

JEEHYUN YANG

Postdoctoral Scholar

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Department of Astronomy and Astrophysics, The University of Chicago

RESEARCH INTERESTS

Exoplanet and Planetary Atmosphere Modeling and Characterization

Chemical Reaction Kinetics

Polycyclic Aromatic Hydrocarbon (PAH) Chemistry

Archean Earth's Atmosphere and the Great Oxidation Event (GOE)

Atmospheric engineering of Martian and Venusian atmospheres

Habitable worlds and Origins of life

EMPLOYMENTS

The University of Chicago

Chicago, IL, USA

Postdoctoral Scholar | Department of Astronomy & Astrophysics

2025–present

Advisor: Prof. Eliza M.-R. Kempton

California Institute of Technology

Pasadena, CA, USA

Staff Scientist | Division of Geological and Planetary Sciences

2025

Advisor: Prof. Yuk L. Yung

Jet Propulsion Laboratory

Pasadena, CA, USA

JPL Postdoctoral Fellow | Planetary Sciences Section

2022 - 2025

Advisor: Dr. Murthy S. Gudipati & Dr. Renyu Hu

EDUCATION

Massachusetts Institute of Technology

Cambridge, MA, USA

Ph.D. in *Physical Chemistry* | Department of Chemical Engineering

2022

Thesis: Experiment and modeling combined kinetic study of bottom-up polycyclic aromatic hydrocarbon formations

Advisor: Prof. William H. Green Jr.

Hokkaido University

Sapporo, Hokkaido, Japan

B.E. in *Sustainable Resources Engineering* | School of Engineering

2016

Thesis: Experimental study for understanding hydrothermal alteration of iron and chromium oxides using a flow-through system

Advisor: Prof. Tsubasa Otake

GRANTS AND COMPETITIVE OBSERVATION PROGRAMS

(Co-I) *Efficient and Detailed Characterization of a Temperate Water World Candidate*

Program: *James Webb Space Telescope (JWST)* Cycle 3 GO 4711

Principal Investigator: Dr. Renyu Hu

(Co-I) *Detailed Atmospheric Characterization of a Unique Low-Temperature Exo-Saturn*
Program: *James Webb Space Telescope (JWST)* Cycle 3 GO 5177
Principal Investigator: Dr. Renyu Hu

(Co-I) *Probing the volcanic outgassing activity of a warm sub-Earth planet*
Program: *James Webb Space Telescope (JWST)* Cycle 2 GO 3942
Principal Investigator: Dr. Mario Damiano

PUBLICATIONS

21 refereed publications; 9 first-author; 2 second-author ; 2 papers under review

2026

23. **Yang J**, Nagpal V, Zhang M, Xue Q, *et al.*, Photochemical Production of CS₂ in Temperate-to-Warm Gas Giant Exoplanet Atmospheres *ApJL* *in press*, 2026
22. Zhang M, Xue Q, **Yang J**, Nagpal V, *et al.*, C, N, O, S, and photochemistry in a temperate giant planet orbiting a late M dwarf *ApJL* *in press*, 2026
21. Baeyens R, Moses JI, Jasmina Blečić, *et al.*, including **Yang J**, Phase-dependent chemistry of WASP-43 b revealed with a suite of one-, two-, and three-dimensional models *A&A* *in press*, 2026
20. **Yang J**, Kempton EMR, Savel AB. Sub-neptunes as soot factories: Deep atmosphere hydrocarbon formation and quenching as the origin of sub-Neptune aerosol trends, *ApJL*, 2026, 1003, L16
19. **Yang J**, Adams DJ, Hu R, Yung YL. Novel chemical pathways for the formation of nucleobase precursors via benzene π -bond addition to HCN, *Icarus*, 2026, 456, 117134
18. Ghosh P, Rani N, **Yang J**, Willacy K, Rimmer PB, and Majumdar L. A comprehensive sulfur chemistry network with excited S(¹D) and SO(¹ Δ), *ApJ*, 2025, 1004, 160
17. Bello-Arufe A, Hu R, Zilinskas M, **Yang J**, *et al.* Methane on the temperate exo-Saturn TOI-199 b, *AJ*, 2026, 171, 354
16. **Yang J**, Hyder A, Hu R, Lunine JI. Coupled 1D chemical kinetic–transport and 2D hydrodynamic modeling supports a modest 1–1.5 $\times$ supersolar oxygen abundance in Jupiter’s atmosphere *PSJ*, 2026, 7, 2

