, Mars, and the Moon.</b> NASA Postdoctoral Program. PI                                                                                  |
| 2012      | <b>Pāhoehoe lava on Mars and Earth: inflated and disrupted flows.</b> W. M. Keck Foundation. Co-I (PI: Andrew de Wet, Franklin & Marshall College)                                                           |

## MISSIONS AND FIELD PROGRAMS

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|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2023–present | <b>NASA VERITAS</b> , Venus mission. Collaborator                                                                                                     |
| 2023–present | <b>PANTHER</b> (Passive Autonomy, Navigation, Topography, and Habitability Exploration Radar) analog program. Co-Investigator                         |
| 2022–2025    | <b>Io Volcano Observer</b> , NASA New Frontiers proposal. Co-Investigator                                                                             |
| 2020–2024    | <b>RAVEN</b> (Rover–Aerial Vehicle Exploration Network) analog mission, Iceland. Principal Investigator                                               |
| 2017–2022    | <b>DLR (German Aerospace Center) TerraSAR-X/TanDEM-X</b> science team. Collaborator                                                                   |
| 2013–2020    | <b>Io Volcano Observer</b> , NASA Discovery proposals and Phase A study. Co-Investigator                                                              |
| 2017–2019    | <b>Moon Diver</b> , NASA Discovery proposal. Co-Investigator                                                                                          |
| 2004–present | <b>Field campaigns</b> in Iceland, Hawai'i (since 2005), the southwestern United States (since 2013), New Zealand, Greenland, and the Canadian Arctic |

## PUBLICATIONS

**Bold:** C. W. Hamilton. °: Student or postdoctoral researcher in the Hamilton group. <sup>1</sup>: Co-first author.

### 2026

Carrasco-Herrera R, JA Noble, G Danger, F Duvernay, N Park, EL Shock, KE Miller, CR Glein, JH Waite, and **CW Hamilton** (2026) Electron bombardment of methanol ices: Implications for organic chemical diversity on Europa's surface, *Icarus*, 456, 117136, pp. 1–13. [doi.org/10.1016/j.icarus.2026.117136](https://doi.org/10.1016/j.icarus.2026.117136)

- Hadland N°, **CW Hamilton**, P Schroedl, F Calabrese, J Marlow, and S Duhamel (2026) Microbial dispersal from a hyperactive sandsheet in the Icelandic Highland. *Science of the Total Environment*, 1025, 181659, pp. 1–15, [doi.org/10.1016/j.scitotenv.2026.181659](https://doi.org/10.1016/j.scitotenv.2026.181659)
- Carr BB, MR Patrick, HR Dietterich, MH Zoeller, CE Parcheta, DT Downs, PA Nadeau, and **CW Hamilton** (2026) Growth of a passive lava lake during the 2020–2021 Eruption of Kilauea Volcano, Hawaii. *Bulletin of Volcanology*, 88(1), pp. 1–17, [doi.org/10.1007/s00445-025-01867-4](https://doi.org/10.1007/s00445-025-01867-4)

