

Curriculum Vitae



Yang LIU Research Scientist

Jet Propulsion Laboratory
California Institute of Technology
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Education

The University of Michigan, Advisor: Youxue Zhang
Ph.D. Geology, April 2003
M.S., Geology, December 1998

Chengdu University of Technology
B.S., Petroleum, July 1995

Position Held

NASA Jet Propulsion Laboratory, California Institute of Technology
Research Scientist, Nov. 2012-present
Division Safety Representative, Oct. 2019-present
Group supervisor, Feb. 2022-present

California Institute of Technology
Visiting Associate, Division of Geophysics and Planetary Geosciences, Nov. 2012-present

California Institute of Technology
Lecturer, Division of Geophysics and Planetary Geosciences, Spring, 2013-2015

University of Tennessee
Research Assistant Professor, Jan. 2010-Oct. 2012

University of Tennessee
Post-Doctoral Researcher, May 2005-Dec. 2009
Planetary Geosciences Institute, Department of Earth and Planetary Sciences (with Lawrence A. Taylor)

University of Chicago
Post-Doctoral Researcher, Jan. 2003-April 2005
Department of Geophysical Sciences (with Alfred T. Anderson)

Mission Involvement

Mars 2020

Investigation Scientist, 2014-2020, the Planetary Instrument for X-ray Lithology (PIXL)
Appointed after the selection of the instrument and participated in reviews of all key decision points (preliminary design review, critical design review, and instrument delivery review. Gained the first-hand experience in requirement writing and associated and verification and validation. Led the development of the flight calibration target, and main contributor to the definition of verification and validation for elemental calibration and key scientific functionalities.

Mars Return Sample Planning Experience

MSR Science Planning Group

MRSI Implementation Planning Scientist, 2019

Based on the iMOST recommended science investigations, developed a matrix to evaluate science investigations that need to be performed in containment, which formed the basis for assessing scientific measurements and implementation strategies

Participated in discussion regarding contamination control in returned sample handling

Re-evaluated sample mass estimates for measurements

Contributed to the planning of two successful workshops relating to science in containment and contamination control, writing the reports, and the Mars return sample management plan

Conducted exercise to evaluate implementation strategies of recommended measurements in sample returning facility

MSR Sample Quality Requirements

Sample scientist, 2012-2014

Developed a matrix to evaluate required sample qualities (integrity, inorganic contamination, magnetic, temperature, radiation) in the measurements of returned samples

Supported a working group in drafting recommendations of sample quality requirements for overall Mars return sample missions

Co-organized workshop at the 2014 LPSC and presented working group findings at GSA, MEPAG, and 8th iMars conference which received positive feedback from the scientific community

The final recommendations of sample quality requirements were adapted for Mars 2020 sample caching system

Assessed effects of individual missions on sample quality and workflow of samples in a sample return facility

Research Experience

- *Expertise:* Mineralogy, petrology, petrography, stable isotope, and trace element geochemistry
- *Planetary samples:* More than 15 years' experience working with small, precious Apollo samples and meteorite samples that require special handling and processing considerations to minimize terrestrial contamination
- *Microbeam techniques on polished samples:* Proficient in microbeam techniques including scanning electron microscopy (SEM), electron probe micro-analyzer (EPMA), Secondary Ion Mass Spectrometry (SIMS), Micro-XRF, IR/Raman spectroscopy, laser ablation inductively-coupled plasma mass spectrometry (LA-ICP-MS). Specifically, established SIMS procedure for D/H analysis of Apollo and martian samples that minimize terrestrial contamination
- *Other analytical techniques:* In-depth knowledge of micro-XRF, powder X-ray diffraction (XRD), CT scans. Familiarity with the transmission electron microscope (TEM) for nano-scale imaging and synchrotron X-ray absorption
- *Experimental Apparatus:* Setup and calibration of a rapid-quench cold-seal pressure vessel, involving high-pressure gas system; frequent use of cold-seal vessels and internally heated pressure vessels.

