

Curriculum Vitae

Personal data

Name: Ming-Chang Liu
Address: Department of Earth, Planetary, and Space Sciences
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Nationality: Taiwan and U.S.A (dual citizenships)
Languages: English (fluent), Mandarin (native), French (basic)

Education

Ph.D. 2008 Department of Earth and Space Sciences, UCLA
Los Angeles, California, USA.
Thesis: Short-lived radionuclides and early Solar System
chronology: A hibonite perspective.
Advisor: Prof. Kevin D. McKeegan
B.S. 2001 Department of Geosciences, National Taiwan University
Taipei, Taiwan, R.O.C
Advisor: Prof. Typhoon Lee

Employment

- Scientist, Department of Earth, Planetary and Space Sciences, UCLA, Feb 2026 – present
- Secondary Ion Mass Spectrometrists and Cosmochemist, Nuclear and Chemical Sciences Division, Lawrence Livermore National Laboratory, Aug 2022 – Jan 2026
- Academic Ion Microprobe Specialist & Manager of NSF National Ion Microprobe Facility, Department of Earth, Planetary and Space Sciences, UCLA, July 2014 – Aug 2022
- Visiting Professor, Institut de Physique du Globe de Paris, France, Feb 2014 – March 2014
- Director of NanoSIMS Laboratory at Academia Sinica, May 2013 – July 2014
- Assistant Research Fellow (Assistant Professor equivalent), Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan, Jan 2012 – July 2014
- Postdoctoral Researcher, Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan, Sept 2011 – Dec 2011
- Joint Postdoctoral Researcher, Centre de Recherches Pétrographiques et Géochimiques, CNRS, & Institute of Astronomy and Astrophysics, Academia Sinica, Sept 2010 – Aug 2011.
- Joint Postdoctoral Researcher, Department of Terrestrial Magnetism, Carnegie Institution of Washington & Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan, Aug 2008 – Aug 2010.

- Research Assistant, Department of Earth and Space Sciences, UCLA, Sep 2003 – Jul 2008.
- Teaching Assistant in “Solar System and Planets”, Department of Earth and Space Sciences, UCLA, Spring 2005 / Fall 2006.
- Research Assistant, Institute of Earth Sciences, Academia Sinica, Taiwan, Jan 2000 – Oct 2001.
- Summer Intern, Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan, Summer 2000.
- Observation Assistant of “Observational Astronomy”, Department of Physics, NTU, Spring 1998.

Research Interests

- Understanding the Formation Conditions and Environments of CAIs, Chondrites and the Solar System via Components in Chondritic Meteorites and Samples Returned from Comets and Asteroids
- Short-lived Radionuclides and Early Solar System Chronology
- Isotopic Anomalies in Primitive Meteorites and Their Relationships to Stellar Nucleosynthesis
- Lunar Geochronology
- Numerical Modeling of Spallogenic Stable Isotope Anomalies
- Secondary Ion Mass Spectrometry: Fundamentals, Technical Developments, and Applications to Isotope Cosmochemistry, Geochemistry, Geochronology, and Nuclear Forensics

Instrument Experience

- 23-year experience with CAMECA IMS1290/1280HR2/1270/7f-geo/6f Ion Microprobes, including laboratory building, operation, developments of analytical protocols, and routine maintenance
- 8-year experience with CAMECA NS50L/NS50 Ion Microprobe (NanoSIMS), including laboratory building, operation, developments of analytical protocols, and routine maintenance
- 5-year experience with Leo 1430 Scanning Electron Microscope
- 2-year experience with JEOL JSM-6500 field emission Scanning Electron Microscope
- 8-year experience with Tescan VEGA3 Scanning Electron Microscope

Space Mission Experience

- Member, Phase-2 Curation Team Kochi (Ph2K) of the Hayabusa2 Mission, Nov 2020 – dissolution
- Member, Isotope Preliminary Examination Team of the Hayabusa2 Mission, Aug 2018 – dissolution
- Member, Isotope Preliminary Examination Team of the Stardust Mission, Aug 2006 – Dec 2006

Honors and Awards

- Invited Professorship, Institut de Physique du Globe de Paris, France, Feb 2014 – March 2014
- Short-term Researcher Fellowship, Japanese Society for the Promotion of Science, 2013.
- Excellence in Teaching Earth and Space Sciences (score 8.7/9), Department of Earth and Space Sciences, UCLA, 2007

