

Dr. Renyu Hu

Jet Propulsion Laboratory
4800 Oak Grove Dr., MS 169-237
Pasadena, CA 91109, USA

Curriculum Vitae

1 (818) 281 9459
renyu.hu@jpl.nasa.gov
<https://renyuplanet.github.io/>

EMPLOYMENT

2023- Scientist V, NASA Jet Propulsion Laboratory
2019-23 Scientist IV, NASA Jet Propulsion Laboratory
2015-19 Scientist III, NASA Jet Propulsion Laboratory
2013-15 Hubble Fellow, NASA Jet Propulsion Laboratory

EDUCATION

2013 Ph.D., Planetary Sciences, Massachusetts Institute of Technology
 "Atmospheric Photochemistry, Surface Features, and Potential Biosignature Gases of Terrestrial Exoplanets," Advisor: Sara Seager
2009 M.S., Astrophysics, Tsinghua University
2009 Diplôme d'Ingénieur (French Engineer's Degree), École Centrale Paris
2007 B.S., Mathematics and Physics, Tsinghua University

RESEARCH INTERESTS

Characterization of atmospheres, surfaces, and geologic histories of rocky exoplanets.
Characterization of low-temperature exoplanets from Earth-sized to Jupiter-sized.
Atmospheric physics and chemistry in a wide range of planetary environments.
Atmospheric evolution of Mars and other rocky planets and exoplanets. Search for potentially habitable planets and biosignatures. Gas and aqueous phase chemical kinetics.
Starshade and advanced space instrumentation.

SELECTED AWARDS

2024 JPL Team Award for significant contributions to the Habitable Worlds Observatory
2023 Scialog Fellow, Research Corporation for Science Advancement
2021 JPL Edward Stone Award for outstanding research publication
2020 NASA Early Career Public Achievement Medal
2019 NASA Group Achievement Award for astrophysics large mission studies
2017 JPL Voyager Award for individual achievement
2013-15 NASA Hubble Fellowship
2011-13 NASA Earth and Space Science Fellowship
2012 Barrett Prize, Massachusetts Institute of Technology
2009 Presidential Fellowship, Massachusetts Institute of Technology
2009 Best Master Dissertation, Tsinghua University
2009 Wu You-Xun Prize, Tsinghua University

SPACE MISSION & LEADERSHIP EXPERIENCE

- 2024- **Co-founder**, NASA Study Analysis Group (SAG26) on exoplanet reflectance spectroscopy for the Habitable Worlds Observatory (HWO)
- Initiate and lead the community study to compare and converge on the practices of the simulation and retrieval of the exoplanet reflectance spectra, with a focus on terrestrial exoplanets relevant to HWO
- 2023- **Member**, NASA Science, Technology, Architecture Review Team (START) for HWO
- Chartered to quantify the science objectives and inform the technology maturation program of HWO
 - **Co-chair** of the “Characterizing Exoplanets” working group (>300 participating scientists, lead the steering committee, oversee the development of 7 key science cases on characterizing exoplanets)
 - **Steering Committee** of the “Exoplanet Science Yield” working group
- 2022- **Principal Investigator**, JPL Strategic Initiative for scientific optimization of missions
- Lead a team of 7 staff scientists and additional postdocs and students to optimize the spectroscopic measurements for HWO
- 2024 **Group Supervisor**, JPL Exoplanet Discovery and Science Group
- Organized and coordinated the science activities of 16 staff scientists and 6 postdocs. Provided personnel management
- 2018-24 **Starshade Scientist**, NASA Exoplanet Exploration Program
- Provided project science leadership to the Starshade Technology Development to TRL-5 (S5) project and managed a national-level and community-facing science and industry partnership program
 - Led a team of 6 JPL scientists and engineers to develop and conduct the Starshade Exoplanet Data Challenge, and managed the acquisition of two external participating teams through a proposal process
- 2022- **Collaborator**, Ultraviolet Explorer (UVEX), a Medium-Class Explorer (MIDEX) mission in Phase B
- 2022-23 **Exoplanet Science Lead**, JPL Uranus flagship mission concept team
- **Co-chair** of the exoplanet working group (>10 external subject matter experts, oversee the development of two key science cases at the intersection between the explorations of Uranus and exoplanets)
- 2017-21 **Atmospheric Science Lead**, Starshade Rendezvous Probe concept study and Roman Space Telescope starshade accommodation study
- 2021-23 **Member**, Venus in-situ aerobot mission concept team
- Outlined the atmospheric chemistry, cloud physics, and astrobiology investigations enabled by a maneuverable balloon that would operate at the cloudy layers of the Venusian atmosphere
- 2018-22 **Member**, TESS Atmospheric Characterization Working Group