2025

15. Hu R, **Yang J**, *et al.* A water-rich interior in the temperate sub-Neptune K2-18 b revealed by JWST *in revision at ApJ*, 2025
14. **Yang J**, Yung YL. A building block approach to Gibbs free energy trends in organic compounds detected in asteroid Bennu *Astrobiology*, 2025, 25, 12, 855–860
13. Oza A, Gebek A, zu Westram MM *et al.*, including **Yang J**, Volcanic satellites tidally venting Na, K, SO₂ in Optical & Infrared Light *MNRAS*, 2025, 546, 1
12. Bello-Arufe A, Damian M, Bennet K *et al.* including **Yang J**, A volcanic atmosphere on the sub-Earth L 98-59 b *ApJL*, 2025, 980, L26

2024

11. **Yang J**, Hu R. Chemical mapping of temperate sub-Neptune atmospheres: Constraining the deep-interior H₂O/H₂ using the atmospheric CO₂/CH₄ *ApJL*, 2024, 971, L48
10. Damiano M, Bello-Arufe A, **Yang J**, Hu R. LHS 1140 b is potentially habitable world *ApJL*, 2024, 968, L22

9. Benneke B, Roy P-A, Coulomb L-P *et al.*, including **Yang J**, JWST reveals CH₄, CO₂, and H₂O in a metal-rich miscible atmosphere on a two-Earth-radius exoplanet *in revision at ApJL*, 2024
8. **Yang J**, Hu R. Automated chemical reaction network generation and its application to exoplanet atmospheres *ApJ*, 2024, 966, 2, 189
7. Powell D, Feinstein AD, Lee EKH *et al.*, including **Yang J**, Detection of SO₂ in the mid-infrared transmission spectrum of WASP-39b *Nature*, 2024, 626, 979–983

2023

6. Tsai S-M, Lee EKH, Powell D, *et al.*, including **Yang J**, Photochemically-produced SO₂ in the atmosphere of WASP-39b *Nature*, 2023, 617, 483–487
5. **Yang J**, Gudipati MS, Henderson BL, Fleury B. High-fidelity reaction kinetic modeling of hot-Jupiter atmospheres incorporating thermal and UV-photochemistry enhanced by metastable CO (a³Π) *ApJ*, 2023, 947, 1, 26

2022

4. Ohmoto Y., **Yang J**, Nishikata M *et al.* Low-temperature hydrothermal synthesis of chromian spinel from Fe-Cr hydroxides using a flow-through reactor *Minerals*, 2022, 12, 9, 1110

2021

3. **Yang J**, Smith MC, Prendergast BM, Chu T-C, Green WH. C₁₄H₁₀ Polycyclic aromatic hydrocarbons formation by acetylene addition to naphthalenyl radicals observed *Phys. Chem. Chem. Phys.*, 2021, 23, 14325–14339

2020

2. Chu T-C, Smith MC, **Yang J**, Liu M, Green WH. Theoretical study on the HACA chemistry of naphthalenyl radicals and acetylene: the formation of C₁₂H₈, C₁₄H₈, and C₁₄H₁₀ species *Int. J. Chem. Kinet.*, 2020, 52, 11, 752–768
1. Smith MC, Liu G, Buras ZJ, Chu T-C, **Yang J** and Green WH. Direct measurement of radical-catalyzed C₆H₆ formation from acetylene and validation of theoretical rate coefficients for C₂H₃+C₂H₂ and C₄H₅ + C₂H₂ reactions *J. Phys. Chem. A*, 2020, 124, 14, 2871–2884

INVITED TALKS

(Seminar) Northwestern University, Evanston, IL, Observational Astronomy Meetings	2026
(Webinar) Max Planck Institute for Astronomy, Heidelberg, Germany, Exocoffee	2026
(Seminar) Ulsan National Institute of Science and Technology, Korea, Department of Physics	2026
(Seminar) The Ohio State University, Columbus, OH, Exoplanet Group Meeting	2026
(Seminar) The Pennsylvania State University, University Park, PA, CEWH Seminar	2026
(Seminar) Purdue University, West Lafayette, IN, Planetary Seminar	2026
(Seminar) Argonne National Laboratory, Lemont, IL, CSE Seminar	2025
(Webinar) Korea Aerospace Research Institute, Korea, KARI SES Seminar Series	2025
(Symposium) Hokkaido University, Japan, The 8 th ICRDD International Symposium	2024
(Seminar) National Astronomical Observatory of Japan, Japan, NAOJ Planet Seminar	2024
(Colloquium) Kyung Hee University, Korea, Department of Astronomy and Space Science	2024