## 2025

- Spurling R, S Nerozzi, and **CW Hamilton** (2025) Crater-based dating of Hebrus Valles and Hephaestus Fossae, Mars. *The Planetary Science Journal*, 6(306), pp. 1–14, [doi.org/10.3847/PSJ/ae0721](https://doi.org/10.3847/PSJ/ae0721)
- Hadland N°, **CW Hamilton**, SH Björnsdóttir, and S Duhamel (2025) Three eruptions at the Fagradalsfjall Volcano in Iceland show rapid and predictable microbial community establishment. *Communications Biology*, 8, 1657, pp. 1–17, [doi.org/10.1038/s42003-025-09044-1](https://doi.org/10.1038/s42003-025-09044-1)
- Hamid S, L Kerber, M Varnam°, **CW Hamilton**, and A Clarke (2025) Warming, cooling, and surface ice accumulation initiated by the release of water from the Athabasca Valles flood lava eruption on Mars. *Earth and Planetary Science Letters*, 671, 119651, pp. 1–12, [doi.org/10.1016/j.epsl.2025.119651](https://doi.org/10.1016/j.epsl.2025.119651)
- Perkins RP, SM Hibbard, CD Neish, **CW Hamilton**, and BA Campbell (2025) Active sedimentary mantling of the 2014–2015 Holuhraun lava flow-field: Insights from a Mars analogue environment. *The Planetary Science Journal*, 6(259), pp. 1–17, [doi.org/10.3847/PSJ/ae0b50](https://doi.org/10.3847/PSJ/ae0b50)
- Garland SP, S Adeli, N Müller, C Althaus, MD Dyar, A Domac, SE Smrekar, DC Nunes, G Alemanno, O Barraud, A Maturilli, L Breitenfeld, **CW Hamilton**, F Trauthan, D Wendler, T Hagelschuer, S Chauhan, G Peter, J Helbert, AC Plesa (2025) Measuring emissivity in the field and the lab with an emulator of the VERITAS Venus Emissivity Mapper (VEM), *Proceedings of the International Society for Optics and Photonics (SPIE)*, 13612, Infrared Remote Sensing and Instrumentation XXXIII, 136120F, (17 September 2025), pp. 1–12, [doi.org/10.1117/12.3064430](https://doi.org/10.1117/12.3064430)
- Stack KM, R Francis, FJ Calef III, SJ Gwizd, JF Schroeder, JRC Voigt°, Þ Hanning Kristinsson, P Schroedl, J Shah, M Varnam°, CD Neish, RP Perkins, S Vanga, M Bramble, A Donnellan, JT Osterhout, MI Tuite, BB Carr, and **CW Hamilton** (2025) Simulating science operations for a joint rover–helicopter mission architecture in a Mars analog setting. *The Planetary Science Journal*, 6(173), pp. 1–37 [doi.org/10.3847/PSJ/ade786](https://doi.org/10.3847/PSJ/ade786)
- Chen CX, **CW Hamilton**, C Sipe, K Bywaters, J Lawrence, P Creekmore, N Traeden, and K Zacny (2025) Unoccupied aircraft systems (UAS) sampling for Earth and Mars. *The Planetary Science Journal*, 6(153), pp. 1–24, [doi.org/10.3847/PSJ/adcfal](https://doi.org/10.3847/PSJ/adcfal)
- Hamilton CW**, AS McEwen, L Keszthelyi, LM Carter, AG Davies, K de Kleer, KL Jessup, X Jia, JT Keane, K Mandt, F Nimmo, C Paranicas, RS Park, JE Perry, A Pommier, J Radebaugh, SS Sutton°, A Vorburger, P Wurz, C Borlina, AF Haapala, DN DellaGiustina, BW Denevi, SM. Hörst, S Kempf, KK Khurana, JJ Likar, A Masters, O Mousis, A Polit, A Bhushan, M Bland, I Matsuyama, and J Spencer (2025) Comparing NASA Discovery and New Frontiers Class Mission Concepts for the Io Volcano Observer (IVO). *The Planetary Science Journal*, 6(134), pp. 1–28, [doi.org/10.3847/PSJ/adcab0](https://doi.org/10.3847/PSJ/adcab0)
- Hudziak S, IA Ukstins, D Peate, PL Whelley, SP Scheidt°, and **CW Hamilton** (2025) Improving quantitative ventifact analysis for climate investigations using the Dyngjúsandur sandsheet in Iceland as a planetary analogue. *Journal of the Geological Society of London*, 182(3), jgs2024-173, pp. 1–16, [doi.org/10.1144/jgs2024-173](https://doi.org/10.1144/jgs2024-173)
- Voigt JRC°, **CW Hamilton**, LP Keszthelyi, M Varnam°, SM Hibbard, and KM Stack (2025) The Holuhraun lava flow-field in Iceland as a planetary analog for young volcanic terrains in Elysium Planitia, Mars. *The Planetary Science Journal*, 6(81), pp. 1–18, [doi.org/10.3847/PSJ/adb5f1](https://doi.org/10.3847/PSJ/adb5f1)