- 2016-21 **Member**, WFIRST (Roman) Coronagraph Science Investigation Teams
- 2016-17 **Member**, NASA Study Analysis Group (SAG16) on exoplanet biosignatures
- 2016-17 **Member**, NASA Study Analysis Group (SAG15) on science questions for direct imaging exoplanet missions
- 2014 **Principal Investigator** for science return of direct-imaging exoplanet missions, NASA Exoplanet Exploration Program

PROFESSIONAL SERVICE

- 2024 **Member**, JPL Palomar Review Board
- 2024 **Panel Reviewer**, NSF Astronomy and Astrophysics Research Grants
- 2023 **External Reviewer**, James Webb Space Telescope Time Allocation Committee
- 2022 **Chair**, Astrophysics Return to Lab Working Group, Jet Propulsion Laboratory
- 2021- **Chair**, Astrophysics Colloquium Committee, Jet Propulsion Laboratory
- 2020 **Panel Reviewer**, Hubble Space Telescope Time Allocation Committee
- 2016- **Founder**, Exoplanet Lunch Seminar Series, Jet Propulsion Laboratory
- 2013- **Referee** for Science, Nature, Nature Geoscience, Nature Astronomy, PNAS, ApJ, ApJS, MNRAS, A&A, Astrobiology, Icarus, EPSL, JGR, and GRL
- 2012- **Panel Reviewer** for NASA's Planetary Atmospheres Program, Mars Data Analysis Program, Mars2020 Participating Scientists Program, Exoplanets Research Program, Exobiology Program, Astrophysics Research and Analysis Program, and Earth and Space Science Fellowship
- 2018 **Panel Reviewer**, Hubble Space Telescope Time Allocation Committee
- 2018 **Member**, Organizing Committee of the workshop "Combining high-resolution spectroscopy and high-contrast imaging for exoplanet characterization"
- 2018 **Member**, Selection Committee of NASA Hubble Postdoctoral Fellowship
- 2017 **Member**, Selection Committee of NSF Astronomy and Astrophysics Postdoctoral Fellowship
- 2015 **Panel Reviewer**, Hubble Space Telescope Time Allocation Committee

POSTDOC ADVISING EXPERIENCE

- 2023- Armen Tokadjian, JPL Postdoc Fellow
- 2022- Apurva V. Oza, JPL Postdoc Fellow (co-advise with Rosaly Lopes)
- 2022- Jeehyun Yang, JPL Postdoc Fellow
- 2022- Aaron Bello-Arufe, JPL Postdoc Fellow
- 2021-23 Markus Scheucher, JPL Postdoc Fellow (now JPL employee)
- 2018-22 Mario Damiano, JPL Postdoc Fellow (now JPL employee)

GRADUATE STUDENT ADVISING EXPERIENCE

- 2022- Kimberly Paragas (Caltech, co-advise with Heather Knutson)
- 2021-23 Danica Adams (Caltech, co-advise with Yuk Yung). Now prize postdoc at Harvard

2015 Peter Gao (Caltech, co-advise with Yuk Yung). Now staff scientist at the Carnegie Institution for Science

UNDERGRADUATE STUDENT ADVISING EXPERIENCE

2024 Claire Mao (MIT)
2024 Evann Kurzawa (Ecole des Mines de Saint-Étienne)
2023-24 Zachary Burr (Delft University of Technology)
2023 Aidan Robinson (UCLA)
2022-23 Audrey DeVault (Caltech). Now graduate student at MIT
2022 Naylynn Tañón Reyes (Smith College). Now working in the healthcare industry
2020-21 Lexy LeMar (Caltech). Now graduate student at MIT
2018-23 Trent Thomas (UCLA). Now graduate student at U. Washington
2018-19 Héctor Delgado Diaz (Cal State LA). Now graduate student at U. Washington
2018 Luke Peterson (Northwestern University). Now graduate student at CU Boulder
2017-18 Tre'Shunda James (Occidental College). Now postdoc at NASA Goddard
2017 Isabel Angelo (UC Berkeley). Now graduate student at UCLA
2017 George Filippatos (Penn State). Now postdoc at U. Chicago

