

Vivian Z. Sun

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EDUCATION

Brown University, Earth, Environmental, and Planetary Sciences **Ph.D.** (2017)
Brown University, Geological Sciences **M.S.** (2014)
California Institute of Technology, Planetary Science **B.S. with honors** (2012)

RESEARCH EXPERIENCE

Jet Propulsion Laboratory, Pasadena, CA

- Systems Engineer in 397D (Science Planning) (2018 – present)
 - Mars 2020 Science Operations (SO) Systems Engineer.
- JPL Postdoctoral Scholar, Supervisor: Kathryn Stack Morgan (2017-2018)
 - Constrained diagenetic conditions at Gale crater from a survey of Murray fm. concretions.

Brown University, Providence, RI (2012 – 2017)

- Graduate Student, Supervisor: Ralph E. Milliken
- Dissertation: Clays and Opals on Mars: Implications for Water-Rock Interactions Through Time.
 - Constrained distribution of hydrated minerals in Mars' crust from CRISM/HiRISE observations of central peaks. Characterized near-infrared spectral properties of terrestrial opals, including at Mars-like conditions, applied lab results to CRISM data to identify opal types present on Mars.

Jet Propulsion Laboratory, Pasadena, CA (Summer 2011)

- Undergraduate research assistant, Supervisor: Leslie Tamppari
 - Inferred wind directions from dust devil tracks and wind streaks in the 65-72N region of Mars.

California Institute of Technology, Pasadena, CA

- Undergraduate research assistant, Supervisor: Judith Cohen (Spring 2011)
 - Assisted with cataloging Hamburg/ESO survey results.
- Undergraduate research assistant, Supervisors: Andrew Ingersoll, Shawn Ewald (Summer 2010)
 - Characterized temporal behavior of Jupiter's polar vortices from Cassini data.
- Undergraduate research assistant, Supervisors: Joseph Kirschvink, Timothy Raub (Summer 2009)
 - Characterized Permian-Triassic boundary using samples from the Quinn River Fm., Nevada.

MISSION/FIELD EXPERIENCE

Mars 2020 Science Team Member 2017 – present
Mars Science Laboratory (MSL) Participating Science Collaborator 2012 – present
JPL Planetary Science Summer School 2015
Impact Cratering Short Course and Field School, Sudbury, Ontario 2013
USGS Photogrammetric Processing of Planetary Stereo Imagery 2013

FUNDING/GRANTS

2018-2021: Science PI, NASA ROSES 2017 Mars Data Analysis Program (\$358,397)

“Assessing the Formation Environments of Hydrated Silica on Mars” (PI: Kathryn Stack Morgan)

2019-2021: Science PI, NASA ROSES 2018 Planetary Data Archiving, Restoration, and Tools Program (\$132,023) “Preparing a USGS Geologic Map of the Northeast Syrtis and Jezero Regions of Mars” (PI: Kathryn Stack Morgan)

2017-2020: Co-I, JPL R&TD, “MAARS: Machine learning-based Analytics for Autonomous Rover Systems” (PI: Masahiro Ono)

2019-2020: Co-I, JPL Data Science Pilot 2019, “Automatic Image Captioning and Annotation Capability for the PDS Imaging Node” (PI: Chris Mattman)

PROFESSIONAL SERVICE

Panelist for 3 NASA SSW, NESSE/FINESST Review Panels	(2017 – present)
External Reviewer for 4 NASA MDAP, LDAP, SSW Review Panels	(2017 – present)
Reviewer (x12) for JGR Planets, Icarus, Planetary and Space Science, Meteoritics and Planetary Science, AAS Planetary Science Journal	(2016 – present)
MSL Blogger	(2018 – present)
Co-Mentor for JPL Student Interns (Vicente Ochoa, 2018; Axel Noblet, 2019)	(2018 - 2019)
Coordinator for JPL Mars Forum	(2017 – 2019)
JPL Reviewer for three Discovery Mission Concepts and one Strategic R&TD	(Summer 2018)
Co-Chair , LPSC Oral Session: “Martian Remote Sensing”	(2019)
Co-Chair , LPSC Oral Session: “Geologic History from Curiosity Observations at Gale Crater”	(2018)