## 2024

- Phillips MS, C Tai Udovicic, JE Moersch, U Basu, and **CW Hamilton** (2024) HyPyRameter: A Python toolbox to calculate spectral parameters from hyperspectral reflectance data. *The Planetary Science Journal*, 5(11), 258, pp. 1–18, [doi.org/10.3847/PSJ/ad81f8](https://doi.org/10.3847/PSJ/ad81f8)
- Garland SP, S Adeli, N Müller, C Althaus, MD Dyar, SE Smrekar, DC Nunes, A Domac, G Alemanno, O Barraud, A Maturilli, **CW Hamilton**, F Trauthan, D Wendler, T Hagelschuer, R Demirok, S Chauhan, G Peter, and J Helbert (2024) The Venus Emissivity Mapper Emulator 2.0: A NIR camera system for Venus analogue field measurements. *Proceedings of the Society of Photo-Optical Instrumentation Engineers (SPIE)*, 13144, Infrared Remote Sensing and Instrumentation XXXII, 131440I, pp. 1–11, [doi.org/10.1117/12.3028083](https://doi.org/10.1117/12.3028083)

- Carr BB, M Varnam<sup>o</sup>, N Hadland<sup>o</sup>, J Shah, JRC Voigt<sup>o</sup>, S Gwizd, KM Stack, F Calef, R Francis, U Basu, B Björnsson, CX Chen, E Dong, JE Moersch, M Phillips, J Springer, CD Neish, and **CW Hamilton** (2024) Evaluating the use of unoccupied aircraft systems (UAS) for planetary surface exploration in analog terrain. *The Planetary Science Journal*, 5(10), 231. pp. 1–25, [doi.org/10.3847/PSJ/ad781e](https://doi.org/10.3847/PSJ/ad781e)
- Gwizd S, KM Stack, R Francis, F Calef, G Tolometti, BB Carr, C Langley, J Graff, Þ Hanning Kristinsson, VP Thorarensen, E Bernharðsson, M Phillips, M Varnam<sup>o</sup>, N Hadland<sup>o</sup>, J Shah, J Moersch, U Basu, JRC Voigt<sup>o</sup>, and **CW Hamilton** (2024) Comparing rover and helicopter planetary mission architectures in a Mars analog setting in Iceland. *The Planetary Science Journal*, 5(8), 172. pp. 1–35. [doi.org/10.3847/PSJ/ad55f4](https://doi.org/10.3847/PSJ/ad55f4)
- Chen C, K Bywaters, K Zacny, N Traeden, and **CW Hamilton** (2024) Unoccupied aerial system coring drill sampler development for applications on Earth and other planetary bodies. “Earth and Space 2024: Engineering for Extreme Environments”, Proceedings of the 19th Biennial International Conference on Engineering, Science, Construction, and Operations in Challenging Environments, April 15–18, 2024, Miami, FL, USA, Aerospace Division of the American Society of Civil Engineers (ASCE), eISBN 9780784485736, pp. 321–331. [doi.org/10.1061/9780784485736](https://doi.org/10.1061/9780784485736)
- Varnam M<sup>o</sup>, **CW Hamilton**, I Aleinov, and JJ Barnes (2024) Composition and speciation of volcanic volatiles on the Moon. *Icarus*, 413, 116009. [doi.org/10.1016/j.icarus.2024.116009](https://doi.org/10.1016/j.icarus.2024.116009)
- Hadland N<sup>o</sup>, **CW Hamilton**, and S Duhamel (2024) Young volcanic terrains are windows into early microbial colonization. *Communications Earth & Environment*, 5(114), pp. 1–19. [doi.org/10.1038/s43247-024-01280-3](https://doi.org/10.1038/s43247-024-01280-3)