- University Fellowship, Fall 2007
- UCLA IGPP Astrobiology Fellowship, 2003

Professional Society

- Meteoritical Society (2004 – present)
- Geochemical Society (2015 – present)

Community Service

- Editorial Board Member: PLOS One
- Panel member and chief: Various NASA Review Panels (2018 – present)
- Member of the Audit committee, The Meteoritical Society (2025 – dissolution)
- Meteorite sub-committee member, ExMAG (2023 – present)
- Astromaterials Allocation Review Board member (2026 – present)
- Peer Reviewer: *Geochimica et Cosmochimica Acta*, *Earth and Planetary Science Letters*, *The Astrophysical Journal*, *The Astrophysical Journal Letters*, *Meteoritics and Planetary Sciences*, *Astronomy and Astrophysics*, *Planetary and Space Sciences*, *Geochemical Journal*, *Rapid Communications in Mass Spectrometry*, *Nature Communications*, *Chemical Physics*, *Science Advances*, *Chemical Geology*, *Nature Geosciences*, *Analytical Chemistry*, *Scientific Reports*, *NASA Proposals*, *Swiss National Science Foundation Proposals*, *Belgium FNRS Proposals*, *AGU Monograph*.
- Conferences:
 - 2024 Meteoritical Society Meeting, Scientific Organizing Committee Member.
 - 2023 Meteoritical Society Meeting in Los Angeles, Local Organizing Committee co-Chair.
 - 2023 Meteoritical Society Meeting, McKay Award Committee Vice Chair
 - 2022 Meteoritical Society Meeting, Scientific Organizing Committee Member.
 - 2022 Goldschmidt, SIMS Workshop Organizer.
 - 2021 Meteoritical Society Meeting, Travel Award Committee Member.
 - 2019 Meteoritical Society Meeting, Scientific Organizing Committee Member.
 - 2016 Goldschmidt, 2c Session Convener.
 - 2013 The Life Cycle of Dust in the Universe, Local Organizing Committee Member.
 - 2012 Meteoritical Society Meeting, McKay Award Committee Member.

Departmental Service

- Chair, Colloquium Committee, 2013 – 2014, Institute of Astronomy and Astrophysics, Academia Sinica
- Member, Project Committee, 2013 – 2014, Institute of Astronomy and Astrophysics, Academia Sinica
- Member, Instrumentation Review Panel, 2012 – 2014, Institute of Astronomy and Astrophysics, Academia Sinica

Funding History

Funded proposals (~\$5.8M in total)

- 2025–2029 NASA Planetary Science Enabling Facilities, Establishment of the LLNL-NASA In-situ Microanalysis Facility for high spatial resolution isotopic analysis of elements across the periodic table (\$2,792,147), PI.
- 2024–2026 LLNL LDRD, Origins of the solar boron isotope ratio: insight into nucleosynthesis in the neutrino process and low-energy charged particle irradiation (\$545,000), PI.
- 2023–2026 NASA Emerging Worlds, Origins of the solar system boron isotope ratio inferred from the Li and B isotopic compositions of chondrule olivines (\$727,970), PI.
- 2021–2024 NASA Emerging Worlds, Coordinated microanalyses of refractory inclusions and insights into their condensation origin (\$67,191), Institutional PI (proposal PI: Dr. Jangmi Han).
- 2020–2023 NASA Emerging Worlds, Tracing the formation environments of the Solar System through studies of multiple short-lived radionuclides in the early Solar System materials (\$409,209 USD), PI.
- 2019–2022 NASA Laboratory Analysis of Returned Samples, The Isotopic Compositions of Light Elements in the Solar Wind: Implications for Solar Composition (\$700,000 USD), Co-I (PI: Kevin McKeegan).
- 2018–2021 NASA Emerging Worlds, Probing solar nebula environments: Isotopic heterogeneity in the earliest condensates (\$420,000 USD), PI.
- 2018–2020 JAXA Hayabusa 5th International Announcement of Opportunity, Analysis of Light Isotopes of Implanted Solar Wind in Itokawa Pristine Particles: Implications for Solar Isotopic Compositions (No Funding Allocated), PI.
- 2014–2015 Ministry of Science and Technology (formerly known as National Science Council), Taiwan, ROC. Tracing irradiation processes in the solar nebula by using short-lived radionuclides in refractory inclusions (~ 56,000 USD), sole PI (Turned down because of leaving Academia Sinica for UCLA).
- 2013–2014 National Science Council, Taiwan, ROC. Tracing irradiation processes in the solar nebula by using short-lived radionuclides in the meteorites (~ 50,000 USD), sole PI.
- 2012–2013 National Science Council, Taiwan, ROC. Tracing irradiation processes in the early Solar System through isotopic compositions in meteorite components (~ 66,411 USD), sole PI.