AWARDS AND HONORS

JPL Voyager Award , Mars 2020 ROASTT-2020	(2019)
JPL Voyager Award , Mars Science Laboratory	(2019)
JPL Team Award , Mars 2020 ROASTT-2019	(2019)
NASA Group Achievement Award , MSL Extended Mission-1 Science and Operations Team	(2017)
Lunar and Planetary Institute Career Development Award	(2017)
Brown University Dissertation Fellowship	(2017)
American Geophysical Union (AGU) Student Travel Grant Recipient	(2016)
SETI Institute Lunar and Planetary Science Conference Travel Grant Recipient	(2016)
NASA Group Achievement Award , MSL Prime Mission Science and Operations Team	(2013, 2015)
Geological Society of America Northeastern Section Student Travel Grant	(2014, 2015)
Brown University First Year Fellowship	(2012)
Hugh F. and Andy Lou Colvin SURF Fellow	(2010)

TEACHING AND OUTREACH

Tulane University	(4/9/2021)
Westridge High School, Pasadena CA	(3/21/2021)
San Joaquin Geological Society	(5/8/2018)
Teaching Assistant , Brown University, GEOL 1240: Stratigraphy and Sedimentation	(2014)
Teaching Assistant , Caltech, Ge 10: Frontiers in Geological and Planetary Sciences	(2012)
Teaching Assistant , Caltech, Ay 1: The Evolving Universe	(2011)

FIRST AUTHOR PUBLICATIONS

- Sun, V.Z.** and Stack, K.M. (2020), *Geologic map of Jezero crater and the Nili Planum region, Mars*. U.S. Geological Survey Scientific Investigations Map 3464, doi: <https://doi.org/10.3133/sim3464>.
- Sun, V.Z.** and Milliken, R.E. (2019), *Characterizing the mineral assemblages of hot spring environments and applications to Mars orbital data*. *Astrobiology*, 20(4), 453-474, doi: 10.1089/ast.2018.2003
- Sun, V.Z.**, Stack, K.M., Kah, L.C., Thompson, L., Fischer, W., Williams, A.J., Johnson, S.S., Wiens, R.C., Kronyak, R.E., Nachon, M., House, C.H., and VanBommel, S. (2018), *Late-stage diagenetic concretions in the Murray Formation, Gale Crater, Mars*. *Icarus*, 321, 866-890, doi: 10.1016/j.icarus.2018.12.030.
- Sun, V.Z.** and Milliken, R.E. (2018), *Distinct Geologic Settings of Opal-A and Opal-CT on Mars*. *Geophysical Research Letters*, 45, 10221-10228, doi: 10.1029/2018GL078494.
- Sun, V.Z.** (2017), *Clays and Opals on Mars: Implications for Water-Rock Interactions Through Time*. Brown University Dissertation, doi: 10.7301/Z08G8J58.

2. **Sun, V.Z.**, and Milliken, R.E. (2015), *Ancient and recent clay formation on Mars as revealed from a global survey of hydrous minerals in crater central peaks*. Journal of Geophysical Research - Planets, 120, 2293-2332, doi: 10.1002/2015JE004918.
1. **Sun, V.Z.**, and Milliken, R.E. (2014), *The geology and mineralogy of Ritzche crater, Mars: Evidence for post-Noachian clay formation*. Journal of Geophysical Research - Planets, 119, 810–836, doi: 10.1002/2013JE004602.

