Christopher Ward Hamilton

University of Arizona, 1629 E. University Blvd., Tucson, AZ 85721 USA
Telephone: (301) 301-3818 • Email: hamilton@lpl.arizona.edu

Research Summary

I am a planetary volcanologist specializing in magma–water interactions and Solar System exploration. My research combines field observations, remote sensing, machine learning, and geophysics to investigate geological surface processes and planetary habitability.

Education

Ph.D. **University of Hawai'i, Mānoa, USA**
2004–2010 **Major: Geology and Geophysics**
- Dissertation: "Explosive lava–water interactions on Earth and Mars" (Advisor: Dr. Sarah Fagents)
- Visiting Studentship (2007–2008), University of Edinburgh, Scotland

B.Sc. **Dalhousie University, Canada**
1998–2004 **Major: Earth Sciences**
- First Class Honors in Earth Sciences with a concentration in Physics
- Thesis: "Ice-contact volcanism in the Vífilsfell Region, southwest Iceland" (Advisor: Dr. D. Barrie Clarke)
- Visiting Studentship (2002–2003), University of Iceland, Reykjavík, Iceland

Chronology of Employment

Current Positions:

2020–Present **Associate Professor**, Lunar and Planetary Laboratory (LPL), University of Arizona, Tucson, AZ, USA
2020–Present **Associate Professor**, Department of Geosciences (Joint Appointment with LPL), University of Arizona, Tucson, AZ, USA
2018–Present **Adjunct Associate Professor**, Lamont–Doherty Earth Observatory, Columbia University, Palisades, NY, USA
2019–Present **Adjunct Professor**, Institute of Earth Sciences, University of Iceland (Háskóli Íslands), Reykjavík, Iceland

Past Positions:

2014–2020 **Assistant Professor**, Lunar and Planetary Laboratory (LPL), University of Arizona, Tucson, AZ, USA
2015–2020 **Assistant Professor**, Department of Geosciences (Joint Appointment with LPL), University of Arizona, Tucson, AZ, USA
2013–2014 **Associate Researcher**, Planetary Geodynamics Laboratory (Code 698), NASA Goddard Space Flight Center, Greenbelt, MD, USA (Administered by the Department of Astronomy, University of Maryland—College Park)
2011–2013 **Postdoctoral Researcher**, Planetary Geodynamics Laboratory (Code 698), NASA GSFC, Greenbelt, MD, USA (Administered by Oak Ridge Associated Universities)
2010 **Postdoctoral Researcher**, Hawai'i Institute of Geophysics and Planetology (HIGP), University of Hawai'i, Mānoa, HI, USA

Honors and Awards

2020
- Fulbright Scholar, Faculty Fellowship to the University of Iceland
- Science Dialog (Scialog) Fellow in Astrobiology: "Signatures of Life in the Universe" (https://rescorp.org/scialog), Co-Sponsored by the Research Corporation for Science Advancement (RCSA) and Heising–Simons Foundation

2018
- Selection by *Science News* as one of the Top 10 Scientists to Watch in 2018 (https://www.sciencenews.org/article/sn-10-scientists-to-watch-2018)
- Geological Society of America (GSA)'s Early Career Award (Mineralogy, Geochemistry, Petrology and Volcanology Division)
- W. M. Keck Institute for Space Studies (KISS) participant in the "Tidal Heating – Lessons from Io and the Jovian System" workshop (https://www.kiss.caltech.edu/workshops/tidal_heating/tidal_heating.html)
- NASA Marshall Space Flight Center (MSFC) Faculty Fellowship

2017
- Invited by the Icelandic government to help develop a proposal for a new United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site within the Central Highlands (The Vatnajökull National Park, Iceland was successfully inscribed as a World Heritage Center in 2019)

2016
- Chair of the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) Working Group on Volcano–Ice Interactions

2015
- NASA Early Career Fellowship (ECF) Award
- Appointed to the Editorial Board of GSA's journal *Geology*

2014
- Elected Secretary of the IAVCEI Working Group on Volcano–Ice Interactions

2011
- NASA Postdoctoral Program (NPP) Fellowship (2011–2013)