Leadership and Services

NASA: Panelist and reviewer for multiple NASA ROSES and CAN programs, & Judge for NASA Centennial Challenge (Sample Return Robot)

Guest Editor: *Geochimica et Cosmochimica Acta*

Editor: *Minerals*

Journal Reviewers: *Annals of Geophysics, American Mineralogist, Bulletin of Volcanology, Chemical Geology, Contributions to Mineralogy and Petrology, Geochimica et Cosmochimica Acta, Geology, Icarus, International Geology Review, Journal of*

Geology, JGR, Journal of Volcanology and Geothermal Research, Meteoritics & Planetary Science, Minerals, Planetary and Space Science, X-ray spectrometry.
Conveners: Southeastern GSA 2006; Western Pacific Geophysics Meeting 2006, Goldschmidt 2010, 2014; GSA 2013.
Program Committee: 8th International Mars conference

Professional Association

Mineralogical Society of America, Geological Society of America, The Meteoritical Society,

Awards and Honor

2021, 2020, 2016	Voyager Awards, JPL
2020	Mars 2020 surface operation and PIXL bonus Awards
2020	NPR interview
2017	Film Discovery Channel on Volcanoes in the Solar System
2016	JPL NASA profile interview
2016	Mars Exploration Science Support Team Award, JPL
2016	PIXL Instrument Team Award
2014	Mariner Award, JPL
1998-2001	Three Turner Awards, Dept. of Geological Sci., Univ. of Michigan, Ann Arbor, MI
1992-1994	Excellent Academic Achievement Award, Chengdu University of Technology

Invited Talks

- University of Nevada, Las Vegas, September, 2021
- University of Arizona, Oct 2020
- University of Michigan, Earth and Environmental Sciences, Smith Lecture, September, 2019
- Geological Society of America, Seattle, WA, “T198. Apatite As a Versatile Tool for Enabling Planetary Science”, Oct 22-25, 2017
- Geological Society of America, Boulder, Colorado, “Volatiles & Magma Ascent Rates”, Oct., 2014
- University of California, San Diego: “Some New Constraints on Martian Meteorites”, Oct., 2013
- Caltech: “Water on the Moon”, Feb., 2013
- Goldschmidt 2012: “Water , Water, Everywhere on the Moon”, June 2012
- Geological Society of America, Boulder, Colorado, “Volatiles & Magma Ascent Rates”, Nov. 2010
- East Tennessee Geological Society, Knoxville, “Water on the Moon”, Nov. 2010
- Tennessee Technology Society, Knoxville, “Water on the Moon”, Oct. 2010
- University of Tennessee, Knoxville, Earth & Planetary Science Department, “Water on the Moon”, Sept. 2010
- University of Tennessee, Knoxville, Earth & Planetary Science Department, “Volatiles in Silicate Melts and Volcanic Eruptions”, Jan. 2007

Outreach

- 2019 Speaker at the Project Scientist Academy (K-12)
- 2019 Speaker at the Chinese Parents Booster Club, Arcadia High School
- 2018 Support the Science and Engineering Booth at the STEAM Fair at Arcadia High School
- 2017 Led hiking event for Knox Presbyterian
- 2013 Volunteer, Door of Hope

New Minerals

- 1) Ma, C., Liu, Y., and Tschauner, O. (2013). Tissintite. *IMA 2013-027. CNMNC Newsletter No. 16, Aug. 2013, Page 2707; Mineralogical Magazine, 77, 2695-2709.*
- 2) Tschauner, O., Ma, C., and Liu, Y. (2013). Ahrensitite. *IMA 2013-028. CNMNC Newsletter No. 16, Aug. 2013, Page 2707; Mineralogical Magazine, 77, 2695-2709.*

New Meteorite Classified

- 1) Liu, Y. (2016) NWA 10553, brecciated eucrite, *Meteorite Bulletin, 105.*
- 2) Liu, Y. (2016) NWA 10554, eucrite, *Meteorite Bulletin, 105.*
- 3) Liu, Y. (2020) NWA 13134, shergottite, *Meteorite Bulletin, 109.*
- 4) Liu, Y. (2021) NWA 13638, lunar breccia, *Meteorite Bulletin, 110.*

Teaching Experience

Lecturer, Spring of 2013-2015, *Caltech*

GS115c-Petrography of Igneous and Metamorphic Rock: a lab-based course for undergraduate students.

Instructor, Spring, 2006, 2010, 2011, *University of Tennessee*

GS460-Principles of Geochemistry: Developed syllabus and course materials for a senior-graduate level course with 9 students.

GS630-Phase Equilibria: Discussion-type graduate courses on silicate phase diagrams with 5-6 students.