(Colloquium)	Korea Astronomy and Space Science Institute, Korea	2024
(Seminar)	Boston University, Boston, MA , Planet Lunch Seminar	2024
(Seminar)	Massachusetts Institute of Technology, Cambridge, MA , Planetary Lunch Seminar	2024
(Seminar)	University of Maryland, College Park, MD, PALS seminar	2024
(Seminar)	Columbia University, New York, NY, Astronomy and Astrophysics Department	2024
(Seminar)	Princeton University, Princeton, NJ , Exoplanet Discussion Group	2024
(Seminar)	California Institute of Technology, Pasadena, CA, Yuk Lunch Seminar	2024
(Webinar)	The University of Arizona, Tucson, AZ, Prof. Sukrit Ranjan group seminar	2024
(Seminar)	California Institute of Technology, Pasadena, CA, Yuk Lunch Seminar	2023
(Webinar)	California Institute of Technology, Pasadena, CA, Yuk Lunch Seminar	2021

CONFERENCES

Yang J, Zhang M, Xue, Q, Vighnesh N, *et al.* A new molecule on a temperate giant orbiting a late M dwarf **Oral presentation** at *Exoplanets 6*, Porto, Portugal, July 2026

Yang J, Savel AB, Kempton, EMR. Explaining Sub-Neptune Aerosol Trends with Deep Interior PAH Formation **Oral presentation** at *11th AAS Topical Conference Series Exoplanet Atmospheres*, Denver, Colorado, USA, March 2026

Yang J, Hu R. Water-rich Sub-Neptune Interiors and Abiotic Organosulfur Formation: Evidence from K2-18 b JWST Observations **Poster presentation** at *The Great Lakes Exoplanet Area Meeting*, The University of Wisconsin-Madison, Wisconsin, USA, November 2025

Yang J, Adams DJ, Hu R, Yung YL. Novel Chemical Pathways for the Formation of Nucleotide Base Precursors via Benzene π -Bond Addition to HCN **Poster presentation** at *The Origins Federation Third Annual Origins of Life Conference*, The University of Chicago, Illinois, USA, September 2025

Yang J. Atmospheric CO₂/CH₄ as a probe of deep H₂O/H₂ in sub-Neptunes: Evidence from K2-18 b and abiotic organosulfur chemistry **Oral presentation** at *From Transits to Trends: the Next Decade of Long-Period Exoplanets*, University of New Mexico, New Mexico, USA, August 2025

Yang J, Hu R. Constraining the deep-interior H₂O/H₂ of temperate sub-Neptune exoplanets using the atmospheric CO₂/CH₄ observation **Oral presentation** at *The 245rd Meeting of the American Astronomical Society*, National Harbor, Maryland, USA, January 2025

Yang J, Hu R. Automated chemical reaction network generation and its application to exoplanet atmospheres **Oral presentation** at *The 3rd Boston Area Planetary Science Meeting*, Cambridge, Massachusetts, USA, September 2024

Yang J, Kite ES, Mao C, Kerber L, Hu R. Vertical Ozone Distribution in an Oxygen-Rich Scenario of Martian Atmosphere: Insights from One-Dimensional Photochemical Modeling **Poster presentation** at *The Tenth International Conference on Mars*, Pasadena, California, USA, July 2024

Yang J, Hu R. Automated chemical reaction network generation and its application to exoplanet atmosphere **Oral presentation** at *The 243rd Meeting of the American Astronomical Society*, New Orleans, Louisiana, USA, January 2024

Yang J, Hu R. Automated chemical reaction network generation and its application to exoplanet atmospheres **Poster presentation** at *Exoclimes VI*, University of Exeter, UK, June 2023