COAUTHORED PUBLICATIONS

14. Smith, R.J., McLennan, S.M., Achilles, C.N., Dehouck, E., Horgan, B.H.N., Mangold, N., Rampe, E.B., Salvatore, M., Siebach, K.L., **Sun, V.**, *X-Ray Amorphous Components in Sedimentary Rocks of Gale Crater, Mars: Evidence for Ancient Formation and Long-Lived Aqueous Activity*. Journal of Geophysical Research: Planets, 126, e2020JE006782, doi: 10.1029/2020JE006782.
13. Stack, K.M., Williams, N.R., Calef, F., **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 Sci Rev **216**, 127, doi: 10.1007/s11214-020-00739-x.
12. Li, S., Lucey, P.G., Fraeman, A.A., Poppe, A.R., **Sun, V.Z.**, Hurley, D.M., Schultz, P.H. (2020), *Widespread Hematite at High Latitudes of the Moon*. Science Advances 6(36), eaba1940, doi: 10.1126/sciadv.aba1940.
11. Fraeman, A.A., Edgar, L.A., Rampe, E.B., Thompson, L.M., Frydenvang, J., Fedo, C.M., Catalano, J.G., Dietrich, W.E., Gabriel, T.S.J., Vasavada, A.R., Grotzinger, J.P., L'Haridon, J., Mangold, N., **Sun, V.Z.**, and 29 others (2020). *Evidence for a diagenetic origin of Vera Rubin ridge, Gale crater, Mars: Summary and synthesis of Curiosity's exploration campaign*. Journal of Geophysical Research: Planets, 125, e2020JE006527, doi: 10.1029/2020JE006527.
10. Fraeman, A.A., Johnson, J.R., Arvidson, R.E., Rice, M.S., Wellington, D.F., Morris, R.V., Fox, V.K., Horgan, B.H.N., Jacob, S.R., Salvatore, M.R., **Sun, V.Z.**, Pinet, P., Bell, J.F., Wiens, R.C., Vasavada, A.R. (2020). *Synergistic ground and orbital observations of iron oxides on Mt. Sharp and Vera Rubin ridge*. Journal of Geophysical Research: Planets, 125, e2019JE006294, doi: 10.1029/2019JE006294.
9. Horgan, B.H.N. and 18 others including **Sun, V.Z.** (2020), *Diagenesis of Vera Rubin ridge, Gale crater, Mars, from Mastcam multispectral images*. Journal of Geophysical Research: Planets, 125, e2019JE006322, doi: 10.1029/2019JE006322.
8. L'Haridon, J., Mangold, N., Fraeman, A.A., Johnson, J.R., Cousin, A., Rapin, W., David, G., Dehouck, E., **Sun, V.**, and 13 others (2020), *Iron mobility during diagenesis at Vera Rubin ridge, Gale Crater, Mars*. Journal of Geophysical Research: Planets, 125, e2019JE006299, doi: 10.1029/2019JE006299.
7. Qiu, D., Rothrock, B., Islam, T., Didier, A.K., **Sun, V.Z.**, Mattmann, C.A., Ono, M. (2020), *SCOTI: Science captioning of terrain images for data prioritization and local image search*. Planetary and Space Science, 188, 104943, doi: 10.1016/j.pss.2020.104943.
6. Edgar, L.A. and 14 others including **Sun, V.** (2020), *A lacustrine paleoenvironment recorded at Vera Rubin ridge, Gale crater: Overview of the sedimentology and stratigraphy observed by the Mars Science Laboratory Curiosity rover*. Journal of Geophysical Research: Planets, 125, e2019JE006307, doi: 10.1029/2019JE006307.
5. Ono, M., Rothrock, B., Otsu, K., Iwashita, Y., Didier, A., Islam, T., **Sun, V.**, and 18 others (2020), *MAARS: Machine Learning-Based Analytics for Automated Rover Systems*. IEEE Aerospace Conference, doi: 10.1109/AERO47225.2020.9172271 .
4. Rampe, E.B., and 41 others including **Sun, V.Z.** (2020), *Mineralogy and geochemistry of sedimentary rocks and eolian sediments in Gale crater, Mars: A review after six Earth years of exploration with Curiosity*. Geochemistry, 80(2), 125605, doi: 10.1016/j.chemer.2020.125605.
3. Kronyak, R.E., Kah, L.C., Miklusick, N.B., Edgett, K.S., **Sun, V.Z.**, Bryk, A.B., and Williams, R.M.E. (2019), *Extensive polygonal fracture network in Siccar Point group strata: fracture mechanisms*