2010
- Graduate Student Marshall, Spring Commencement, University of Hawai'i
- University of Hawai'i Research Council Doctoral Research Achievement Award
- Mark Lierman Memorial Scholarship from the Hawai'i Geographic Information Coordinating Council for extraordinary achievements in Geography and Geographic Information Systems (GIS)

2009
- American Geophysical Union (AGU) award for outstanding student presentation (Volcanology, Geochemistry, and Petrology Division)

2007
- Icelandic Centre for Research (RANNÍS) student research grant

2006
- GSA student research grant with an award for outstanding merit
- Research grant from the Graduate Student Organization, University of Hawai'i

2005
- Léopold Gélinas Medal from the Geological Association of Canada (GSC) for Best Undergraduate Thesis in Canada (Volcanology and Igneous Petrology Division)

2004
- Canadian National Sciences and Engineering Research Council (NSERC) Postgraduate Masters Scholarship
- Dalhousie University, Earth Sciences, Best Undergraduate Thesis Award
- AGU award for outstanding student presentation (Planetary Sciences Division)
- Atlantic Geoscience Society (AGS), Rupert MacNeil Award for best presentation

2003
- Atlantic Provinces Council on the Sciences (APICS) award for best presentation

2002
- Dalhousie University Student Work International Fund Scholarship

Publications

Published Peer-Reviewed Publications:

[1]Co-First Author; [†]Undergraduate Student; [‡]Graduate Student; [*]Postdoctoral Researcher

36. Dundas CM, L Keszthelyi, Einat Lev, M. Elise Rumpf, **CW Hamilton**, Á Höskuldsson, and T Thordarson (2020) Lava–water interaction and hydrothermal activity within the 2014–2015 Holuhraun Lava Flow Field, Iceland. *Journal of Volcanology and Geothermal Research*, *408*, 107100, pp. 1–13. https://doi.org/10.1016/j.jvolgeores.2020.107100
35. Steinbrügge G[1,*], JRC Voigt[1,‡], N Wolfenbarger, **CW Hamilton**, KM Soderlund, DA Young, DD Blankenship, S Vance, and DM Schroeder (2020) Brine migration and impact-induced cryovolcanism on Europa, *Geophysical Research Letters*, *47*(21), e2020GL090797, pp. 1–10. https://doi.org/10.1029/2020GL090797.
34. **Hamilton CW**, SP Scheidt, MM Sori, AP de Wet, JE Bleacher, WB Garry, PL Whelley, PJ Mouginis-Mark, S Self, JR Zimbelman, and LS Crumpler (2020) Lava-rise plateaus and inflation pits within the McCartys flow-field, New Mexico: An analog for pāhoehoe-like lava flows on planetary surfaces. *Journal of Geophysical Research: Planets*, *124*(7), e2019JE005975, pp. 1–36. https://doi.org/10.1029/2019JE005975
33. Steinbrügge G[*], JRC Voigt[‡], D Schroeder, AS Stark, MS Haynes KM Scanlan, **CW Hamilton**, DA Young, H Hussman C Grima, and DD Blankenship (2020) The surface roughness of Europa derived from *Galileo* stereo images. *Icarus*, *343,* 113669, pp. 1–15. https://doi.org/10.1016/j.icarus.2020.113669
32. **Hamilton CW** (2019) "Fill and spill" lava flow emplacement: Implications for understanding planetary flood basalt eruptions. In: NF Six and G Karr (Eds.), *NASA Technical Memorandum: Marshall Space Flight Center Faculty Fellowship Program,* NASA/TM0-2019-220139, M-1490, M19-7746, pp. 47–56. https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20200000048.pdf
31. Bonnefoy LE[‡], **CW Hamilton**, SP Scheidt, S Duhamel, Á Höskuldsson, I Jónsdottir, T Thordarson, and U. Münzer (2019) Hydrological changes associated with the 2014–2015 Holuhraun eruption in Iceland, *Journal of Volcanology and Geothermal Research*, 387, 105552, pp. 1–22. https://doi.org/10.1016/j.jvolgeores.2019.07.019
30. Morrison AA[‡], M Zanetti, **CW Hamilton**, E Lev, CD Neish, and AG Whittington (2019) Rheological investigation of lunar highland and mare impact melt simulants. *Icarus*, *317*, pp. 307–323. https://doi.org/10.1016/j.icarus.2018.08.001
29. **Hamilton CW**, PJ Mouginis-Mark, MM Sori, SP Scheidt, and AM Bramson[‡] (2018) Episodes of aqueous flooding and volcanism associated with Hrad Vallis, Mars. *Journal of Geophysical Research: Planets*, *123*(6), pp. 1484–1510. https://doi.org/10.1029/2018JE005543
28. Savage R[‡], LF Palafox, CT Morrison, JJ Rodriguez, K Barnard, S Byrne, and **CW Hamilton** (2018) A Bayesian approach to sub-kilometer crater shape analysis using individual HiRISE images. *IEEE Transactions on Geoscience and Remote Sensing*, 56(10), pp. 5802–5812. https://doi.org/10.1109/TGRS.2018.2825608
27. Voigt JRC[‡], and **CW Hamilton** (2018) Investigating the volcanic versus aqueous origin of the surficial deposits in Eastern Elysium Planitia, Mars. *Icarus*, *309*, pp. 389–410. https://doi.org/10.1016/j.icarus.2018.03.009
26. Stadermann A[‡], MR Zanetti, BL Jolliff, H Hiesinger, CH van der Bogert, and **CW Hamil-**