Yang J, Gudipati MS, Henderson BL, Fleury B. Metastable CO($a^3\Pi$)-aided photochemistry in H₂- or N₂-dominated exoplanet atmospheres **Oral presentation** at *The 242nd Annual Meeting of the American Astronomical Society*, Albuquerque, New Mexico, USA, June 2023

Yang J, Smith MC, Chu T-C, Green WH. Experimental Investigation of Naphthyl radical Hydrogen Abstraction Acetylene Addition (HACA) Mechanism **Oral presentation** at *American Chemical Society Virtual National Fall Meeting and Expo*, Virtual, August 2020

Yang J, Smith MC, Chu T-C, Green WH. Experimental Investigation of Naphthyl radical Hydrogen Abstraction Acetylene Addition (HACA) Mechanism **Oral presentation** at *38th Northeast Regional Meeting on Kinetics and Dynamics*, Cambridge, Massachusetts, USA, January 2020

Yang J, Hull A, Field R, Ono S. Mass Independent Sulfur Isotope Fractionation during Elemental Sulfur Photolysis **Poster presentation** at *2018 Goldschmidt Conference*, Boston, Massachusetts, USA, August 2018

Yang J, Hull A, Field R, Ono S. Mass Independent Sulfur Isotope Fractionation during Carbonyl Sulfide Photolysis **Oral presentation** at *2018 International Symposium on isotopomers*, Baton Rouge, Louisiana, USA, March 2018

Otake T, **Yang J**, Ohtomo Y, Sato T. Experimental study for the Formation of Chromian Spinel under Low-Temperature Hydrothermal Conditions using a Flow-Through Apparatus **Oral presentation** at *2016 The Geochemical Society of Japan*, Osaka City University, Japan, Sep 2016

Yang J, Otake T, Sato T. Experimental Study to Understand the Hydrothermal Alteration of Iron and Chromium Hydroxides in a Flow-Through System **Oral presentation** at *2016, Goldschmidt Conference* Yokohama, Japan, June 2016

PROFESSIONAL SERVICES

External Reviewer for <i>JWST</i> Cycle 3, 4 GO & AR	2023–2024
Peer-review Referee for <i>JPCA</i> , <i>A&A</i> , <i>JGR: Atmospheres</i> , <i>PSJ</i> , <i>ApJ</i> , <i>ApJL</i>	2021–present

ADVISING EXPERIENCE

(Graduate) Jingyu Wang (UA)	2025
(Graduate) Rahul Arora (UA)	2025
(Undergraduate) Claire Mao (MIT)	2024
(Undergraduate) Calden Ball (SBU)	2022

HONORS, AWARDS AND SPECIAL ACTIVITIES

2019 OTEFE Award (\$2,000). Opportunity to Earn Future Education Scholarship, USA	2019
Whiteman Fellowship, Massachusetts Institute of Technology, USA	2017-18
MIT Presidential Fellowship, Massachusetts Institute of Technology, USA	2016-17
Valedictorian, School of Engineering, Hokkaido University, Japan	2016
William Wheeler Prize (The highest honor in the department), Hokkaido University, Japan	2016
Nitobe Award (\$2,000). Hokkaido University, Japan	2011
10 th Korea-Japan Joint Government Scholarship (Full tuition fee + \$1,000/month)	2009-13, 2015-16

TEACHING EXPERIENCE

University of Texas, El Paso	El Paso, TX, USA
<i>Guest Lecturer</i>	2026

- GEOL 1314 Introduction to Historical Geology

Massachusetts Institute of Technology

Teaching Assistant

Cambridge, MA, USA

2019-2020

- 12.335 / 12.835 Experimental Atmospheric Chemistry

Hokkaido University

Teaching Assistant

Sapporo, Hokkaido, Japan

2015-2016

- Construction and interpretation of the topographic and geological map

Hokkaido University

Temporary Lecturer

Sapporo, Hokkaido, Japan

2015-2016

- General Physics
- General Chemistry

MAINTENANCE AND OPERATION OF THE DEVICES

Time-of-flight Mass Spectrometry

Isotope-Ratio Mass Spectrometry

Quadrupole Mass Spectrometry

Two-dimensional Gas Chromatography-Mass Spectrometry

Fourier Transform Infrared Radiation

Laser Spectroscopy using Nd: YAG laser and diode laser

High-temperature and ultra-high vacuum technique

Automation of temperature and pressure-controlling system