- Sutton SS<sup>o</sup>, JA Richardson, PL Whelley, SP Scheidt<sup>o</sup>, and **CW Hamilton** (2024) Degradation of the 2014–2015 Holuhraun vent-proximal edifice in Iceland. *Bulletin of Volcanology*, 86(37), pp. 1–19. [doi.org/10.1007/s00445-024-01709-9](https://doi.org/10.1007/s00445-024-01709-9)
- 2023**
- Voigt JRC<sup>o</sup>, **CW Hamilton**, G Steinbrügge, MS Christoffersen, S Nerozzi, L Kerber, JW Holt, and LM Carter (2023). Revealing Elysium Planitia’s young geologic history: Constraints on lava emplacement, areas, and volumes. *Journal of Geophysical Research: Planets*, 128, e2023JE007947. [doi.org/10.1029/2023JE007947](https://doi.org/10.1029/2023JE007947)
- Nerozzi S, MS Christoffersen, JW Holt, and **CW Hamilton** (2023) Evidence of widespread volcanic activity Near Hebrus Valles on Mars revealed by SHARAD. *Remote Sensing*, 15, 4967, pp. 1–15, [doi.org/10.3390/rs15204967](https://doi.org/10.3390/rs15204967)
- 2022**
- Breuer D, **CW Hamilton**, and K Khurana (2022) The internal structure of Io. *Elements*, 18(6), pp. 385–390. [doi.org/10.2138/gselements.18.6.385](https://doi.org/10.2138/gselements.18.6.385)
- Duhamel S, **CW Hamilton**, S Pálsson, and SH Björnsdóttir (2022) Microbial response to increased temperatures within a lava-induced hydrothermal system in Iceland: An analogue for the habitability of volcanic terrains on Mars. *Astrobiology*, 22(11), pp. 1–21, [doi.org/10.1089/ast.2021.0124](https://doi.org/10.1089/ast.2021.0124)
- Pedersen GBM, JMC Belart, BV Óskarsson, MT Gudmundsson, N Gies, T Högnadóttir, ÁR Hjartardóttir, V Pinel, E Berthier, T Dürig, HI Reynolds, **CW Hamilton**, G Valsson, P Einarsson, D Ben-Yehosua, A Gunnarsson, and B Oddsson (2022) Volume, effusion rate, and lava transport during the 2021 Fagradalsfjall eruption: Results from near real-time photogrammetric monitoring. *Geophysical Research Letters*. 49(13), e2021GL097125, pp. 1–11. [doi.org/10.1029/2021GL097125](https://doi.org/10.1029/2021GL097125)
- Tolometti GD, CD Neish, **CW Hamilton**, GR Osinski, A Kukko, and JRC Voigt<sup>o</sup> (2022) Differentiating fissure-fed lava flow types and facies using RADAR and LiDAR: An example from the 2014–2015 Holuhraun lava flow-field. *Journal of Geophysical Research: Solid Earth*, 127, E2021JB023419, pp. 1–21, [doi.org/10.1029/2021JB023419](https://doi.org/10.1029/2021JB023419)
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## DATA SETS

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## WHITE PAPERS, REPORTS, AND OUTREACH ARTICLES

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- Duhamel S<sup>1</sup>, and **CW Hamilton**<sup>1</sup> (2021) How microbes in Iceland can teach us about possible life on Mars. *Futurum*, 7, pp. 30–33, [doi.org/10.33424/FUTURUM112](https://doi.org/10.33424/FUTURUM112)
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## TEACHING