- and implications for fluid circulation in Gale crater, Mars.* Journal of Geophysical Research – Planets, 124, 2613-2634, doi: 10.1029/2019JE006125.
2. Kronyak, R.E., Kah, L.C., Edgett, K.S., VanBommel, S.J., Thompson, L.M., Wiens, R.C., **Sun, V.Z.** and Nachon, M. (2019), *Mineral-filled fractures as indicators of multigenerational fluid flow in the Pahrump Hills member of the Murray formation, Gale crater, Mars.* Earth and Space Sciences, 6, 238-265, doi: 10.1029/2018EA000482.
 1. MacKenzie, S.M., Caswell, T.E., Phillips-Lander, C.M., Stavros, E.N., Hofgartner, J.D., **Sun, V.Z.**, Powell, K.E., Steuer, C.J., O'Rourke, J.G., Dhaliwal, J.K., Leung, C.W.S., Petro, E.M., Wynne, J.J., Phan, S., Crismani, M., Krishnamurthy, A., John, K.K., DeBruin, K., Budney, C.J., and Mitchell, K.L. (2016), *THEO Concept Mission: Testing the Habitability of Enceladus's Ocean.* Advances in Space Research, 58, 1117-1137, doi:10.1016/j.asr.2016.05.037.

FIRST AUTHOR ABSTRACTS (* denotes oral presentations)

28. ***Sun, V.Z.** (2021), Geologic mapping of Jezero crater, Mars, the landing site for the Mars 2020 Perseverance rover. Open Planetary Virtual Talk, February 16, 2021.
27. ***Sun, V.Z.** and Stack, K.M. (2020), Geologic map of the Jezero and Nili Planum regions of Mars. Planetary Geologic Mappers Meeting, #7019.
26. **Sun, V.Z.** and Stack, K.M. (2020), A geologic map of the Jezero and Northeast Syrtis regions of Mars. 51st Lunar and Planetary Science Conference, #2439.
25. ***Sun, V.Z.** (2019), How Jezero Crater was selected as the Mars 2020 Landing Site. Mars 2020 Lunch and Learn, August 23, 2019.
24. ***Sun, V.Z.** (2019), Mineral Diagenesis of Clays and Opaline Silica Across Mars: Evidence for Crustal Fluids and Extended Aqueous Activity. 9th International Conference on Mars, #6155.
23. ***Sun, V.Z.** and Stack, K.M. (2019), Geologic Mapping of the Jezero and Northeast Syrtis Regions of Mars. Planetary Geologic Mappers Meeting, #7002.
22. *** Sun, V.Z.** (2019), Mineral Diagenesis on Mars: Orbital Evidence for Crustal Fluids and Extended Aqueous Activity. Caltech Geoclub Seminar, May 30, 2019. (Invited)
21. ***Sun, V.Z.** and Stack, K.M. (2019), Understanding the continuity of regional units in the Mars 2020 Jezero and Northeast Syrtis regions: Implications for the origin of the mafic units. 50th Lunar and Planetary Science Conference, #2271.
20. ***Sun, V.Z.**, Stack, K.M., Kah, K.C., Williams, A.J., Thompson, L.M., Wiens, R.C., VanBommel, S., Johnson, S.S., House, C.H., Nachon, M., Fischer, W.W., and Kronyak, R.E. (2018), Diagenetic concretions in the Murray Formation, Gale Crater, Mars. AGU Fall Meeting, P43A-10.
19. ***Sun, V.Z.**, Quantin-Nataf, C., Ehlmann, B., Scheller, E., and Kelemen, P. on behalf of the Mars 2020 Science Team Landing Site Working Group (2018), Mars 2020 Science Team Assessment of Northeast Syrtis and Midway. Mars 2020 4th Landing Site Workshop.
18. ***Sun, V.Z.** (2018), Multiple diagenetic fluid episodes in an ancient lake environment at Gale Crater, Mars. JPL Postdoc Seminar.
17. ***Sun, V.Z.**, Stack, K.M., Nachon, M., Johnson, S.S., Kronyak, R.E., Wiens, R.C., Minitti, M.E., and Kah, L.C. (2018), Late-stage diagenetic concretions in the lacustrine Murray Formation, Gale Crater, Mars. GSA Cordilleran Section Meeting 2018, 33-2.
16. **Sun, V.Z.** and Stack, K.M. (2018), Geomorphic mapping of the basement unit within the Northeast Syrtis Mars 2020 landing ellipse. GSA Cordilleran Section Meeting 2018, 69-5.
15. ***Sun, V.Z.**, Stack, K.M., Nachon, M., Johnson, S.S., Kronyak, R.E., Wiens, R.C., Minitti, M.E., and Kah, L.C. (2018), Late-stage diagenesis in the Murray Formation, Gale Crater, Mars: Evidence from diverse concretion morphologies. 49th Lunar and Planetary Science Conference, #1587.
14. **Sun, V.Z.** and Stack, K.M. (2018), Geomorphic mapping of the basement unit within the Northeast Syrtis Mars 2020 landing ellipse. 49th Lunar and Planetary Science Conference, #2179.