Guest Lecturer, Winter, 2007, 2009, *University of Tennessee*,

GS103-Earth and Environment: 1.5-hour lecture on volcanic hazards to ~100 students.

Graduate Teaching Assistant, Winter, 2001, 2002, *University of Michigan*

GS 410-Earth Materials: Routine lectures on course topics; Design of the curriculum, experiments, and exams for the lab section.

Other Teaching-Associated Activities, 1998, 1999, 2000, *University of Michigan*,

Participant in teaching workshops for international and graduate students. Lab assistant teaching users of a Cameca MBX electron microprobe and a Hitachi scanning electron microscope.

Mentoring Experience

Jet Propulsion Lab, Caltech

2013-present

Supervisor

Postdocs: Yang Chen, Jinping Hu, David Burney

Summer interns: Richard Kim, USC (2015); Barry Chew (2014)

California Institute of Technology

2014-2015

Co-Mentor

Undergraduate: Jen Caseres

Senior Thesis, results presented at MetSoc 2015.

University of Tennessee, Knoxville, TN

2007-2012

Co-supervisor

Postdocs: Amit Basu Sarbadhikari, Amy VJ Riches, Ioannis Baziotis.

Projects of Master students: Darren Schnare and Mike Mellin

University of Michigan, Ann Arbor, MI

1998

Supervisor of an undergraduate student (J Sohn) in his summer research project

Publications

Reports

- 1) MSPG (MSR Science Planning Group: co-chairs M. Meyer and E. Sefton-Nash; facilitation D. W. Beatty and B. L. Carrier; and D. Bass, F. Gaubert, T. Haltigin, A. D. Harrington, M. M. Grady, Y. Liu, D. Martin, B. Marty, R. Mattingly, S. Siljestrom, E. Stansbery, K. Tait, M. Wadhwa, L. White) & C. C. Allen, H. Busemann, M. Calaway, M. Chaussidon, C. M. Corrigan, N. Dauphas, V. Debaille, D. P. Glavin, S. M. McLennan, K. Olsson-Francis, R. Shaheen, C. L. Smith, J. Thieme, T. Usui, M. A. Velbel, S. C. Werner (2019) The Relationship of MSR Science

- and Containment. Unpublished workshop report, posted 04/01/19 at <https://mepag.jpl.nasa.gov/reports/Science%20in%20Containment%20Report.pdf>
- 2) MSPG (MSR Science Planning Group: co-chairs M. Meyer and E. Sefton-Nash; facilitation D. W. Beaty and B. L. Carrier; and D. Bass, F. Gaubert, M. M. Grady, T. Haltigin, A. D. Harrington, **Y. Liu**, D. Martin, B. Marty, R. Mattingly, S. Siljeström, E. Stansbery, K. Tait, M. Wadhwa, L. White), & A. M. B. Anesio, L. Bonal, A. Bouvier, J. C. Bridges, J. R. Brucato, K. L. French, U. Gommel, H. V. Graham, J. M. C. Holt, G. Kreck, R. Mackelprang, F. M. McCubbin, K. Olsson-Francis, A. B. Regberg, A. Saverino, M. A. Sephton, & C. K. Sio (2019) Science-Driven Contamination Control Issues Associated with the Receiving and Initial Processing of the MSR Samples. Unpublished workshop report, posted 09/20/19 at <https://mepag.jpl.nasa.gov/reports.cfm>.
 - 3) MSPG (MSR Science Planning Group: co-chairs M. Meyer and E. Sefton-Nash; facilitation D. W. Beaty and B. L. Carrier; and D. Bass, F. Gaubert, M. M. Grady, T. Haltigin, Y. Liu, D. Martin, B. Marty, R. Mattingly, S. Siljeström, E. Stansbery, K. Tait, M. Wadhwa, L. White), 2019, A Framework for Mars Returned Sample Science Management. Unpublished white paper, posted 12/11/19 at <https://mepag.jpl.nasa.gov/reports.cfm?expand=mosp>.
 - 4) MSPG (MSR Science Planning Group: co-chairs M. Meyer and E. Sefton-Nash; facilitation D. W. Beaty and B. L. Carrier; and D. Bass, F. Gaubert, M. M. Grady, T. Haltigin, Y. Liu, D. Martin, B. Marty, R. Mattingly, S. Siljeström, E. Stansbery, K. Tait, M. Wadhwa, L. White), 2019, Summary of the 2019 Work of the MSR Science Planning Group (MSPG), posted 12/2/2019 at <https://mepag.jpl.nasa.gov/reports.cfm>.
 - 5) Velazco, JE, Taylor, M, Liu, Y, Hodyss, R, Allwood, A 2016. A Novel Rotating-Wave X-Ray Source for Analysis of the Martian Landscape. The Interplanetary Network Progress Report, 207, 1-12.
 - 6) Hyanes, P., Ingersoll, A.P., Paige, D.A., et al. (2014) New approaches to lunar ice detection and mapping. KISS report.
 - 7) Eiler, J; Blacksborg, J.; et al. (2013) In situ science and instrumentation for primitive bodies. KISS report.