Postdocs Supervised

- Kaitlyn McCain, Mar 2024 – Sept 2025
- Nozomi Matsuda, Oct 2019 – Aug 2022
- Andreas Hertwig, July 2018 – Aug 2020
- Zan Peeters, Nov 2013 – July 2014
- Bernd Liebig, Aug 2013 – July 2014

Students Supervised

- Kaitlyn McCain (Ph.D. student, co-advised with Kevin McKeegan), Jan 2021 – Aug 2022
- Erika Valdueza (Summer intern student), July 2013 – Aug 2013
- Pei-Shan Jiang (Summer intern student), July 2013 – Aug 2013

Publications († denotes a postdoc or student author under my (co-)supervision)

Book chapters

2. **Liu, M.-C.** and Chaussidon, M. 2017, The Cosmochemistry of Boron Isotopes. *Advances in Isotope Geochemistry, Boron Isotopes – The Fifth Element*, 273–289.
1. Chaussidon, M. and **Liu, M.-C.** 2015, Timing of Nebula Processes which Shaped the Precursors of the Terrestrial Planets. *AGU Monograph “The Early Earth”*, 1–26.

Peer reviewed journals

73. Dunham, E. T., **Liu, M.-C.**, Burman, A., Jorge-Chavez, F., Leuer, D., Herbst, A. K., Tissot, F. L. H., and McKeegan, K. D. 2026, The CAI Database: ^{26}Al – ^{26}Mg Isotope Systematics. *The Astrophysical Journal Supplement Series*, 282, 11 (15pp).
72. Borg, L. E., Kruijer, T. K., **Liu, M.-C.**, Roberts, A. G., Wimpenny, J., Maina, O., Boro, J., Shearer, C. K., and Samperton, K. M., 2025, Temporal relationships among lunar crustal rocks. *Geochimica et Cosmochimica Acta*, 410, 266–280
71. Iizuka, T. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2025, Late fluid flow in a primitive asteroid revealed by Lu–Hf isotopes in Ryugu. *Nature*, 646, 62–67
70. Han, J., Park, C., **Liu, M.-C.**, Matsuda, N., Simon, J. I., and Keller, L. P., 2025, Mineralogical and Isotopic Constraints on Early, High-temperature Events and Reservoirs Recorded in the Interior of a Type B Ca–Al-rich Inclusion from the Reduced CV3 Chondrite Vigarano. *Geochimica et Cosmochimica Acta*, 404, 25–40
69. Harrison, T. M., Yamamoto, C. A., and **Liu, M.-C.**, 2025, Probing Cretaceous–Paleogene Crustal Thickness in Southern Tibet using Quartz–Zircon Chronobarometry. *Earth and Planetary Science Letters*, 663, 119413.
68. Schönbächler, and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2025, Zirconium Isotope Composition Indicates s-process Depletion in Samples Returned from Asteroid Ryugu. *Meteoritics and Planetary Sciences*, 60, 3–16
67. Pilorget, C., and 57 coauthors including **Liu, M.-C.**, 2024, Phosphorus-rich Grains in Ryugu Samples with Major Biochemical Potential. *Nature Astronomy*, 8, 1529–1535.
66. Weber, P. K., Debliqui, M., Defouilloy, C., Mayali, X., **Liu, M.-C.**, Hestrin, R., Pett-Ridge, J., Stuart, R., Morris, M., Ramon, C., Jorgens, D. M., Zalpuri, R., Arnoldi, L., Farcy, J., Saquet, N., Fichou, V. S., Renaud, L., and Thomen, A. 2024, The NanoSIMS-HR: the Next Generation of High Spatial Resolution Dynamic SIMS. *Analytical Chemistry*, 96, 19321–19329.
65. Verchovsky, A. B., and 34 coauthors including **Liu, M.-C.**, 2024, A Primordial Noble Gas Compo-

nent Discovered in the Ryugu Asteroid and Its Implications. *Nature Communications*, 15, 8075.