13. ***Sun, V.Z.** (2017), Clays and Opals on Mars: Tracing Water-Rock Interactions Through Time. Mars Forum, Jet Propulsion Laboratory.
12. ***Sun, V.Z.**, Milliken, R.E., and Robertson, K.M. (2017), Opals on Mars: Geologic Settings and Orbital Evidence for Seasonal Cycling of Water with the Atmosphere. 48th Lunar and Planetary Science Conference, #1715.
11. **Sun, V.Z.** and Milliken, R.E. (2016), An overview of orbital detections of hydrated silica and silica-rich rocks on Mars. AGU Fall Meeting 2016, P11B-1853. (Invited)
10. ***Sun, V.Z.**, Milliken, R.E., and Robertson, K.M. (2016), Relating opaline silica hydration and maturity to geologic settings on Mars. Goldschmidt Conference 2016, #1330.
9. ***Sun, V.Z.**, Milliken, R.E., and Robertson, K.M. (2016), Hydrated silica on Mars: Relating geologic setting to degree of hydration, crystallinity, and maturity through coupled orbital and laboratory studies. 47th Lunar and Planetary Science Conference, #2416.
8. **Sun, V.Z.**, Milliken, R.E., Robertson, K.M., Ruff, S.W., and Farmer, J.D. (2016), Spectral characterization and mineralogy/chemistry of opaline silica samples from diverse Mars analog sites. 47th Lunar and Planetary Science Conference, #2071.
7. ***Sun, V.Z.** and Milliken, R.E. (2015), Ancient and recent clay formation on Mars as revealed from a global survey of hydrated minerals in crater central peaks. GSA Annual Meeting 2015, #265182.
6. **Sun, V.Z.** and Milliken, R.E. (2015), Hydrated silica as a mineralogical marker for Hesperian Mars: Constraining environmental conditions from orbital and laboratory data. 46th Lunar and Planetary Science Conference, #2157.
5. ***Sun, V.Z.** and Milliken, R.E. (2015), Understanding ancient and recent clay formation on Mars from a global survey of crater central peaks. 46th Lunar and Planetary Science Conference, #1652.
4. ***Sun, V.Z.** and Milliken, R.E. (2014), Recent periods of clay and hydrated silica formation at Martian central peaks. GSA Annual Meeting 2014, #246594.
3. **Sun, V.Z.** and Milliken, R.E. (2014), The timing and distribution of clay and hydrated mineral formation in Martian central peaks. 8th International Conference on Mars, #1362.
2. **Sun, V.Z.** and Milliken, R.E. (2014), Origin of clay minerals in Martian central peaks: Evidence for post-Noachian clay formation. 45th Lunar and Planetary Science Conference, #1523.
1. **Sun, V.Z.** and Milliken, R.E. (2013), Geologic and mineralogical mapping to determine the origin of clay minerals in Ritchey Crater, Mars. 44th Lunar and Planetary Science Conference, #2675.