ton (2018) The age of lunar mare basalts south of the Aristarchus Plateau and effects of secondary craters formed by the Aristarchus event. *Icarus*, *309*, pp. 45–60. https://doi.org/10.1016/j.icarus.2018.02.030

25. Marcucci EC*, **CW Hamilton**, and RR Herrick (2017) Remote sensing evidence of lava–ground ice interactions associated with the Lost Jim Lava Flow, Seward Peninsula, Alaska. *Bulletin of Volcanology*, *79*(89), pp. 1–18. https://doi.org/10.1007/s00445-017-1176-y
24. Whelley PL, WB Garry, **CW Hamilton**, and JE Bleacher (2017) LiDAR-derived surface roughness signatures of basaltic lava flow textures at the Muliwai a Pele lava channel, Hawaii. *Bulletin of Volcanology*, *79*(75), pp. 1–13. https://doi.org/10.1007/s00445-017-1161-5
23. Bleacher JE, TR Orr, AP de Wet, JR Zimbleman, **CW Hamilton**, WB Garry, LS Crumpler, and DA Williams (2017) Plateaus and sinuous ridges as the fingerprints of lava flow inflation in the Eastern Tharsis Plains of Mars. *Journal of Volcanology and Geothermal Research*, *342*, pp. 29–46. https://doi.org/10.1016/j.jvolgeores.2017.03.025.
22. Palafox LF, **CW Hamilton**, SP Scheidt, and AM Alvarez† (2017) Automated detection of geologic landforms on Mars using Convolutional Neural Networks. *Computers and Geosciences*, *101*, pp. 48–56. https://doi.org/10.1016/j.cageo.2016.12.015
21. Sori MM*, S Byrne, MT Bland, AM Bramson‡, AI Ermakov, CW Hamilton, KA Otto, O Ruesch, and CT Russell (2017) The vanishing cyrovolcanoes on Ceres. *Geophysical Research Letters*, 4(3), pp. 1243–1250. https://doi.org/10.1002/2016GL072319
20. Fitch EP‡, SA Fagents, T Thordarson, and **CW Hamilton** (2017) Fragmentation mechanisms associated with explosive lava–water interactions in a lacustrine environment. *Bulletin of Volcanology*, *79*(12), 1–16. https://doi.org/10.1007/s00445-016-1087-3
19. **Hamilton CW**, EP Fitch‡, SA Fagents, and T Thordsarson (2017) Rootless tephra stratigraphy and emplacement processes. *Bulletin of Volcanology*, *79*(11), pp. 1–19. https://doi.org/10.1007/s00445-016-1086-4
18. Neish CD, **CW Hamilton**, SS Hughes, S Kobs-Nawotniak, WB Garry, JR Skok, RC Elphic, E Schaefer†, LM Carter, JL Bandfield, D Lim, and JL Heldmann (2017) Terrestrial analogues for lunar impact melt flows. *Icarus*, *281*, pp. 73–89. https://doi.org/10.1016/j.icarus.2016.08.008
17. Sori MM*, S Byrne, **CW Hamilton**, and M Landis† (2016) Viscous flow rates of icy topography on the North Polar Layered Deposits of Mars. *Geophysical Research Letters*, *43*(2), pp. 541–549. https://doi.org/10.1002/2015GL067298
16. Tyler RH, WG Henning, and **CW Hamilton** (2015) Tidal heating in a magma ocean within Jupiter's moon Io. *Astrophysical Journal Supplement Series*, *218*(22), pp. 1–17. https://doi.org/10.1088/0067-0049/218/2/22
15. Baker VR, **CW Hamilton**, DM Burr, VC Gulick, G Komatsu, W Luo, JW Rice Jr., and JAP Rodriguez (2015) Fluvial geomorphology on Earth-like planetary surfaces: A review. *Geomorphology*, *24*, pp. 149–182. https://doi.org/10.1016/j.geomorph.2015.05.002
14. Fink W, VR Baker, D Schulze-Makuch, **CW Hamilton**, and MA Tarbell (2015) Autonomous exploration of planetary lava tubes using a multi-rover framework. *IEEE Aerospace Conference Proceedings*, 7–14 March, 2015, Big Sky, MT, USA, pp. 1–9. https://doi.org/10.1109/aero.2015.7119315
13. Keske A‡, **CW Hamilton**, AS McEwen, and IJ Daubar‡ (2015) Episodes of fluvial and volcanic activity in Mangala Valles, Mars. *Icarus*, *245*, pp. 333–347.