64. **Liu, M.-C.**, Mastuda, N., McKeegan, K. D., Dunham, E. T., and McCain, K. A. 2024, HIDALGO: A FUN Object from the Earliest Epoch of the Solar System's History. *Geochimica et Cosmochimica Acta*, 386, 48–62.
63. Yui, H. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2024, Pyrrhotites in Asteroid 162173 Ryugu: Records of the Initial Changes on Their Surfaces with Aqueous Alteration. *Geochimica et Cosmochimica Acta*, 379, 172–183.
62. Kita, N. T. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2024, Disequilibrium Oxygen Isotope Distribution Among Aqueously Altered Minerals in Ryugu Asteroid Returned Samples *Meteoritics and Planetary Sciences*, 59, 2097–2116.
61. Aléon, J. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2024, Hydrogen in Magnetite from Asteroid Ryugu. *Meteoritics and Planetary Sciences*, 59, 2058–2072.
60. Torrano, Z. A. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2024, Neodymium-142 Deficits and Samarium Neutron Stratigraphy of C-type Asteroid (162173) Ryugu. *Meteoritics and Planetary Sciences*, 59, 1966–1982.
59. Imae, N., and 26 coauthors including **Liu, M.-C.**, 2024, Mineralogical Approach on Laboratory Weathering of Uncontaminated Ryugu Particles: Comparison with Orgueil and perspective for storage and analysis. *Meteoritics and Planetary Sciences*, 59, 1705–1722
58. Greenwood, R. C., Findlay, R. M., Steele, R. C. J., Shaw, K. M. M., Morton, E., Savage, P. S., Murphy, M. E., Rehkampl, M., Franchi, I. A., Elliott, T., Suttle, M. D., King, A. J., Anand, M., Malley, J., Howard, K. T., Zhao, X., Johnson, D., **Liu, M.-C.**, McCain, K. A., Stephan, N. R., 2024, The Formation and Aqueous Alteration of CM2 Chondrites and Their Relationship to CO₃ Chondrites: A Fresh Isotopic (O, Cd, Cr, Si, Te, Ti, and Zn) Perspective from the Winchcombe CM2 Fall. *Meteoritics and Planetary Sciences*, 59, 1170–1193
57. Hu, Y., and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2024, Pervasive Aqueous Alteration in the Early Solar System Revealed by Potassium Isotopic Variations in Ryugu Samples and Carbonaceous Chondrites. *Icarus*, 409, 115884.
56. Barlow, E. V., House, C. H., **Liu, M.-C.**, Wetherington, M. T., and Van Kranendonk, M. J. 2024, Distinctive Microfossil Supports Early Paleoproterozoic Rise in Complex Cellular Organisation. *Geobiology*, 22, e12576.
55. Morita, M. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2024, Analysis of Cation Composition in Dolomites on the Intact Particles Sampled from Asteroid Ryugu. *Analytical Chemistry*, 96, 170–178.
54. Zhang, B., Lehnert, K. A., Rubin, A. E., McKeegan, K. D., Warren, P. H., Mays, J. L., Profeta, L. R., Johansson, A. K., Ni, P., Young, E. D., Kyte, F. T., **Liu, M.-C.**, Dunham, E. T., Tang, H., Ji, P. and Figueora-Salazar, J. D. The UCLA Cosmochemistry Database. *Scientific Data*, 10, 874.
53. Bizzarro, M. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2023, The Magnesium Isotope Composition of Samples Returned from Asteroid Ryugu. *The Astrophysical Journal Letters*, 958, L25.
52. Yokoyama, T. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2023, Water Circulation

in Ryugu Asteroid Affected the Distribution of Nucleosynthetic Isotope Anomalies in Returned Sample. *Science Advances*, 9, eadi7048.