Conference Papers

- 1) Fraeman AA, Ehlmann B.L., Northwood-Smith G.W.D., **Liu Y.**, Wadhwa M., Greenberger R.N. (2016) Using VSWIR microimaging spectroscopy to exploring the mineralogical diversity of HED meteorites. In: *8th Workshop on Hyperspectral Image and Signal Processing: Evolution in Remote Sensing (WHISPERS 2016)*, 21-24 August 2016, Los Angeles, CA.
- 2) **Liu, Y.**, and Taylor, L.A., 2010. Troublesome lunar dust: Knowns and unknowns for mitigation. In Global Lunar Conference, GLUC-2010.2.8.A.2, Beijing, China. 15 pages.
- 3) Taylor, L.A., and **Liu, Y.**, 2010. Important considerations for lunar soil simulants. *12th Biennial ASCE Aerospace Division International Conference*. 15 pages.
- 4) Cole, D.M., Taylor, L.A., **Liu, Y.**, and Hopkins, M.A., 2010. Grain-scale mechanical properties of lunar plagioclase and its simulant: Initial experimental findings and modeling implications. *12th Biennial ASCE Aerospace Division International Conference*. 15 pages.
- 5) **Liu, Y.**, Taylor, L.A., Basu Sarbadhikari, A., Valley, J., et al. 2008c. Diamond genesis in the world's largest diamondiferous eclogite, part II: In-situ isotopes study of diamond and mineral inclusions. *9th International Kimberlite Conference, Abstract 00188*. 3 pages.
- 6) Taylor, L.A., **Liu, Y.**, Basu Sarbadhikari, A., Ketchum, R., Carlson, W., et al. 2008. Diamond genesis in the world's largest diamondiferous eclogite, part I: X-ray tomography and xenolith dissection. *9th International Kimberlite Conference, Abstract 00186*. 3 pages.
- 7) **Liu, Y.**, Park, J., Hill, E., Kihm, K.D., Taylor, L.A., 2006b. Morphology and physical characteristics of Apollo 17 dust particles. *10th ASCE Aerospace Division International Conference*, 15 pages.
- 8) Hill, E., Patchen, A.D., Deane, B., **Liu, Y.**, Park, J., and Taylor, L.A., 2006. Lunar simulants as feedstocks for ISRU processing: mineralogy and chemistry. *10th ASCE Aerospace Division International Conference*, 15 pages.
- 9) Park, J.S., **Liu, Y.**, Kihm, K.D., Hill, E., and Taylor, L.A., 2006. Submicron particle size distribution of Apollo 11 lunar dust. *10th ASCE Aerospace Division International Conference*, Houston, 15 pages.
- 10) Taylor, L.A., Hill, E., **Liu, Y.**, Park, J.S., and Bruce, R.W. 2006. Microwave processing Apollo soil: products for a lunar base. *10th ASCE Aerospace Division International Conference*, Houston, 15 pages.

Book Chapter

Williams, D.A., Byrne, P.K., Jozwiak, L., **Liu, Y.**, Radebaugh, J., 2021. Effusive silicate volcanism: Observations and processes, in: Byrne, P.K., Lopes, R.M.C., Siegler, M.A. (Eds.), *Planetary Volcanism across the Solar System*. Elsevier.

