JEEHYUN YANG

Staff Scientist
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Division of Geology and Planetary Sciences, California Institute of Technology

RESEARCH INTERESTS

Cross-disciplinary characterization of exoplanet atmospheres

Laboratory studies of the evolution of (exo)planetary atmospheres

The evolution of Archean Earth's atmosphere

Atmospheric engineering of Martian and Venusian atmospheres

Search for habitable worlds and origin of life

Sulfur photochemistry and its application to planetary atmospheres

EMPLOYMENTS

California Institute of Technology *Pasadena, CA, USA*
Staff Scientist 2025 - Present

Jet Propulsion Laboratory/California Institute of Technolgoy *Pasadena, CA, USA*
JPL Postdoctoral Fellow 2022 - 2025

EDUCATION

Massachusetts Institute of Technology *Cambridge, MA, USA*
Ph.D. in Physical Chemistry 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 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**) *Probing the volcanic outgassing activity of a warm sub-Earth planet*
Program: *James Webb Space Telescope (JWST)* Cycle 2 Guest observers Program 3942
Principal Investigator: Dr. Mario Damiano

(**Co-I**) *Efficient and Detailed Characterization of a Temperate Water World Candidate*
Program: *James Webb Space Telescope (JWST)* Cycle 3 Guest observers Program 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 Guest observers Program 5177
Principal Investigator: Dr. Renyu Hu

PUBLICATIONS

11 refereed publications; 4 first-author papers; 2 submitted paper

13. A. Oza, A. Gebek, M. M. zu Westram, *et al.*, including **Yang J**, Volcanic Satellites Tidally Venting Na, K, SO_2 in Optical & Infrared Light. *submitted to MNRAS*

12. Bello-Arufe A., Damian M., Bennet K., Hu R., MacDonald L., Welbanks L., Seligman D., Sing D., Tokadjian A., Oza A., **Yang J**, A volcanic atmosphere on the sub-Earth L 98-59 b. *ApJL in press*

11. **Yang J**, Hu R. Chemical mapping of temperate sub-Neptune atmospheres: Constraining the deep-interior H_2O/H_2 using the atmospheric CO_2/CH_4. *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 CH_4, CO_2, and H_2O in a Metal-rich Miscible Atmosphere on a Two-Earth-Radius Exoplanet. *Under review in 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 SO_2 in the Mid-Infrared Transmission Spectrum of WASP-39b. *Nature*, 2024, 626, 979–983

6. Tsai S-M, Lee EKH, Powell D, *et al.*, including **Yang J**, Photochemically-produced SO_2 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 ($a^3\Pi$). *ApJ*, 2023, 947, 1, 26

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

3. **Yang J**, Smith MC, Prendergast BM, Chu T-C, Green WH. $C_{14}H_{10}$ Polycyclic Aromatic Hydrocarbons Formation by Acetylene Addition to Naphthalenyl Radicals Observed. *Phys. Chem. Chem. Phys.*, 2021, 23, 14325–14339

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 $C_{12}H_8$, $C_{14}H_8$, and $C_{14}H_{10}$ 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 C_6H_6 Formation from Acetylene and Validation of Theoretical Rate Coefficients for C_2H_3+C_2H_2 and C_4H_5 + C_2H_2 Reactions, *J. Phys. Chem. A*, 2020, 124, 14, 2871–2884

INVITED TALKS

(Symposium) Hokkaido University, Japan, The 8th ICReDD 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, 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 H_2- or N_2-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, Lousiana, 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*, *Goldchmidt Conference* Yokohama, Japan, June 2016

PROFESSIONAL SERVICES

External Reviewer for *JWST* Cycle 3 GO & AR 2023

Peer-review Referee for *JPCA, A&A, JGR: Atmospheres, ApJ, ApJL* 2021–present

ADVISING EXPERIENCE

(Graduate) Sihe Chen (Caltech) 2024

(Undergraduate) Claire Mao (MIT) 2024

(Undergraduate) Calden Ball (Stony Brook University) 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

10th Korea-Japan Joint Government Scholarship (Tuition fee + $1,000/ month) 2009-13, 2015-16

TEACHING EXPERIENCE

Massachusetts Institute of Technology Cambridge, MA, USA
Teaching Assistant *2019-2020*

· 12.335 / 12.835 Experimental Atmospheric Chemistry

Hokkaido University Sapporo, Hokkaido, Japan
Teaching Assistant *2015-2016*

· General Physics
· General Chemistry
· Construction and interpretation of the topographic and geological map

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