51. Tang, H. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2023, The Oxygen Isotopic Composition of Samples Returned from Asteroid Ryugu with Implications for the Nature of the Parent Planetesimal. *The Planetary Science Journal*, 4, 144.
50. Fujiya, W. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2023, Carbonate Record of Temporal Change in Oxygen Fugacity and Gaseous Species in Asteroid Ryugu. *Nature Geosciences*, 16, 675–682.
49. Nguyen, A. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2023, Abundant Presolar Grains and Primordial Organics Preserved in Carbon-rich Exogenous Clasts in Asteroid Ryugu. *Science Advances*, 9, eadh1003.
48. Dunham, E. T., Sheikh, A., Opara, D., Matsuda, N., **Liu, M.-C.** and McKeegan, K. D. 2023, Calcium-aluminum-rich Inclusions in Non-carbonaceous Chondrites: Abundances, Sizes, and Mineralogy. *Meteoritics and Planetary Sciences*, <https://doi.org/10.1111/maps.13975>.
47. Tomioka, N., Yamaguchi, A., Ito, M., Uesugi, M., Imae, N., Shirai, N., Ohigashi, T., Kimura, M., **Liu, M.-C.**, and 31 coauthors, 2023, A History of Mild Shocks Experienced by the Regolith Particles on Hydrated Asteroid Ryugu. *Nature Astronomy*, 7, 669–677.
46. Piani, L. and Hayabusa2 initial analysis team including **Liu, M.-C.**, 2023, Hydrogen Isotopic Composition of Hydrous Minerals in Asteroid Ryugu. *The Astrophysical Journal Letters*, 946, L43.
45. Yamaguchi, A., Tomioka, N., Ito, M., Shirai, N., Kimura, M., Greenwood, R. C., **Liu, M.-C.**, and 27 coauthors, 2023, Insight into Multi-step Geological Evolution of C-type Asteroids from Ryugu Particles. *Nature Astronomy*, <https://doi.org/10.1038/s41550-023-01925-x>.
44. **Liu, M.-C.**, Chaussidon, M. and Matsuda, N. 2023, Lithium and Boron Isotopic Compositions of Olivine in Chondrules from Carbonaceous and Ordinary Chondrite Meteorites: Implications for the Origin of Solar $^{11}\text{B}/^{10}\text{B}$ ratio. *Geochimica et Cosmochimica Acta*, 341, 150–163.
43. McCain, K. A.[†], Matsuda, N.[†], **Liu, M.-C.**, et al. 2023, Early Fluid Activity on Ryugu Inferred by Isotopic Analyses of Carbonates and Magnetite. *Nature Astronomy*, 7, 309–317.
42. Paquet, M. and 123 coauthors including **Liu, M.-C.**, 2023, Contribution of Ryugu-like Material to Earth's Volatile Inventory by Cu and Zn Isotopic Analysis. *Nature Astronomy*, 7, 182–189.
41. Greenwood, R. C. and 41 coauthors including **Liu, M.-C.**, 2023, Oxygen Isotope Evidence from Ryugu Samples for Early Water Delivery to Earth by CI Chondrites. *Nature Astronomy*, 7, 29–38.
40. Cavole, L. M., Limburg, K. E., Gallo, N. D., Salvanes, A. G. V., Ramirez-Valdez, A., Levin, L. A., Oropeza, O. A., Hertwig, A., **Liu, M.-C.** and McKeegan, K. D. 2023, Otoliths of Marine Fishes Record Evidence of Low Oxygen, Temperature and pH Conditions of Deep Oxygen Minimum Zones. *Deep Sea Research Part I: Oceanographic Research Papers*, 191, 103941.
39. Kawasaki, N. and 139 coauthors including **Liu, M.-C.**, 2022, Oxygen Isotopes of Anhydrous Primary Minerals Show Kinship Between Asteroid Ryugu and Comet 81P/Wild2. *Science Advances*, 8, eade2067.
38. Hopp, T. and 139 coauthors including **Liu, M.-C.**, 2022, Ryugu's Nucleosynthetic Heritage from the Outskirts of the Solar System. *Science Advances*, 8, eadd8141.