Peer-Reviewed Articles (*Post-doc, Google scholar h-index = 34, i10-index = 58)

1. **Liu, Y.** and Ma, C. **2022**. Direct evidence of volcanic outgassing of Na and K on the Moon from Apollo orange beads. *Icarus* (in press).
2. **Liu, Y.** et al. 2022. An olivine cumulate outcrop on the floor of Jezero crater, Mars. *Science* (revised).
3. Farley, K. et al. 2022. Aqueously altered igneous rocks on the floor of Jezero crater, Mar. *Science* (revised).
4. Scheller, E.L. et al. 2022. Aqueous alteration processes and implications for organic geochemistry in Jezero crater, Mars *Science Advance* (submitted).
5. Tice, M. et al. 2022. Alteration History of Séítah Formation Rocks Inferred by PIXL X-ray Fluorescence, X-ray 3 Diffraction, and Multispectral Imaging on Mars. *Science Advance* (submitted).
6. Shkolyar, S., Jaret, S. J., Cohen B. A., Johnson, J. R., Ollila, A., Beysac, O., Wiens, R., **Liu, Y.**, Holm-Alwmark S. 2021. Estimating peak shock pressures on Mars using spectroscopic techniques: Implications for geochronology studies on returned samples (accepted).
7. Su, X., Zhang, Y.X., Liu, Y., Holder, R. (2022) Outgassing and in-gassing of Na and Cu in lunar 74220 orange glass beads. *Earth and Planetary Science Letters* (submitted).
8. **Liu, Y.**, Fischer, W.W., Ma, C., Beckett, J.R., Tschauner, O., Guan, Y., Lingappa, U.F., Webb, S.M., Prakapenka, V.B., Lanza, N.L., Agee, C.B. **2021**. Manganese oxides in Martian meteorites Northwest Africa (NWA) 7034 and 7533. *Icarus* **364**, <https://doi.org/10.1016/j.icarus.2021.114471>.
9. Masiero, R.J., Davidsson, B.J.R., Liu, Y., Moore, K., Tuite, M. 2021. Volatility of sodium in carbonaceous chondrites at temperatures consistent with low-perihelia asteroids. *Planetary Science Journal* **2**, 165-178.
10. Nicklas, R.W., Day, J.M.D., Vaci, Z., Udry, A., **Liu, Y.**, Tait, K.T. 2021. Uniform oxygen fugacity of shergottite mantle sources and an oxidized martian lithosphere. *Earth and Planetary Science Letters*, **564**, 1-10.
11. Strahle, J.W., Mock, S., Mattingly, R., Younse, P., Chesin, J., Kim, T., Mayo, J., Lengtat, C., Liu, Y. 2021. Sample return container opening process concept for potential Mars sample return. IEEE Aerospace Conference (50100), 1-19.
12. Allwood, A.C., Wade L.A., Foot, M.C., et al. **2020**. PIXL: Planetary Instrument for X-ray Lithochemistry. *Space Science Reviews* **216**, 314, <https://doi.org/10.1007/s11214-020-00767-7>.
13. Farley, K., Williford, K., Stack, K.M., et al. 2020. Mars 2020 Mission Overview. *Space Science Reviews* **216**, 142, <https://doi.org/10.1007/s11214-020-00762-y>.
14. Stack, K.M., Calef III, F., Williams, N.R., et al. 2020. Photogeology map of the Mars 2020 Landing Site, Jezero Crater, Mars: Insights from Photo-geologic Mapping by the Mars 2020 Science Team. *Space Science Reviews* **216**, 127, <https://doi.org/10.1007/s11214-020-00739-x>.
15. McIntosh, E.C., Day, J.M.D., **Liu, Y.**, et al. 2020. Examining the compositions of impactors striking the Moon using Apollo impact melt coats and anorthositic regolith breccia meteorites. *Geochim. Cosmochim. Acta* **274**, 192-210.
16. Ma, C., **Liu, Y.** **2019**. Discovery of a zinc-rich mineral on the surface of lunar orange pyroclastic beads. *American Mineralogist* **104**, 447-452.
17. Carrier, B.L., Abbey, W.J., Beegle, L.W., Bhartia, R., **Liu, Y.** 2019 Attenuation of ultraviolet radiation in rocks & minerals: Implications for Mars science. *JGR-Planet* 10.1029/2018JE005758.