https://doi.org/10.1016/j.icarus.2014.09.040
12. **Hamilton CW**[*], LS Glaze, MR James, and SM Baloga (2013b) Topographic and stochastic influences on pāhoehoe lava lobe emplacement. *Bulletin of Volcanology, 75*(756), pp. 1–16. https://doi.org/10.1007/s00445-013-0756-8
11. **Hamilton CW**[*], CD Beggan, S Still, M Beuthe, RM Lopes, DA Williams, J Radebaugh, and W Wright[‡] (2013a) Spatial distribution of volcanoes on Io: implications for tidal heating and magma ascent. *Earth and Planetary Science Letters*, *361*, pp. 272–286. https://doi.org/10.1016/j.epsl.2012.10.032
10. Boyce, JM, L Wilson, PJ Mouginis-Mark, **CW Hamilton**[‡], and LL Tornabene[‡] (2012) Origin of pits in martian impact craters. *Icarus*, *221*(1), pp. 262–275. https://doi.org/10.1016/j.icarus.2012.07.027
9. Tornabene LL[*], GR Osinski, AS McEwen, JM Boyce, VJ Bray, CM Caudill, JA Grant, **CW Hamilton**[*], S Mattson, and PJ Mouginis-Mark (2012) Widespread crater-related pitted materials on Mars: Further evidence for the role of target volatiles during the impact process. *Icarus*, *220*(2), pp. 348–368. https://doi.org/10.1016/j.icarus.2012.05.022
8. **Hamilton CW**[*], SA Fagents, and T Thordarson (2011) Lava–ground ice interactions in Elysium Planitia, Mars: Geomorphological and geospatial analysis of the Tartarus Colles cone groups. *Journal of Geophysical Research: Planets*, *116*, E03004, pp. 1–26. https://doi.org/10.1029/2010JE003657
7. **Hamilton CW**[‡], SA Fagents, and L Wilson (2010c) Explosive lava–water interactions in Elysium Planitia, Mars: constraints on the formation of the Tartarus Colles cone groups. *Journal of Geophysical Research: Planets*, *115*, E09006, pp. 1–24. https://doi.org/10.1029/2009JE003546
6. **Hamilton CW**[‡], SA Fagents, and T Thordarson (2010b) Explosive lava–water interaction II: Self-organization processes among volcanic rootless eruption sites in the 1783–1784 Laki lava flow, Iceland. *Bulletin of Volcanology*, *72*(4), pp. 469–485. https://doi.org/10.1007/s00445-009-0331-5
5. **Hamilton CW**[‡], T Thordarson, and SA Fagents (2010a) Explosive lava–water interactions I: Architecture and emplacement chronology of volcanic rootless cone groups in the 1783–1784 Laki lava flow, Iceland. *Bulletin of Volcanology*, *72*(4), pp. 449–467. https://doi.org/10.1007/s00445-009-0330-6
4. Beggan C[‡] and **CW Hamilton**[‡] (2010) New image processing software for analyzing object size-frequency distribution, geometry, orientation, and spatial distribution. *Computers and Geosciences*, *36*(4), pp. 539–549. https://doi.org/10.1016/j.cageo.2009.09.003
3. Harris AJL, M Favalli, F Mazzarini, and **CW Hamilton**[‡] (2009) Construction dynamics of a lava channel. *Bulletin of Volcanology*, *71*(4), pp. 459–474. https://doi.org/10.1007/s00445-008-0238-6
2. Harris AJL, J Dehn, MR James, **CW Hamilton**[‡], R Herd, L Lodato, and A Steffke[‡] (2007) Pahoehoe flow cooling, discharge and coverage rates from thermal image chronometry. *Geophysical Research Letters, 34*, L19303, pp. 1–6. https://doi.org/10.1029/2007GL030791
1. Bruno BC, SA Fagents, **CW Hamilton**[‡], DM Burr, and SM Baloga (2006) Identification of volcanic rootless cones, ice mounds, and impact craters on Earth and Mars: using spatial distribution as a remote sensing tool. *Journal of Geophysical Research*, *111*, E06017, pp. 1–15. https://doi.org/10.1029/2005JE002510