37. **Liu, M.-C.** and 34 coauthors. 2022, Incorporation of ^{16}O -rich Anhydrous Silicates in the Protolith of Highly Hydrated Asteroid Ryugu. *Nature Astronomy*, 6, 1172–1177.
36. Ito, M. Tomioka, N., Uesugi, M., Yamaguchi, A., Shirai, N., Ohigashi, T., **Liu, M.-C.**, et al, 2022, A Pristine Record of Outer Solar System Materials from Asteroid Ryugu's Returned Sample. *Nature Astronomy*, 6, 1163–1171.
35. Barosh, J. and 123 coauthors including **Liu, M.-C.**, 2022, Presolar Stardust in Asteroid Ryugu. *The Astrophysical Journal Letters*, 935, L3.
34. Moynier, F. and 93 coauthors including **Liu, M.-C.**, 2022, The Solar System Calcium Isotopic Composition Inferred from Ryugu Samples. *Geochemical Perspectives Letters*, 24, 1–6.
33. Yokoyama, T. and 139 coauthors including **Liu, M.-C.**, 2022, Samples Returned from the Asteroid Ryugu are Similar to Ivuna-type Carbonaceous Meteorites. *Science*, 379, eabn7850.
32. Dunham, E. T., Wadhwa, M., Desch, S. J., **Liu, M.-C.**, Fujimoto, Y., Fukuda, K., Kita, N., Hertwig, A. T., Hervig, R. L., Defouilloy, C., Simon, S. B., Davidson, J. and Schrader, D. L. 2022, Uniform $^{10}\text{Be}/^9\text{Be}$ in CAIs: Implications for a Molecular Cloud Origin of ^{10}Be and the Sun's Birth Environment. *Geochimica et Cosmochimica Acta*, 324, 194–220.
31. Bekaert, D. V., Auro, M., Shollenberger, Q. R., **Liu, M.-C.**, Marschall, H., Burton, K., Jacobsen, B., Brennecka, G. A., MacPherson, G. J., von Mutius, R., Sarafian, A. and Nielsen, S. G. 2021, Fossil Records of Early Solar Irradiation and Cosmolocation of the CAI Factory: A Reappraisal. *Science Advances*, eabg8329.
30. Idrisova, E., Gabitov, R., Karamov, T., Voropaev, A., **Liu, M.-C.**, Bogdanovich, N. and Spasennykh, M. 2021, Pyrite Morphology and $\delta^{34}\text{S}$ as Indicators of Deposition Environment in Organic-Rich Shales. *Geosciences*, 11, 355.
29. Osterhout, J. T., Schopf, J. W., Williford, K. H., McKeegan, K. D., Kudryavstev, A. B. and **Liu, M.-C.** 2021, Carbon Isotopes of Proterozoic Filamentous Microfossils: SIMS Analyses of Ancient Cyanobacteria from Two Disparate Shallow-marine Cherts. *Geomicrobiology Journal*, 38, 719–731.
28. Matsumoto, Y., Hasegawa, Y., Matsuda, N. and **Liu, M.-C.** 2021, Formation of Rims Around Chondrules via Porous Aggregate Accretion. *Icarus*, 367, 114538.
27. Zhang, Z., Dauphas, N., Nie, N. X., Mendybaev, R. A., **Liu, M.-C.**, Hu, J., Hopp, T. and McKeegan, K. D. 2021, Kinetics and Isotopic Fractionations of K and Rb during Diffusion-Limited Evaporation from Molten Silicate: Theory and Experiments. *ACS Earth and Space Chemistry*, 5, 755–784.
26. Hertwig, A. T.[†], **Liu, M.-C.**, Simon, S. B. and Brearley, A. J. 2021, Petrographic and Isotopic Investigations of Two Unusual Ca-Al-rich Inclusions from Primitive CO3 Chondrites. *Geochimica et Cosmochimica Acta*, 296, 75-96.
25. McCain, K. A.[†], **Liu, M.-C.**, and McKeegan, K. D. 2020, Calibration of Matrix-Dependent Biases in Isotope and Trace Element Analyses of Carbonate Minerals. *Journal of Vacuum Science & Technology B*, 38, 044005.
24. Borrelli, C., Gabitov, R., **Liu, M.-C.**, Hertwig, A. T. and Panieri, G. 2020, The Benthic Foraminiferal $\delta^{34}\text{S}$ Records Intensity and Timing of Paleo Methane Fluxes. *Scientific Reports*, 10, 1304 .
23. Han, J., Keller, L. P., **Liu, M.-C.**, Needham, A. W., Hertwig, A. T., Messenger, S. and Simon, J. I. 2020, A Coordinated Microstructural and Isotopic Study of a Work-Lovering Rim on a Vigarano

CAI. *Geochimica et Cosmochimica Acta*, 269, 639-660.