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### University of Arizona

|            |                                                                                                                                                      |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2025       | <b>Evolution of Planetary Surfaces</b> , PTYS/GEOS 554. Graduate core course                                                                         |
| 2022, 2024 | <b>Volcanology: Physical Processes and Petrologic Applications</b> , GEOS 470R/570R. Undergraduate and graduate                                      |
| 2016–2024  | <b>Geology and Geophysics of the Solar System</b> , PTYS/GEOS/HWRS 411. Upper-division undergraduate (2016, 2018, 2020, 2022, 2024)                  |
| 2014–2023  | <b>Planetary Geology Field Studies</b> , PTYS 594A. Graduate field course in Arizona, New Mexico, Hawai'i, Utah, and Florida (2014–2019, 2021, 2023) |
| 2017       | <b>Career Development</b> , PTYS 595B. Graduate                                                                                                      |
| 2015, 2017 | <b>Planet Earth: Evolution of the Habitable World</b> , PTYS/ASTR 170A1. General education                                                           |
| 2014       | <b>Remote Sensing of Planetary Surfaces</b> , PTYS/GEOS 551. Graduate                                                                                |

### Other teaching

|            |                                                                                                           |
|------------|-----------------------------------------------------------------------------------------------------------|
| 2013, 2016 | <b>Keck Geology Consortium summer field courses</b> , volcanism in New Mexico and Iceland as Mars analogs |
| 2010       | <b>Advanced Field Methods</b> , EARTH 4000, Dalhousie University. Geology of the Hawaiian Islands         |
| 2009       | <b>Volcano Seismology</b> , Center for the Study of Active Volcanoes, University of Hawai'i at Hilo       |

## RESEARCH GROUP

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### Current

|              |                                                                                                                                  |
|--------------|----------------------------------------------------------------------------------------------------------------------------------|
| 2024–present | <b>Dr. Wesley Tucker</b> , Postdoctoral Researcher. Finite element modeling of lava and conduit flow dynamics                    |
| 2025–present | <b>Carter Mucha</b> , Ph.D. student, Planetary Sciences. Impact-induced hydrothermal systems                                     |
| 2024–present | <b>Joanna Hardesty</b> , Ph.D. student, Planetary Sciences. Cryomagma rheology and conduit flow                                  |
| 2023–present | <b>Madison Tuohy</b> , Ph.D. student, Geosciences. The 2021–2023 Fagradalsfjall eruptions, Iceland. NSF Graduate Research Fellow |
| 2024–present | <b>Brianna Toy</b> , undergraduate, Astronomy. Modeling lava emplacement dynamics. NASA Arizona Space Grant Fellow               |

### Alumni

|           |                                                                                                       |
|-----------|-------------------------------------------------------------------------------------------------------|
| 2022–2026 | <b>Dr. Brett Carr</b> , Staff Scientist. Volcanology, unoccupied aircraft systems, and photogrammetry |
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|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2021–2024 | <b>Dr. Matthew Varnam</b> , Postdoctoral Researcher. Gas fluxes from eruptions on the Earth, Moon, and Mars                                                                                                                                                                             |
| 2014–2020 | <b>Dr. Mike Sori</b> , Postdoctoral Researcher and Staff Scientist. Finite element modeling of ice and lava                                                                                                                                                                             |
| 2014–2018 | <b>Dr. Stephen Scheidt</b> , Postdoctoral Researcher and Staff Scientist. Photogrammetry and planetary data                                                                                                                                                                             |
| 2014–2017 | <b>Dr. Leon Palafox</b> , Postdoctoral Researcher and Staff Scientist. Machine learning and planetary data                                                                                                                                                                              |
| 2025–2026 | <b>Maddy Christensen</b> , graduate student, Planetary Sciences. Lava-induced hydrothermal systems                                                                                                                                                                                      |
| 2020–2026 | <b>Nathan Hadland</b> , Ph.D., Planetary Sciences. Terrestrial analogs for astrobiology. DoD NDSEG Fellow                                                                                                                                                                               |
| 2018–2022 | <b>Joana Voigt</b> , Ph.D., Planetary Sciences. Volcano–tectonics on Earth and Mars. NASA FINESST Fellow                                                                                                                                                                                |
| 2015–2022 | <b>Sarah Sutton</b> , Ph.D., Planetary Sciences. Terrestrial analogs to planetary volcanism. NSF Graduate Research Fellow                                                                                                                                                               |
| 2016–2019 | <b>Amanda Stadermann</b> , M.Sc., Planetary Sciences. Lunar impact melt flows                                                                                                                                                                                                           |
| 2016–2017 | <b>Léa Bonnefoy</b> , graduate student, Planetary Sciences. Landscape evolution                                                                                                                                                                                                         |
| 2020–2022 | <b>Alexia Kubas</b> , undergraduate honors, Astronomy. Secondary cratering of Giordano Bruno Crater                                                                                                                                                                                     |
| 2017–2018 | <b>Anna Schuh</b> , undergraduate honors, Geosciences. Pit crater formation on Mars                                                                                                                                                                                                     |
| 2015–2016 | <b>Jade Bowers</b> , undergraduate honors, Geosciences. Explosive lava–water interactions in Elysium Planitia                                                                                                                                                                           |
| 2014–2025 | <b>Undergraduate interns:</b> Linae Larson, Samantha Lockwood, Justin Klingele, Michael Debbins, Connor Williams, Mathilde Westermann, Selena Valencia, Alexander Alvarez, Mark Buxton; engineering capstone team C. Agarwal, E. Balaguer, K. Barnett, W. Bowman, L. Prijic, and J. Yob |