18. Ma, C., Tschauner, O., Beckett, J. R., **Liu, Y.** 2019. Chenmingite, FeCr₂O₄ in the CaFe₂O₄-type structure, a shock-induced, high-pressure mineral in the Tissint martian meteorite. *American Mineralogist* **104**, 1521-1525.
19. **Liu, Y.**, Chen Y., Guan Y., Eiler, J.M., Ma C., Rossman, G.R., Zhang, Y. **2018**. Impact-melt hygrometer for Mars: The case of shergottite Elephant Moraine (EETA) 79001. *Earth & Planetary Science Letters*, **490**, 206-215.
20. Day, J.M.D., Tait, K.T., Udry, A., Moynier, F., **Liu, Y.**, and Neal, C.R. 2018. Martian magmatism from plume metasomatized mantle. *Nature Communications*, **9**, 4799.
21. Myers, M.L., Wallace, P.J., Wilson, C.J.N., Watkins, J.L., **Liu, Y.** 2018. Ascent rates of rhyolitic magma at the onset of three caldera-forming eruptions. *American Mineralogist*, **103**, 952-965.
22. Hui, H., Guan, Y., Chen, Y., Peslier, A. H. Zhang, Y., **Liu, Y.**, Flemming, R. L., Rossman, G. R., Eiler, J. M., Neal, C. R., Osinski, G. R. **2017**. A heterogeneous lunar interior for hydrogen isotopes as revealed by lunar highlands samples. *Earth & Planetary Science Letters*, **473**, 14-23.
23. Kuchka, CR, Herd, C., Walton, E. L., Guan, Y., **Liu, Y.** 2017. Martian low-temperature alteration materials in shock-melt pockets in Tissint: Constraints on their preservation in shergottite meteorites. *Geochimica et Cosmochimica Acta*, **210**, 228-246.
24. **Liu, Y.**, Ma, C., Beckett, J., Chen, Y., Guan, Y. **2016a**. Rare-earth-element minerals in martian breccia meteorite NWA 7034 and 7533: Implications for fluid-rock interaction in the martian crust. *Earth & Planetary Science Letters*, **451**, 251-262.
25. **Liu, Y.**, Baziotis, I.P., Asimow, P.D., Bodnar, R.J., Taylor, L.A., 2016b. Mineral chemistry of the Tissint meteorite: Indications of two-stage crystallization in a closed system. *Meteoritics & Planetary Science*, **51**, 2293-2315.
26. Howarth, G.H., **Liu, Y.**, Chen, Y., Pernet-Fisher, J.F., and Taylor, L.A. 2016. Postcrystallization metasomatism in shergottites: Evidence from the paired meteorites LAR 06319 and LAR 12011. *Meteoritics & Planetary Science*, **51**, 2061-2072.
27. Ma, C., Tschauner, O., Beckett, J. R., **Liu, Y.**, Rossman, G. R., Stanislav, V., Sinogeikin, S., Smith, J., Taylor, L. A. 2016. Ahrensite, γ -Fe₂SiO₄, a new shock-metamorphic mineral from the Tissint meteorite-implications for the Tissint shock event on Mars. *Geochimica et Cosmochimica Acta*, **184**, 240-256.
28. Taylor, L.A., **Liu, Y.**, Lofgren, G. 2016. Integrity of lunar soil samples. *Nature Geoscience*, **9**, 87-87.
29. Taylor L. A., Logvinova, A., Howarth, G.H., **Liu, Y.**, Peslier, A., Guan, Y., Chen, Y., Sobolev, N.V. 2016. Low water contents in diamond mineral inclusions: Proto-genetic origin in a dry cratonic lithosphere. *Earth & Planetary Science Letters*, **433**, 125-132.
30. *Chen, Y., **Liu, Y.**, Guan, Y., Eiler, J., Ma, C., Rossman, G. R., Taylor, L. A. **2015a**. Evidence in Tissint for recent subsurface water on Mars. *Earth & Planetary Science Letters*, **425**, 55-63.
31. *Chen, Y., Zhang, Y.-X., **Liu, Y.**, Guan, Y., Eiler, J., Stolper, E.M. 2015b. Water, fluorine, and sulfur concentrations in the lunar mantle. *Earth & Planetary Science Letters*, **427**, 37-46.
32. Ma, C., Tschauner, O., Beckett, J. R., **Liu, Y.**, Rossman, G. R., Zuravlev, K., Prakapenka, V., Dera P., Sinogeikin, S., Taylor, L. A. 2015. Tissintite, (Ca,Na,□)AlSi₂O₆, a highly defective shock-induced, high-pressure clinopyroxene in the Tissint Martian meteorite. *Earth & Planetary Science Letters*, **422**, 194-205.
33. McCubbin, F. M., Vander Kaaden, K. E., Tartese, R., Klima, R.L., **Liu, Y.**, and 9 more authors. 2015. Volatiles (H, C, N, F, S, Cl) in the lunar mantle, crust, and regolith: Distribution, processes, sources, and significance. *Am. Min.*, *Invited Review* **100**, 1668-1707.
34. Thompson, D.R., 9 authors, Liu, Y., Wade, L.A. 2015. Automating X-ray fluorescence analysis for rapid astrobiology surveys. *Astrobiology*, **15**, 961-976.
35. *Pernet-Fisher, J.F., Howarth, G.H., **Liu, Y.**, Barry, P.H., Taylor, L. A. **2014**. Estimating the lunar mantle water budget from phosphates: Complications associated with silicate-liquid-immiscibility. *Geochimica et Cosmochimica Acta*, **144**, 326-341.