22. Han, J., Jacobsen, B., **Liu, M.-C.**, Brearley, A. J. and Matzel, J. E. 2019, Origin of ^{16}O -rich fine-grained Ca-Al-rich Inclusions of Different Mineralogy and Texture. *Geochemistry*, 79, 125543.
21. **Liu, M.-C.**, Han, J., Brearley, A. J. and Hertwig, A. T. 2019 Aluminum-26 Chronology of Dust Coagulation and Early Solar System Evolution. *Science Advances*, eaaw3350.
20. Schmitt, A. K., **Liu, M.-C.** and Kohl, I. E. 2019 Sensitive and Rapid Oxygen Isotopic Analysis of Nephrite Jade Using Large-Geometry SIMS. *Journal of Analytical Atomic Spectrometry*, 34, 561–569.
19. Trail, D., Boehnke, P., Savage, P. S., **Liu, M.-C.**, Miller, M. L. and Binderman, I. 2018 Origin and Significance of Si and O Isotope Heterogeneities in Phanerozoic, Archean and Hadean Zircon. *Proceedings of the National Academy of Sciences*, 115, 10287–10292.
18. Dottin III, J. W., Labidi, J., Farquhar, J., Piccoli, P., **Liu, M.-C.** and McKeegan, K. D.. 2018 Evidence for Oxidation at the Base of the Nakhilite Pile by Reduction of Sulfate Salts at the Time of Lava Emplacement. *Geochimica et Cosmochimica Acta*, 239, 186–197
17. **Liu, M.-C.**, McKeegan, K. D., Harrison, T. M., Jarzebinski, G., and Vltava, L. 2018, The Hyperion-II Radio-Frequency Oxygen Ion Source on the UCLA IMS1290 Ion Microprobe: Beam Characterization and Applications in Geochemistry and Cosmochemistry. *International Journal of Mass Spectrometry*, 424C, 1–9
16. Grayburn, R., Voras, Z., Goodwin, C., **Liu, M.-C.**, Beebe, T. and Phenix, A. 2017, Ion Probe Techniques to Measure the Distribution of Substrate Elements in Coatings for Copper Alloys. *Progress in Organic Coatings*, 111, 267–272
15. Oehler, D. Z., Walsh, M. M., Sugitani, K., **Liu, M.-C.** and House, C. H. 2017, Significance of Large and Robust, Lenticular Microorganisms on the Young Earth. *Precambrian Research*, 296, 112–119
14. Isa, J., Kohl, I. E., **Liu, M.-C.**, Wasson, J. T., Young, E. D., and McKeegan, K. D. 2017, Quantification of Oxygen Isotope SIMS Matrix Effects in Olivine Samples: Correlation and Sputter Rate. *Chemical Geology*, 458, 14–21
13. Tang, H., **Liu, M.-C.**, McKeegan, K. D., Tissot, F. L. H. and Dauphas, N. 2017, In situ Isotopic Studies of the U-depleted Allende CAI *Curious Marie*: Pre-accretionary Alteration and the Co-existence of ^{26}Al and ^{36}Cl in the Early Solar Nebula. *Geochimica et Cosmochimica Acta*, 207, 1–18
12. **Liu, M.-C.** 2017, The Initial $^{41}\text{Ca}/^{40}\text{Ca}$ Ratios in Two Type A Ca-Al-rich Inclusions: Implications For the Origin of Short-lived ^{41}Ca . *Geochimica et Cosmochimica Acta*, 201, 123–135
11. Hirashita, H., Asano, R., Nozawa, T., Li, Z.-Y., and **Liu, M.-C.** 2014, Dense Molecular Cloud Cores as a Source of Micrometer-sized Grains in Galaxies. *Planetary and Space Sciences*, 100, 40–45.
10. **Liu, M.-C.** 2014, On the Injection of Shortest-Lived Radionuclides From a Supernova Into the Solar Nebula: Constraints From the Oxygen Isotopes. *The Astrophysical Journal Letters*, 781, L28.
9. **Liu, M.-C.**, Chaussidon, M., Srinivasan, G., and McKeegan, K. D. 2012, A Lower Initial Abundance of Short-lived ^{41}Ca in the Early Solar System and Its Implications for Solar System Formation. *The Astrophysical Journal*, 761, 137.
8. **Liu, M.-C.** 2012, Short-lived Radionuclides in the Early Solar System. *AIP Conference Proceed-*

ings, 1484, 52–56.