COAUTHORED ABSTRACTS

45. Li, S., Robertson, K., **Sun, V.Z.** (2021), Unveiling chaos terrain formation on Europa through synthesizing ice mixtures and modeling of the Galileo NIMS reflectance data. 52nd Lunar and Planetary Science Conference, #2452.
44. Herd, C.D.K., Bosak, T., Stack, K.M., **Sun, V.Z.**, and 23 others (2021), Sampling Mars: Notional caches from Mars 2020 strategic planning. 52nd Lunar and Planetary Science Conference, #1987.
43. Quantin-Nataf, C., and 10 others including **Sun, V.Z.** (2021), The complex exhumation history of Jezero crater floor. 52nd Lunar and Planetary Science Conference, #2034.
42. Simon, J.I., and 10 others including **Sun, V.Z.** (2021), Characterizing the stratigraphy of the Nili Planum region outside Jezero crater: Implications for Mars 2020 strategic planning. 52nd Lunar and Planetary Science Conference, #1515.
41. Ehlmann, B.L., and 16 others including **Sun, V.Z.** (2021), Mineralogy from Mars-2020: Updates to the regional geological history of Jezero crater, its watershed, and a framework for Perseverance exploration. 52nd Lunar and Planetary Science Conference, #1721.
40. Williford, K.H. and 7 others including **Sun, V.Z.** (2021), A tour of ancient habitable environments in and around Jezero crater, Mars. 52nd Lunar and Planetary Science Conference, #1599.