## PROFESSIONAL SERVICE

|              |                                                                                                                                                                                                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Ongoing      | <b>Proposal reviewer</b> for NASA, the National Science Foundation, the Dutch Research Council (NWO), and Poland’s National Science Centre (NCN)                                                       |
| 2023–present | <b>Guest Editor</b> , <i>The Planetary Science Journal</i> focus issue, “Planetary Analogs for Solar System Exploration: Results of the RAVEN Project”                                                 |
| 2024         | <b>Lead convener</b> , “Geological Exploration of Lunar and Martian Terrains,” International Geological Congress, Busan                                                                                |
| 2023         | <b>Lead convener</b> , “Terrestrial Analogues for Planetary Volcanism,” IAVCEI Scientific Assembly, Rotorua                                                                                            |
| 2017         | <b>Co-convener</b> , IAVCEI General Assembly workshop on small unmanned systems in volcanology and session on lava flow dynamics, Portland; GSA Cordilleran Section session on Mars on Earth, Honolulu |
| 2014–2016    | <b>Editorial Board</b> , <i>Geology</i>                                                                                                                                                                |
| 2014–2016    | <b>Secretary, Vice Chair, and Chair</b> , IAVCEI/IACS Joint Commission on Volcano–Ice Interactions                                                                                                     |
| 2015         | <b>Lead convener</b> , AGU Fall Meeting session on magma channelization and IUGG General Assembly session on lava flows, Prague; co-organizer, HiRISE Team Meeting in Iceland                          |
| 2013–2014    | <b>Lead convener</b> , IAVCEI Scientific Assembly session on lava flows, Kagoshima (2013), and LPSC Planetary Volcanology session (2014); LPSC Program Committee (2014)                                |

## UNIVERSITY SERVICE

|              |                                                                                 |
|--------------|---------------------------------------------------------------------------------|
| 2024–present | <b>Coordinator</b> , University of Arizona–Aix-Marseille Université partnership |
| 2024–2026    | <b>Chair</b> , College of Science Faculty Council Strategic Planning Committee  |
| 2021–2024    | <b>Associate Department Head</b> , Lunar and Planetary Laboratory               |