7. **Liu, M.-C.**, Chaussidon, M., Göpel, C., and Lee, T. 2012, A Heterogeneous Solar Nebula as Sampled by CM Hibonite. *Earth Planetary Science Letters*, 327, 75–83.
6. **Liu, M.-C.**, Nittler, L. R., Alexander, C. M. O'D., and Lee, T. 2011, Protosolar Irradiation in the Early Solar System: Clues from Lithium and Boron Isotopes. *Proceedings of Nuclei in the Cosmos XI*, PoS(NIC XI)145.
5. **Liu, M.-C.**, Nittler, L. R., Alexander, C. M. O'D., and Lee, T. 2010, Lithium-Beryllium-Boron Isotopic Compositions in Meteoritic Hibonite: Implications for Origin of ^{10}Be and Early Solar System Irradiation. *The Astrophysical Journal Letters*, 719, L99–L103.
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2. McKeegan, K. D. and 46 co-authors including **Liu, M.-C.** 2006, Isotopic Compositions of Cometary Matter Returned by Stardust. *Science*, 314, 1724–1728.
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1. **Liu, M.-C.**, Ito, M., Tomioka, N., Noguchi, T., Yamada, Y. and McCain, K. A. 2025, The Sun Has an Earth-like Carbon Isotopic Composition. *Nature Astronomy*, (*in revision*)

Invited Presentations

- Arizona State University, Nov 2025
- CAMECA , May 2025
- Stanford University, Apr 2023
- Lawrence Livermore National Laboratory, Nov 2021
- Kochi Core Research Institute, JAMSTEC, Mar 2021
- Arizona State University, May 2020
- TSMC, Jan 2020
- Osaka University, Oct 2019
- University of California, Santa Cruz, May 2019
- Session on Boron Isotope Geochemistry at the Goldschmidt Conference, MA, Aug 2018
- University of Tokyo, June 2018
- University of Arizona, Feb 2018
- Korea Basic Science Institute, Korea, Jan 2018

- Lawrence Livermore National Laboratory, Jan 2018
- Lunar and Planetary Institute, Sept 2016
- Institut de Physique du Globe de Paris, Feb 2014
- Kochi Core Research Institute, JAMSTEC, Dec 2013
- ROCKS Workshop in Kona, Hawaii, Apr 2013
- Workshop on Cosmochemical Perspective on the Early Evolution of the Solar System, Hokkaido University, Feb 2013
- Kochi Core Research Institute, JAMSTEC, Oct 2012
- National Taiwan University, Sept 2012
- University of California, Los Angeles, Apr 2012
- The University of Chicago, Apr 2012
- Biennial Geochemical SIMS Workshop in Honolulu, Nov 2011
- Planetary Science Institute, Aug 2011
- Workshop on Material Circulation in the Early Solar System, Hokkaido University, May 2011
- 8th International Symposium on Atomic Level Characterizations for New Materials and Devices in Seoul, May 2011
- National Central University, Taiwan, Dec 2010
- Academia Sinica, Taiwan, Dec 2010
- Muséum National d'Histoire Naturelle, Paris, Nov 2010.
- SIMS Workshop, Academia Sinica, Taiwan, Nov. 2009.
- Carnegie Institution of Washington, Nov 2008.
- Muséum National d'Histoire Naturelle, Paris, Mar 2008

Computer Skills

- Programming: Proficient in MATLAB for scientific programming and data analysis.
- Software Development: Developed a complete data reduction and analysis package in MATLAB for the CAMECA IMS 1290 ion microprobe. This software processes raw instrument output into final, calibrated isotopic and elemental data products, forming a critical part of the scientific data pipeline.

Miscellaneous Experiences

Secondary Lieutenant of Political Warfare, Army, Taiwan, R.O.C., Oct 2001 – Jun 2003

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