39. Smith, R.J. and 9 others including **Sun, V.Z.** (2021), X-ray amorphous sulfates in Gale crater. 52nd Lunar and Planetary Science Conference, #1486.
38. Hickman-Lewis, K., Herd, C.D.K, Bosak, T., Stack, K.M., **Sun, V.Z.**, and 24 others (2021), Perseverance rover notional caches for Mars Sample Return. Goldschmidt Conference 2021, #4400.
37. Kronyak, R., Kah, L.C., Miklusicak, N.B., Edgett, K.S., **Sun, V.Z.**, Bryk, A.B., Williams, R.M.E. (2020), Polygonal fractures in the Siccar Point group: evidence for late, near-surface fluid cycling in Gale crater, Mars. AGU Fall Meeting 2020, P028-06.
36. Smith, R., and 9 others including **Sun, V.Z.** (2020), Evidence for extensive diagenesis in Gale crater, Mars from X-ray amorphous component compositions. AGU Fall Meeting 2020, P028-05.
35. Kronyak, R., Stack, K.M., **Sun, V.**, Noblet, A. (2020), Geomorphology and relative ages of inverted channel deposits in Jezero crater's western delta. GSA Annual Meeting 2020, #355828.
34. Tamppari, L., Ochoa, V., **Sun, V.** (2020), Dust devil orientation and Martian surface winds. COSPAR 2020, #25274.
33. Williams, N.R., Stack, K.M., Calef, F.J., **Sun, V.**, Williford, K., Farley, K., and the Mars 2020 Geologic Mapping Team (2020), Photo-geologic mapping of the Mars 2020 Landing Site, Jezero Crater, Mars. 51st Lunar and Planetary Science Conference, #2254.
32. Stack, K.M., Noblet, A., **Sun, V.**, Mangold, N. (2020), Relative ages of inverted channel deposits within the western delta, Jezero Crater, Mars. 51st Lunar and Planetary Science Conference, #1817.
31. Li, S., Lucey, P.G., Fraeman, A.A., Poppe, A.R., **Sun, V.Z.**, Hurley, D.M., Schultz, P.H. (2020), Widespread hematite at high latitudes on the Moon: Evidence of a new type of space weathering. 51st Lunar and Planetary Science Conference, #2827.
30. Smith, R.J., McLennan, S.M., Dehouck, E., Horgan, B., Jacob, S., Mangold, N., Rivera-Hernandez, F., Siebach, K., **Sun, V.** (2020), Exploring silica diagenesis in Gale crater, Mars using the chemostratigraphy of X-ray amorphous materials. 51st Lunar and Planetary Science Conference, #2708.
29. Fraeman, A.A. and 40 others including **Sun, V.Z.** (2020), The origin of Vera Rubin Ridge: Overview and results from Curiosity's exploration campaign. 51st Lunar and Planetary Science Conference, #1677.
28. Fedo, C.M. and 15 others including **Sun, V.Z.** (2020), Ground-based stratigraphic correlation of the Jura and Knockfarril Hill members of the Murray Formation, Gale Crater: Bridging the Vera Rubin Ridge – Glen Torridon divide. 51st Lunar and Planetary Science Conference, #2345.
27. Tamppari, L.K., Ochoa, V., **Sun, V.** (2019), Dust devil orientation and martian surface winds. Seventh Mars Polar Science Conference 2020, #6011.
26. Li, S., Lucey, P.G., Fraeman, A., Poppe, A.R., **Sun, V.Z.**, Hurley, D., Schultz, P.H. (2019), The presence of hematite at high latitudes of the Moon. AGU Fall Meeting 2019, P54C-04.
25. Chan, M.A., Williams, R.M.E., and **Sun, V.Z.** (2019), Variability of Concretions on Earth and Mars: Complexities and New Explorations of Diagenetic Histories. AGU Fall Meeting 2019, P54C-03.
24. Francis, R. and 10 others including **Sun, V.Z.** (2019), The ROASTT-2019 training exercise for the Mars 2020 Science Team. AGU Fall Meeting 2019, P33G-3506.
23. Smith, R., McLennan, S.M., Dehouck, E., **Sun, V.Z.**, and Mangold, N. (2019), Exploring a diagenetic origin for X-ray amorphous material in Gale crater sedimentary rocks. AGU Fall Meeting 2019, P51F-3421.
22. Fedo, C. and 14 others including **Sun, V.Z.** (2019), Connecting Lower Mount Sharp strata: How does the Clay-bearing unit in Glen Torridon relate to the Murray formation, Gale Crater, Mars. AGU Fall Meeting 2019, P31A-3422.
21. Kronyak, R.E., Kah, L.C., Miklusicak, N.B., Edgett, K.S., Williams, R.M.E., Sun, V.Z., and Bryk, A.B. (2019), Extensive polygonal fracture network in Siccar Point Group strata, Gale Crater, Mars. GSA Annual Meeting 2019, #333991.

20. Fedo, C.M. and 16 others including **Sun, V.Z.** (2019), Evidence for Persistent, Water-Rich, Lacustrine Deposition Preserved in the Murray Formation, Gale Crater: A Depositional System Suitable for Sustained Habitability. 9th International Conference on Mars, #6308.
19. Fraeman, A.A. and 23 others including **Sun, V.Z.** (2019), Vera Rubin Ridge and Iron Oxide Bearing Sedimentary Rocks on Mars: The Integrated View from Curiosity and Orbital Data. 9th International Conference on Mars, #6237.
18. Fraeman, A. and 17 others including **Sun, V.Z.** (2019), The Origin of Vera Rubin Ridge: Oxidative Weathering on Mars? Goldschmidt, 2019.
17. Stack, K.M., Sun, V.Z., and 7 others (2019), Origin of linear ridges in the clay-bearing unit of Mount Sharp, Gale Crater, Mars. 50th Lunar and Planetary Science Conference, #1210.
16. Li, S., Lucey, P.G., **Sun, V.Z.**, and Fraeman, A.A. (2019), Detection of a 850 nm absorption feature at high latitudes on the Moon: Possible presence of hematite. 50th Lunar and Planetary Science Conference, #2320.
15. Minitti, M.E., House, C.H., and **Sun, V.Z.** (2019), Tracking variations of depositional and diagenetic features with elevation in the Murray Formation (Gale Crater, Mars) using MARDI images. 50th Lunar and Planetary Science Conference, #2427.
14. Fraeman, A.A. and 12 others including **Sun, V.Z.** (2019), Synergistic orbital and in situ observations at Vera Rubin Ridge: Comparing CRISM and Curiosity observations. 50th Lunar and Planetary Science Conference, #2118.
13. Ono, M. and 9 others including **Sun, V.Z.** (2019), Make planetary images searchable: Content-based search for PDS and on-board datasets. 50th Lunar and Planetary Science Conference, #2552.
12. Rivera-Hernandez, F. and 9 others including **Sun, V.Z.** (2019), Vera Rubin Ridge (Gale Crater, Mars) grain size observations from ChemCam LIBS data, and interpretations. 50th Lunar and Planetary Science Conference, #3029.
11. Fraeman, A., **Sun, V.Z.**, and 18 others (2018), Curiosity at Vera Rubin Ridge: Major findings and implications for habitability. AGU Fall Meeting, P41A-02.
10. Edgar, L.A. and 13 others including **Sun, V.Z.** (2018), A lacustrine environment recorded at Vera Rubin Ridge: Overview of the sedimentology and stratigraphy observed by the Mars Science Laboratory Curiosity Rover. AGU Fall Meeting, P41A-01.
9. Rapin, W. and 10 others including **Sun, V.Z.** (2018), Diagenetic groundwater models and the distribution of salts observed at Gale Crater, Mars. AGU Fall Meeting, P43A-03.
8. L'Haridon, J. and 12 others including **Sun, V.Z.** (2018), Iron mobility during diagenesis as observed by ChemCam at Gale Crater, Mars. AGU Fall Meeting, P41A-07.
7. Jacob, S., Wellington, D.F., Bell, J.F., Fraeman, A., **Sun, V.Z.**, Johnson, J.R., and Horgan, B.H. (2018), Correlating Mastcam multispectral data and rock morphology to understand potential links between ferric spectral features along Vera Rubin Ridge in Gale Crater, Mars. AGU Fall Meeting, P41A-05.
6. Edgar, L.A. and 12 others including **Sun, V.Z.** (2018), Sedimentology and stratigraphy observed at Vera Rubin Ridge by the Mars Science Laboratory Curiosity Rover. 49th Lunar and Planetary Science Conference, #1704.
5. Fraeman, A.A. and 16 others including **Sun, V.Z.** (2018), Curiosity's investigation at Vera Rubin Ridge. 49th Lunar and Planetary Science Conference, #1557.
4. Milliken, R.E., Bish, D.L., **Sun, V.Z.** (2017), Mixed-layer clay minerals on Mars and implications for widespread diagenesis. XVI International Clay Conference 2017.
3. McAdam, A. and 13 others including **Sun, V.Z.** (2016), Laboratory evolved gas analyses of Si-rich amorphous materials: Implications for analyses of Si-rich amorphous material in Gale Crater by the Mars Science Laboratory Sample Analysis at Mars Instrument. AGU Fall Meeting 2016, #169004.

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