36. *Pernet-Fisher, J.F., Howarth, G.H., **Liu, Y.**, Barry, P.H., Carmody, L., Valley, J.W., Bodnar, R.J., Spetsius, Z.V., and Taylor, L.A. 2014. Komsomolskaya diamondiferous eclogites: Evidence for oceanic crustal protoliths. *Contrib. Mineral. Petrol.*, **167**, 1-17.
37. **Liu, Y.**, Balta, J.B., Goodrich, C.A., McSween, H.Y., and Taylor L.A. **2013**. New constraints on the formation of Elephant Moraine 79001 Lithology A. *Geochimica et Cosmochimica Acta*, **108**, 1-20.
38. *Baziotis, I. P., **Liu, Y.**, DeCarli, P., Melosh, J., McSween, H.Y., Bodnar, R.J., and Taylor L.A. 2013. The Tissint martian meteorite as evidence for the largest impact excavation. *Nature Communication*, **4**, 1404, DOI: 10.1038.
39. He, Q., Xiao, L., Hsu, W., Balta, J.B., McSween, H.Y. and **Liu, Y.** 2013. The water content and parental magma of the second chassignite NWA 2737: Clues from trapped melt inclusions in olivine. *Meteoritics & Planetary Science*, **48**, 474-492.
40. Sedaghtpour, F., Teng, F.-Z., **Liu, Y.**, and Taylor, L.A., 2013. Magnesium isotopic composition of the Moon. *Geochim. Cosmochimica Acta*, **120**, 1-16.
41. **Liu Y.**, Guan Y., Zhang Y., Rossman G.R., Eiler J.M., Taylor L.A. **2012a**. Direct measurement of hydroxyl in the lunar regolith and the origin of lunar surface water. *Nature Geoscience*, **5**, 779-782.
42. Day, J.M.D., Walker, R.J., Ash, R.D., **Liu, Y.**, Rumble, D., Irving, A.J., Goodrich, C.A., Tait, K., McDonough, W.F., and Taylor, L.A., 2012. Origin of Graves Nunataks 06128 and 06129, brachinites, and brachinite-like achondrites by partial melting of volatile-rich primitive parent bodies. *Geochimica et Cosmochimica Acta*, **81**, 94-128.
43. Riches, A.J.V., Day, J.M.D., Walker, R.J., Simonetti, A., **Liu, Y.**, Neal, C.R. and Taylor, L.A., 2012. Rhenium-osmium isotope and highly-siderophile-element abundance systematics of angrite meteorites. *Earth and Planetary Science Letters*, **353-354**, 208-218.
44. Zhang, A.C., Taylor, L.A., Wang, R.-C., Li, Q., Li, X., Patchen, A.D., and **Liu, Y.**, 2012a. Thermal history of Apollo 12 granite and KREEP-rich rock: Clues from Pb/Pb ages of zircon in lunar breccia 12013. *Geochimica et Cosmochimica Acta*, **95**, 1-14.
45. **Liu, Y.**, and Taylor L.A., **2011b**. Characterization of lunar dust and a synopsis of available lunar simulants. *Planetary and Space Science*, **59**, 1769-1783.
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