Spacecraft Mission Involvement

Current Mission Involvement:

2017–Present • Co-Investigator (Co-I) on TerraSAR-X / TanDEM-X Team, German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR)

2020–Present • Co-Investigator (Co-I) on the Io Volcano Observer (IVO), NASA Discovery Program, Phase A

Research Support

Current Projects Supported as a Principle Investigator (PI, or Co-PI):

2020–2023 • *RAVEN: Rover–Aerial Vehicle Exploration Network*, NASA Planetary Science and Technology Through Analog Research (PSTAR)

2020–2021 • *LIFE: Lava-Induced Fumarolic Environments*, EUROVOLC 2nd Transnational Access Call

2018–2021 • *Pattern to process: Flood basalt emplacement parameters and their cross-sectional morphologies*, JPL Strategic University Research Partnership (SURP) Program (Co-PI Dr. Laura Kerber, JPL)

Current Projects as a Co-I:

2020–2023 • *3-D Modeling of a secondary ancient lunar atmosphere: the effect on volatile distribution*, NASA Solar System Workings (SSW) Program (PI: Igor Aleinov, Columbia University)

2019–2022 • *Investigating magma–cryosphere interactions and outflow channel activity in Hebrus Valles*, NASA Mars Data Analysis Program (PI: Jack Holt, University of Arizona)

2019–2022 • *Assessing the formation and implications of self-secondary craters on Copernican impact ejecta*, NASA Lunar Data Analysis Program (PI: Natalia Artemieva, Planetary Science Institute)

2019–2020 • *The Io Volcano Observer (IVO),* NASA Discovery Program Phase A (PI: Alfred McEwen, University of Arizona)

Teaching Experience at the University of Arizona

PTYS 411 *Geology and Geophysics of the Solar System* (3 Credits – Undergraduate): 2020, 2018, 2016

PTYS 594A *Planetary Geology Field Studies* (1 Credits – Graduate): 2019, 2018, 2017, 2016

PTYS 170A1 *Planet Earth: Evolution of the Habitable World* (3 Credits – Undergraduate): 2017, 2015

PTYS 595B *Career Development* (2 Credits – Graduate): 2017

PTYS 551 *Remote Sensing of Planetary Surfaces* (3 Credits– Graduate): 2015

Professional Memberships

- American Geophysical Union (AGU) – Since 2004
- International Union of Geodesy and Geophysics (IUGG) / International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) – Since 2004
- Geological Society of America (GSA) – Since 2015