## INVITED TALKS

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|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2025   | LPL Evening Public Lecture Series, Tucson. “Mars on Earth: Testing Tomorrow’s Mars Missions in Iceland”                                                                                      |
| 2023   | Hawai’i Institute of Geophysics and Planetology, University of Hawai’i. “Planetary Analog Research in Iceland”                                                                               |
| 2021   | Institute of Earth Sciences, University of Iceland. “Holuhraun as an Analog for Volcanic Terrains on Mars”                                                                                   |
| 2020   | University of Iowa. “Flood Basalt Volcanism on Earth and Mars: Implications for Habitability and Exploration” and “Volcanic Activity in the Solar System and the Frontier of Exovolcanology” |
| 2019   | Northern Arizona University. “Flood Basalt Volcanism on Earth and Mars: Implications for Habitability and Exploration”                                                                       |
| 2019   | Dalhousie University. “Flood Basalt Volcanism on Earth and Mars”                                                                                                                             |
| 2018   | NASA Marshall Space Flight Center. “Flood Lava Volcanism on Earth and Mars”                                                                                                                  |
| 2018   | Lamont–Doherty Earth Observatory, Columbia University. “Lava–Water Interactions: Implications for Explosivity and the Development of Ephemeral Hydrothermal Systems”                         |
| 2017   | Syracuse University. “Planetary Volcanism: Flood Lava Volcanism on Earth and Mars”                                                                                                           |
| 2017   | German Aerospace Center (DLR), Berlin. “Flood Lava Eruptions on Earth and Mars”                                                                                                              |
| 2017   | Jet Propulsion Laboratory. “Lava–water interactions on Earth and Mars”                                                                                                                       |
| 2017   | University of Illinois at Chicago. “Flood lava volcanism on Earth and Mars”                                                                                                                  |
| 2016   | Highlands Conservation Conference, Reykjavík. “The Icelandic Highlands: An analog for Mars and planetary science research”                                                                   |
| 2014   | Binghamton Geomorphology Symposium, Knoxville. “Flood lava volcanism in Elysium Planitia, Mars”                                                                                              |
| 2014   | Hawai’i Institute of Geophysics and Planetology. “Topographic and stochastic influences on pāhoehoe lava lobe emplacement” and “Spatial distribution of volcanoes on Io”                     |
| 2013   | Georgia Institute of Technology; NASA Goddard Space Flight Center; University of Maryland. Volcanism and tidal heating on Io                                                                 |
| 2013   | HiRISE Team Meeting; Lunar and Planetary Laboratory; Smithsonian Institution. Volcanic channels and volcano–ice interactions on Earth and Mars                                               |
| 2012   | Department of Terrestrial Magnetism, Carnegie Institution of Washington. “Lava–water interactions on Earth and Mars”                                                                         |
| Career | More than 400 conference abstracts and presentations                                                                                                                                         |

## MEDIA AND PUBLIC OUTREACH

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|-----------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 2025      | University of Arizona News, “Life on Lava: How Microbes Colonize New Habitats”                                                              |
| 2025      | Ian Forsyth Elementary School, Dartmouth, Nova Scotia. Classroom visit                                                                      |
| 2024      | Channel 4, <i>National Parks from Above</i> , Episode 2: Iceland                                                                            |
| 2024      | <i>Universe Today</i> , “Comparing Two Proposed NASA Missions to Jupiter’s Moon Io”                                                         |
| 2022      | Netflix, <i>Earthstorm</i> , Episode 2: “Volcano”                                                                                           |
| 2021      | CBS <i>60 Minutes Overtime</i> , Iceland’s volcano and Mars                                                                                 |
| 2021      | BBC <i>Click</i>                                                                                                                            |
| 2021      | CNN, <i>Anderson Cooper Full Circle</i> , “This is how Iceland’s volcano surprised an expert”                                               |
| 2021      | <i>Atlas Obscura</i> , “In Iceland, testing the drones that could be the future of Mars exploration”                                        |
| 2021      | <i>Iceland Monitor</i> and <i>Morgunblaðið</i> , Mars drone testing in Iceland                                                              |
| 2021      | University of Arizona News and <i>Arizona Alumni Magazine</i> , RAVEN project in Iceland                                                    |
| 2017–2018 | Public lectures: Tucson Amateur Astronomy Association; University of Arizona Science Café; American Museum of Natural History Sun–Earth Day |

## PROFESSIONAL MEMBERSHIPS

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American Association for the Advancement of Science (AAAS); American Geophysical Union (AGU); Geological Society of America (GSA); Institute of Electrical and Electronics Engineers (IEEE); International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI)