

## Kenneth Hart Williford

Blue Marble Space Institute of Science

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### Education:

- 2024: Professional Certificate, Data Science and Analytics  
Massachusetts Institute of Technology, Cambridge, MA
- 2007: Ph.D., Earth and Space Sciences (certificate in Astrobiology)  
University of Washington, Seattle, WA  
*Biogeochemistry of the Triassic–Jurassic boundary*
- 2000: M.S., Geological Sciences, University of Washington, Seattle, WA  
*Strontium/calcium thermometry in the Caribbean reef coral *Siderastrea siderea**
- 1998: B.S., Natural Resources *cum laude* University of the South, Sewanee, TN

### Professional Experience:

- 2021-present: Scientist, Blue Marble Space Institute of Science
- 2014-present: Co-Investigator, SHERLOC instrument, NASA Mars 2020 rover mission
- 2014-2021: Deputy Project Scientist, NASA Mars 2020 rover mission
- 2013-2021: Visiting Associate, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, California
- 2012-2021: Founding Director, JPL Astrobiogeochemistry Laboratory ([abclab](#))
- 2012-2021: Research Scientist, Jet Propulsion Laboratory, Pasadena, CA
- 2013-2014: Strategic Surface Sampling Scientist, NASA Mars Science Laboratory mission
- 2014-2016: Collaborator, Sample Analysis at Mars instrument, NASA Mars Science Laboratory mission
- 2013-2016: Science Team Member, NASA Mars Science Laboratory mission
- 2010-2012: Research Associate, Dept of Geoscience and Astrobiology Research Consortium, University of Wisconsin, Madison, WI
- 2007-2009: Research Associate, Western Australian Organic and Isotope Geochemistry Centre, Dept of Chemistry, Curtin University, Perth, Western Australia
- 2005-2007: NSF IGERT Fellow, University of Washington Astrobiology Program
- 2003-2005: Research Assistant, Dept of Earth and Space Sciences, Univ of Washington
- 2002-2003: Information Architect, Verisign Inc., Savannah, GA
- 2001: Geologist, Hall, Blake & Associates, Nashville, TN
- 2000-2001: Earth science, life science and math teacher: Good Hope School, St. Croix, USVI
- 1998-2000: Teaching Assistant, Dept of Geological Sciences, University of Washington

### Teaching:

- 2000-2001: Good Hope School, St. Croix, USVI: Earth science, life science and mathematics
- 1998-2000: University of Washington: Geobiology (first two offerings), Invertebrate Paleontology (x2), Dinosaurs, Introduction to Geology

### Student Supervision:

- 2019-2023: Emilia Hernandez, Ph.D., University of California Davis
- 2017-2020: Kelsey Moore, Ph.D., Massachusetts Institute of Technology
- 2014-2021: Jeffery Osterhout, M.S. University of Cincinnati, Ph.D. UCLA
- 2013-: Adam Hoffman, Ph.D. candidate, University of California Riverside
- 2015-2017: Amanda Allen, undergraduate intern, Santa Barbara City College
- 2017-2018: Joyce Yager, Ph.D., University of Southern California

2017-2018: Peter Wynn, undergraduate, University of Southern California  
 2016-2018: Ashley Berg, Ph.D. University of Tennessee  
 2015: Lorenia Alejandra, undergraduate intern, Santa Ana College  
 2014-2016: Katrine Hansen, Ph.D. candidate, University of Copenhagen  
 2016: Brandy Coats, undergraduate intern, University of California–Riverside  
 2016: Erica Gaspari, undergraduate intern, Montana State University  
 2016: Meika Nwaomah, STAR teacher intern  
 2015: Ellie Hara, undergraduate intern, University of Southern California  
 2015: Emily Ross, undergraduate intern, Carleton College  
 2015: Kari Finstad, Ph.D. candidate, University of California, Berkeley  
 2014: Kira Lorber, Ph.D. candidate, University of Cincinnati  
 2014: Jorge Orbay, undergraduate intern, Columbia University  
 2014: Isis Frausto-Vicencio, undergraduate intern, UCLA  
 2014: Emily Meany, undergraduate intern, Caltech  
 2008-2009: Salem Aboglila, Ph.D., Department of Applied Chemistry, Curtin University

### Professional Societies:

2005–present: Geological Society of America  
 2011–present: American Geophysical Union  
 2011–present: Geochemical Society

### Selected Outreach and Service:

2024: Certified Hospice Volunteer, Providence Hospice, Seattle  
 2020: NASA Infiniscope, educating LAUSD teachers in Earth and Planetary Science  
 2017: Von Karman Lecture, *Mars 2020, or There and Back Again*  
[https://www.jpl.nasa.gov/events/lectures\\_archive.php?year=2017&month=11](https://www.jpl.nasa.gov/events/lectures_archive.php?year=2017&month=11)  
 2015-: Technical advisory board, Boundaries of Life Initiative, Templeton Foundation  
 2014: Donald Foster Hewett Seminar Series on The Origin of Life, Lehigh University, invited presentation “Looking for life on Mars (on Earth)”  
 2014-: Editorial Board, *Geobiology*  
 2012: Invited presentation at Explore: Life on Mars, Madison, Wisconsin  
 2011: Imagine Mars: 6 week NASA/NEA program with Akira Toki Middle School  
 2011: Astrobiology in Your Back Yard: outreach stations in Madison, Wisconsin  
 2010: Astrobiology night at the ballpark with the Madison Mallards  
 2008: Contributed a segment on the Triassic extinctions to the Animal Planet television program entitled “Animal Armageddon”  
 2008: Conducted an outreach trip to the Pilbara to present an overview of astrobiology to the Port Hedland school and lead the students and teachers of the Marble Bar High School to an Archean stromatolite locality  
 2007: Designed and led “Discover Smoke Farm,” a 48h event on a former dairy farm in the foothills of the Cascades including a BioBlitz and a day for young (age 6-10) students from Seattle to explore biodiversity in the field  
 2007: Interviewed at Walcott Quarry for a segment on the Burgess Shale, part of the History Channel television program “How Life Began”  
 2006: Graduate student representative to Astrobiology faculty position search committee, University of Washington  
 2005: Curriculum committee member, Department of Earth and Space Sciences, University of Washington  
 2005: Invited speaker, Northwest Geological Society  
 2004-2007: Project AstroBio: astrobiology-themed outreach with Seattle school teachers

### Peer-Reviewed Publications:

- Williford, K.H. and 74 others. (in press). Carbonated ultramafic igneous rocks in Jezero crater, Mars. *Science*
- Jones, A.A. and 29 others including Williford, K.H. (in press). Stratigraphy of Carbonate-Bearing Rocks at the Margin of Jezero Crater, Mars: Evidence for Shoreline Processes? *Journal of Geophysical Research – Planets*
- Blattman, F.R., Eglinton, T.I., Haghipour, N., Rouwendaal, S.E., Bernasconi, S.M., Rivers, J.M., Dittrich, M., Al Disi, Z., Williford, K.H., Sadooni, F., Al-Saad Al-Kuwari, H.A., Bontognali, T.R.R. (in press). Domed-rim microbial polygons and their preservation potential. *The Depositional Record*
- Hurowitz, J.A. and 88 others including Williford, K.H., 2025. Redox-driven mineral and organic associations in Jezero Crater, Mars. *Nature* 645: (<http://doi.org/10.1038/s41586-025-09413-0>).
- Hausrath, E.M. and 65 others including Williford, K.H., 2025. Collection and in situ analyses of regolith samples by the Mars 2020 rover: Implications for their formation and alteration history. *Journal of Geophysical Research – Planets* 130: e2023JE008046 (<https://doi.org/10.1029/2023JE008046>).
- Figueroa, M.C., Gregory, D.D., Williford, K.H., Fike, D.J., Lyons, T.W., 2024. A machine learning approach to biosignature exploration on Early Earth and Mars using sulfur isotope and trace element data in pyrite. *Astrobiology* 24: 1110-1127 (<https://doi.org/10.1089/ast.2024.0019>).
- Scheller, E.L. and 33 others including Williford, K.H., 2024. Inorganic interpretation of luminescent materials encountered by the Perseverance rover on Mars. *Science Advances* 10: eadm8241 (<https://doi.org/10.1126/sciadv.adm8241>).
- Bosak, T. and 66 others including Williford, K.H., 2024. Astrobiological potential of rocks acquired by the Perseverance rover at a sedimentary fan front in Jezero crater, Mars. *AGU Advances* 5: e2024AV001241 (<https://doi.org/10.1029/2024AV001241>).
- Weiss, B.P. and 23 others including Williford, K.H., 2024. Oriented bedrock samples drilled by the Perseverance rover on Mars. *Earth and Space Science* 11 e2023EA003322 (<https://doi.org/10.1029/2023EA003322>).
- Siljeström, S., and 55 others including Williford, K.H., 2024. Evidence of sulfate-rich fluid alteration in Jezero crater floor, Mars. *Journal of Geophysical Research: Planets* 129: e2023JE007989 (<https://doi.org/10.1029/2023JE007989>).
- Simon, J.I., and 67 others including Williford, K.H., 2023. Samples collected from the floor of Jezero Crater with the Mars 2020 Perseverance Rover. *Journal of Geophysical Research: Planets* 128: e2022JE007474 (<https://doi.org/10.1029/2022JE007474>).
- Scheller, E.L. and 65 others including Williford, K.H., 2022. Aqueous alteration processes in Jezero crater, Mars – implications for organic geochemistry. *Science* 378: 1105-1110 (<https://doi.org/10.1126/science.abo5204>).

- Moore, K.R., Daye, M., Gong, J., Williford, K.H., Bosak, T., 2022. A review of microbial-environmental interactions recorded in Proterozoic carbonate-hosted chert. *Geobiology* 21: 3-27 (<https://doi.org/10.1111/gbi.12527>).
- Osterhout, J.T., Schopf, J.W., Kudryavstev, A.B., Czaja, A.D., Williford, K.H., 2022. Deep-UV Raman spectroscopy of carbonaceous Precambrian microfossils: Insights into the search for past life on Mars. *Astrobiology* 22: 1239-1254 (<https://doi.org/10.1089/ast.2021.0135>).
- Farley, K.A. and 113 others including Williford, K.H., 2022. Aqueously altered igneous rocks sampled on the floor of Jezero crater, Mars. *Science* 377: abo2196 (<https://doi.org/10.1126/science.abo2196>).
- Liu, Y. and 70 others including Williford, K.H., 2022. An olivine cumulate outcrop on the floor of Jezero crater, Mars. *Science* 377: 1513-1519 (<https://doi.org/10.1126/science.abo2756>).
- Wiens, R.C. and 93 others including Williford, K.H., 2022. Compositionally and density stratified igneous terrain in Jezero crater, Mars. *Science Advances* 8: eabo3399 (<https://doi.org/10.1126/sciadv.abo3399>).
- Moore, K.R., Present, T.M., Pavia, F., Grotzinger, J.P., Razzell-Hollis, J., Sharma, S., Flannery, D., Bosak, T., Tuite, M., Knoll, A.H., Williford, K.H., 2022. Biosignature preservation aided by organic-cation interactions in Proterozoic tidal environments. *Palaios* 37: 486-498 (<http://dx.doi.org/10.2110/palo.2022.017>).
- Maurice, S. and 41 others including Williford, K.H., 2022. In situ recording of Mars soundscape. *Nature* 605: 653-658 (<https://doi.org/10.1038/s41586-022-04679-0>).
- Changela, H.G. and 38 others including Williford, K.H., 2022. Mars: new insights and unresolved questions. *International Journal of Astrobiology* 20: 394-426 (<https://doi.org/10.1017/S1473550421000276>).
- Mangold, N., Gupta, S., Gasnault, O., Dromart, G., Tarnas, J.D., Sholes, S.F., Horgan, B., Quantin-Nataf, C., Brown, A.J., Le Mouélic, S., Yingst, R.A., Bell, J.F., Beyssac, O., Bosak, T., Calef, F. III, Ehlmann, B.L., Farley, K.A., Grotzinger, J.P., Hickman-Lewis, K., Holm-Alwmark, S., Kah, L.C., Martinez-Frias, J., McLennan, S.M., Maurice, S., Nuñez, J.I., Ollila, A.M., Pilleri, P., Rice Jr., J.W., Rice, M., Simon, J.I., Schuster, D.L., Stack, K.M., Sun, V.Z., Treiman, A.H., Weiss, B.P., Wiens, R.C., Williams, A.J., Williams, N.R., Williford, K.H., 2021. Perseverance rover reveals an ancient delta-lake system and flood deposits at Jezero crater, Mars. *Science* 374: 711-717 (<https://doi.org/10.1126/science.abl4051>).
- Aramendia, J., Gomez-Nubla, L., Tuite, M.L., Williford, K.H., Madariaga, J.M., 2021. A new semi-quantitative surface-enhanced raman spectroscopy method for detection of maleimide (2, 5-pyrroledione) with potential application to astrobiology. *Geoscience Frontiers* 12: 101226 (<https://doi.org/10.1016/j.gsf.2021.101226>).
- Osterhout, J.T., Schopf, J.W., Williford, K.H., McKeegan, K.D., Kudryavstev, A.B., Liu, M., 2021. Carbon isotopes of Proterozoic filamentous microfossils: SIMS analyses of ancient cyanobacteria from two disparate shallow-marine cherts. *Geomicrobiology Journal* 38: 719-731 (<https://doi.org/10.1080/01490451.2021.1939813>).
- Moore, K.R., Gong, J., Pajusalu, M., Skoog, E.J., Xu, M., Soto, T.F., Sojo, V., Matreux, T., Baldes, M.J., Braun, D., Williford, K.H., Bosak, T., 2021. A new model for silicification of

cyanobacteria in Proterozoic tidal flats. *Geobiology* 19: 438-449 (<https://doi.org/10.1111/gbi.12447>).

Farley, K.A., Williford, K.H., Stack, K.M., and 27 others, 2020. Mars 2020 Mission Overview. *Space Science Reviews* 216: 142 (<https://doi.org/10.1007/s11214-020-00762-y>).

Stack, K.M., Williams, N.R., Calef, F. III, Sun, V.Z., Williford, K.H., Farley, K.A., and 61 others, 2020. Photogeologic map of the Perseverance rover field site in Jezero crater constructed by the Mars 2020 Science Team. *Space Science Reviews* 216: 127 (<https://doi.org/10.1007/s11214-020-00739-x>).

Bhartia, R. and 97 others including Williford, K.H., 2021. Perseverance's Scanning Habitable Environments with Raman and Luminescence for Organics and Chemicals (SHERLOC) investigation. *Space Science Reviews* 217: 1-115 (<https://doi.org/10.1007/s11214-021-00812-z>).

Hand, Kevin P., Bartlett, D., Fryer, P., Peoples, L., Williford, K.H., Hofmann, A., Cameron, J., 2020. Discovery of novel structures at 10.7 km depth in the Mariana Trench may reveal chemolithoautotrophic microbial communities. *Deep Sea Research Part I* 160: 103238 (<https://doi.org/10.1016/j.dsr.2020.103238>).

Alleon, J., Flannery, D.T., Ferralis, N., Williford, K.H., Zhang, Y., Schuessler, J.A., Summons, R.E., 2019. Organo-mineral associations in chert of the 3.5 Mount Ada Basalt raise questions about the origin of organic matter in Paleoarchean hydrothermally influenced sediments. *Scientific Reports* 9: 16712 (<https://doi.org/10.1038/s41598-019-53272-5>).

Caudill, C.M., Osinski, G.R., Pilles, E., Sapers, H.M., Pontefract, A.J., Francis, R., Duff, S., Laughton, J., O'Callaghan, J., Sopoco, R., Tolometti, G., Tuite, M., Williford, K.H., Xie, T.Q., 2019. Field and laboratory validation of remote rover operations Science Team findings: The CanMars Sample Return analogue mission. *Planetary and Space Science* 176: 104682. (<https://doi.org/10.1016/j.pss.2019.06.006>).

Tuite, M.L., Williford, K.H., Macko, S.A., 2019. From greenhouse to icehouse: Nitrogen biogeochemistry of an epeiric sea in the context of the oxygenation of the Late Devonian atmosphere/ocean system. *Palaeogeography, Palaeoclimatology, Palaeoecology* 531: 109204 (<https://doi.org/10.1016/j.palaeo.2019.05.026>).

Flannery, D., Allwood, A., Hodyss, R., Summons, R., Tuite, M., Walter, M., Williford, K., 2019. Microbially-influenced formation of Neoarchean ooids. *Geobiology* 17 151-160 (<https://doi.org/10.1111/gbi.12321>).

DiLoreto, Z.A., Bontognali, T.R.R., Al Disi, Z.A., Al Saad Al-Kuwari, H., Williford, K.H., Strohmenger, C.J., Sadooni, F., Palermo, C., Rivers, J.M., McKenzie, J.A., Tuite, M., Dittrich, M., 2019. Microbial community composition and dolomite formation in the hypersaline microbial mats of the Khor Al-Adaid sabkhas, Qatar. *Extremophiles* (<https://doi.org/10.1007/s00792-018-01074-4>).

Osinski, G.R. et al., 2019. The CanMars Mars Sample Return Analogue Mission. *Planetary and Space Science* 166: 110-130 (<https://doi.org/10.1016/j.pss.2018.07.011>).

Abbey, W., R. Anderson, L. Beegle, J. Hurowitz, K.H. Williford, G. Peters, J.M. Morookian, C. Collins, J. Feldman, R. Kinnett, L. Jandura, D. Limonadi, C. Logan, S. McCloskey, J. Melko, A. Okon, M. Robinson, C. Roumeliotis, C. Seybold, J. Singer, and N. Warner, 2019. A look

back: The drilling campaign of the Curiosity rover during the Mars Science Laboratory's Prime Mission. *Icarus* 319:1-13 (<https://doi.org/10.1016/j.icarus.2018.09.004>).

- Pilles, E.A., Cross, M., Caudill, C.M., Francis, R., Osinski, G.R., Newman, J., Battler, M., Bourassa, M., Haltigin, T., Hipkin, V., Kerrigan, M., McLennan, S., Silber, E.A., Williford, K., 2019. Exploring new models for improving planetary rover operations efficiency through the 2016 CanMars Mars Sample Return (MSR) analogue deployment. *Planetary and Space Science* 165: 250-259 (<https://doi.org/10.1016/j.pss.2018.10.001>).
- Manning-Berg, A.R., Wood, R.S., Williford, K.H., Czaja, A.D., Kah, L.C., 2019. The taphonomy of Proterozoic microbial mats and implications for early diagenetic silicification. *Geosciences* 9: 40 (<https://doi.org/10.3390/geosciences9010040>).
- Lepot, K., Williford, K.H., Philippot, P., Thomazo, C., Ushikubo, T., Kitajima, K., Mostefaoui, S., Valley, J.W., 2019. Extreme  $^{13}\text{C}$ -depletions and organic sulfur content argue for S-fueled anaerobic methane oxidation in 2.72 Ga old stromatolites. *Geochimica et Cosmochimica Acta* 244: 522-547 (<https://doi.org/10.1016/j.gca.2018.10.014>).
- Williford, K.H., K.A. Farley, K.M. Stack, A.C. Allwood, D. Beaty, L. Beegle, R. Bhartia, A.J. Brown, M. de la Torre Juarez, S.-E Hamran, M.H. Hecht, J. Hurowitz, J.A. Rodriguez-Manfredi, S. Maurice, S. Milkovich, R.C. Wiens, 2018. The NASA Mars 2020 rover mission and the search for extraterrestrial life. In: *From Habitability to Life on Mars*, Cabrol, N.A., and E.A. Grin, eds., p. 275-308, Elsevier (<https://doi.org/10.1016/B978-0-12-809935-3.00010-4>).
- Grant, J., Golombek, M., Wilson, S., Farley, K., Williford, K., Chen, A., 2018. The science process for selecting the landing site for the 2020 Mars rover. *Planetary and Space Science* 164: 106-126 (<https://doi.org/10.1016/j.pss.2018.07.001>).
- Finstad, K.M., Pfeiffer, M., McNicol, G., Tuite, M., Williford, K.H., Amundson, R., 2018. A late Quaternary paleoenvironmental record in sand dunes of the northern Atacama Desert, Chile. *Quaternary Research* 90: 127-138 (<https://doi.org/10.1017/qua.2018.20>).
- Ishida, A., Kitajima, K., Williford, K.H., Tuite, M.L., Kakegawa, T., Valley, J.W., 2018. Simultaneous in situ analysis of carbon and nitrogen isotope ratios in organic matter by secondary ion mass spectrometry *Geostandards and Geoanalytical Research* 42: 189-203. (<https://doi.org/10.1111/ggr.12209>).
- McMahon, S., Bosak, T., Grotzinger, J., Milliken, R., Summons, R., Daye, M., Newman, S., Fraeman, A., Williford, K.H., Briggs, D., 2018. A field guide to finding fossils on Mars. *Journal of Geophysical Research: Planets* 123: 1012-1040 (<https://doi.org/10.1029/2017JE005478>).
- Flannery, D., Allwood, A.C., Summons, R.E., Williford, K.H., Abbey, W., Matys, E.D., Ferralis, N., 2018. Spatially-resolved isotopic study of carbon trapped in ~3.43 Ga Strelley Pool Formation stromatolites. *Geochimica et Cosmochimica Acta* 223: 21-35. (<https://doi.org/10.1016/j.gca.2017.11.028>).
- Schopf, J.W., Kudryavstev, A.B., Osterhout, J.T., Williford, K.H., Kitajima, K., Valley, J.W., Sugitani, K., 2017. An aerobic similar to 3400 Ma shallow-water microbial consortium: Presumptive evidence of Earth's Paleoarchean anoxic atmosphere. *Precambrian Research* 299: 309-318 (<https://doi.org/10.1016/j.precamres.2017.07.021>).



- Abbey, W.J., Bhartia, R., Beegle, L.W., DeFlores, L., Paez, V., Sijapati, K., Williford, K., Tuite, M., Hug, W., Reid, R., 2017. Deep UV Raman spectroscopy for planetary exploration: The search for in situ organics. *Icarus* 290: 201-214 (<http://doi.org/10.1016/j.icarus.2017.01.039>).
- Izon, G., Zerkle, A.L., Williford, K.H., Farquhar, J., Poulton, S.W., Claire, M.W., 2017. Biologic regulation of atmospheric chemistry en route to planetary oxygenation. *Proceedings of the National Academy of Sciences of the United States of America* 114: E2571-2579 (<http://dx.doi.org/10.1073/pnas.1618798114>).
- Stack, K.M., Edwards, C.M., Grotzinger, J.P., Gupta, S., Sumner, D.Y., Calef, F.J. III, Edgar, L.A., Edgett, K.S., Fraeman, A.A., Jacob, S.R., Le Deit, L., Lewis, K.W., Rice, M.S., Rubin, D., Williams, R.M.E., Williford, K.H., 2016. Comparing orbiter and rover image-based mapping of an ancient sedimentary environment, Aeolis Palus, Gale Crater, Mars. *Icarus* 280: 3-21 (<http://dx.doi.org/10.1016/j.icarus.2016.02.024>).
- Schoepfer, S.D., Algeo, T.J., Ward, P.D., Williford, K.H., Haggart, J.W., 2016. Testing the limits in a greenhouse ocean: Did low nitrogen availability limit marine productivity during the end-Triassic mass extinction? *EPSL* 451: 138-148 (<http://dx.doi.org/10.1016/j.epsl.2016.06.050>).
- Haddad, E.E., Tuite, M.L., Martinez, A.M., Williford, K.H., Boyer, D.L., Droser, M.L., Love, G.D., 2016. Lipid biomarker stratigraphic records through the Late Devonian Frasnian/Famennian boundary: Comparison of high- and low-latitude epicontinental marine settings. *Organic Geochemistry* 98: 38-53 (<http://dx.doi.org/10.1016/j.orggeochem.2016.05.007>).
- Tuite, M.L., Flannery, D.T., Williford, K.H., 2016. Organic geochemistry of a high-latitude Lower Cretaceous lacustrine sediment sample from the Koonwarra Fossil Beds, South Gippsland, Victoria, Australia. *Memoirs of Museum Victoria* 74: 73-79. ([https://museumvictoria.com.au/pages/381429/073-079\\_MMV74\\_Tuite\\_2\\_WEB.pdf](https://museumvictoria.com.au/pages/381429/073-079_MMV74_Tuite_2_WEB.pdf))
- Morag, N., Williford, K.H., Kitajima, K., Philippot, P., Van Kranendonk, M.J., Lepot, K., Thomazo, C., Valley, J.W., 2016. Microstructure-specific carbon isotopic signatures of organic matter from ~3.5 Ga cherts of the Pilbara Craton support a biologic origin. *Precambrian Research* 275: 429-449 (<https://doi.org/10.1016/j.precamres.2016.01.014>).
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- Kasprak, A.H., Sepúlveda, J., Price-Waldman, R., Williford, K.H., Schoepfer, S.D., Haggart, J.W., Ward, P.D., Summons, R.E., Whiteside, J.H., 2015. Episodic photic zone euxinia in the northeastern Panthalassic Ocean during the end-Triassic extinction. *Geology* 43: 307-310 (<http://dx.doi.org/10.1130/G36371.1>).
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null hypothesis. *Proceedings of the National Academy of Sciences of the United States of America* 112: 2087-2092 (<http://dx.doi.org/10.1073/pnas.1419241112>).

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#### **Selected Conference Presentations:**

- Hurowitz, Joel A., and 80 others including Williford, K.H., 2025. The detection of a potential biosignature by the Perseverance rover on Mars. 56<sup>th</sup> Lunar and Planetary Science Conference. 2581.
- Williford, K.H., 2023 (invited). How does the record of life on Earth inform the search for ancient life on Mars? American Astronomical Society Meeting Abstracts 55: 317.01.
- Scheller, E.L., and 21 others including Williford, K.H., 2023. Investigating the origin of luminescent materials in the crater floor and delta of Jezero crater, Mars. American Geophysical Union Fall Meeting 2023. P41E-3225.
- Phua, Y.Y., and 19 others including Williford, K.H., 2023. Sulfates as hydration carrier phases in altered rocks of Jezero crater fan and floor geologic units from SHERLOC on Mars 2020. American Geophysical Union Fall Meeting 2023. P51B-05.
- Hurowitz, J.A. and 34 others including Williford, K.H., 2023. Provenance and diagenesis of martian sedimentary rocks in the Jezero crater delta front from microscale observations by the Mars 2020 PIXL instrument. Goldschmidt 2023.
- Hurowitz, J.A. and 34 others including Williford, K.H., 2023. The petrogenic history of the Jezero crater delta front from microscale observations by the Mars 2020 PIXL instrument. 54<sup>th</sup> Lunar and Planetary Science Conference.

- Clavé, E. and 10 others including Williford, K.H., 2023. Interpreting the continuum signal in the Raman spectra acquired with SuperCam in Jezero crater, Mars. LPI Contributions 2806.
- Roppel, R.D. and 15 others including Williford, K.H., 2023. Investigation of mineralogies during the delta front campaign by SHERLOC. LPI Contributions 2806.
- Scheller, E.L. and 12 others including Williford, K.H., 2022. SHERLOC investigations of the Jezero delta reveals preservation of organic compounds. American Geophysical Union Fall Meeting. P55A-02.
- Weiss, B.P. and 18 others including Williford, K.H., 2022. Orienting rock cores on Mars drilled by the Perseverance rover for martian paleomagnetism studies. American Geophysical Union Fall Meeting. GP36A-07.
- Beegle, L. and 35 others including Williford, K.H., 2022. SHERLOC: Results of the first 350 sols of operations. COSPAR 2022 (Athens).
- Beegle, L. and 34 others including Williford, K.H., 2022. SHERLOC investigation at the Máaz and Séítah Formations within Jezero crater. 2022 Astrobiology Science Conference.
- Mangold, N. and 37 others including Williford, K.H., 2022. Significance of the variations in fluvial input within Jezero crater from Perseverance rover observations. 53<sup>rd</sup> Lunar and Planetary Science Conference.
- Gupta, S., and 40 others including Williford, K.H., 2022. A delta-lake system at Jezero crater (Mars) from long distance observations. 53<sup>rd</sup> Lunar and Planetary Science Conference.
- Tzanetos, T., and 25 others including Williford, K.H., 2022. Ingenuity Mars Helicopter: From technology demonstration to extraterrestrial scout. 2022 IEEE Aerospace Conference.
- Murphy, A.E. and 29 others including Williford, K.H., 2022. The first 300 sols of the SHERLOC investigation on the Mars 2020 rover. 53<sup>rd</sup> Lunar and Planetary Science Conference.
- Beegle, L.W. and 50 others including Williford, K.H., 2021. An overview of SHERLOC Raman and fluorescence spectroscopy results obtained during Perseverance's Green Zone Campaign at Jezero crater, Mars. American Geophysical Union Fall Meeting 2021.
- Mangold, N. and 38 others including Williford, K.H., 2021. Observations of the Jezero crater delta front by Perseverance cameras. American Geophysical Union Fall Meeting 2021.
- Cardarelli, E.L. and 12 others including Williford, K.H., 2021. Exploring rock-regolith interfaces in Jezero crater with Mars 2020 SHERLOC. American Geophysical Union Fall Meeting 2021.
- Herd, C.D.K. and 14 others (including Williford, K.H.), 2021. The Plan for Sampling: Perseverance Rover Notional Caches for Mars Sample Return. American Geophysical Union Fall Meeting 2021.
- Farley, K.A., Stack, K., Brown, A.J., Williford, K.H., 2021. The Mars 2020 Perseverance rover's early mission in Jezero Crater, Mars. American Geophysical Union Fall Meeting 2021.
- Farley, K., Bell, J., Bosak, T., Gupta, S., Hand, K., Newman, C., Shuster, D., Stack, K., Weiss, B., Williford, K.H., Wiens, R., 2021. American Geophysical Union Fall Meeting 2021.

- Morgan, K.S., Farley, K.A., Williford, K.H., 2021. Early results from the Mars 2020 Perseverance rover in Jezero Crater, Mars. GSA Connects 2021 in Portland, Oregon.
- Hollis, J.R. and 40 others (including Williford, K.H.), 2021. First SHERLOC results from Mars 2020's Green Zone Campaign in Jezero Crater. AAS/Division for Planetary Sciences Meeting Abstracts 53: 206-7.
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- Moore, K.R., Flannery, D., Tuite, M.L., Tarnas, J.D., Bosak, T., Williford, K.H., 2021. Exploring relationships between major element cations and organic preservation in silica. Goldschmidt 2021.
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