TEACHING EXPERIENCE

2015- **Guest Lecturer**, California Institute of Technology, Class Ge/Ay 159: Astrobiology (Planetary Evolution and Habitability)
2015 **Co-Instructor**, California Institute of Technology, Class Ge 194: Isotopic Tracers of Mars Atmosphere-Surface Interactions
2014 **Professional Development Program**, Institute for Scientist and Engineer Educators, UC Santa Cruz
2012 **Teaching Certificate Program**, Massachusetts Institute of Technology
2010 **Teaching Assistant**, Tsinghua University, Class: Quantum Mechanics

EXTERNAL GRANTS & COMPETITIVE OBSERVATION PROGRAMS

- **Awarded \$4.5M since 2015, of which \$3.6M as PI or Co-PI**
- **NASA ROSES:** 3 programs as PI, 5 programs as Co-I
- **JWST Observations:** 7 programs (165 hours) as PI and Co-PI, 8 programs (231 hours) as Co-I
- **HST Observations:** 1 program (6 orbits) as PI, 3 programs (241 orbits) as Co-I
- **Spitzer Observations:** 2 programs (176 hours) as Co-I

PI, NASA Astrophysics Decadal Survey Precursor Science Program, Retiring the risk of misidentifying planet types from reflected light spectra, 2025-2028, \$622K

PI, JWST Cycle 3, Efficient and Detailed Characterization of a Temperate Water World Candidate, 2024-2026, \$190K (17 observing hours)

PI, JWST Cycle 3, Detailed Atmospheric Characterization of a Unique Low-Temperature Exo-Saturn, 2024-2026, \$247K (25 observing hours)

Co-PI, JWST Cycle 2, Probing the volcanic outgassing activity of a warm sub-Earth planet, 2023-2025, \$227K (PI: Mario Damiano, 13 observing hours)

PI, JWST Cycle 1, Deep Characterization of the Atmosphere of a Temperate Sub-Neptune, 2022-2025, \$394K (68 observing hours)

PI, JWST Cycle 1, Determining the Atmospheric Composition of the Super-Earth 55 Cancri e, 2022-2024, \$236K (16 observing hours)

Co-PI, JWST Cycle 1, Exploring the nature of a temperate exoplanet in the Fulton gap, 2022-2024, \$227K (PI: Mario Damiano, 14 observing hours)

Co-PI, JWST Cycle 1, A Search for Signatures of Volcanism and Geodynamics on the Hot Rocky Exoplanet LHS 3844b, 2022-2024 \$176K (PI: Laura Kreidberg, 12 observing hours)

PI, NASA Exoplanets Research Program, Thermal Structure, Chemistry, and Observational Signatures of Cold Exoplanet Atmospheres, 2018-2022, \$459K

PI, NASA Habitable Worlds, Constraining Early Mars's Atmosphere and Habitability with Isotopic Measurements, 2017-2022, \$808K

PI, HST Cycle 24, First Transmission Spectrum of a Cold, Water-Cloud Gas Giant Planet, 2017-2020, \$75K (6 observing orbits)

Co-I, JWST Cycle 2, Mapping the atmosphere or surface of a hot ultra-short-period super Earth, 2023-2024, \$91K (PI: Michael Zhang, 17 observing hours)

Co-I, JWST Cycle 2, The search for regolith on the airless exoplanet LHS 3844 b, 2023-2024, \$64K (PI: Sebastian Zieba, 19 observing hours)

Co-I, HST Cycle 30, The SPACE Program: A Sub-Neptune Planetary Atmosphere Characterization Experiment, 2022-2025, \$64K (PI: Laura Kreidberg, 205 observing orbits)

Co-I, JWST Cycle 1, Is it raining lava in the evening on 55 Cancri e? 2022-2024, \$98K (PI: Alexis Brandeker, 25 observing hours)

Co-I, JWST Cycle 1, Searching Our Closest Stellar Neighbor for Planets and Zodiacal Emission, 2022-2025, \$15K (PI: Charles Beichman, 25 observing hours)

Co-I, JWST Cycle 1, Unveiling the Atmospheric Composition and Haze Formation Rates in the Young, Cool, Super-Puff Kepler-51d, 2022-2024, \$40K (PI: Jessica Libby-Roberts, 21 observing hours)

Co-I, JWST Cycle 1, Hot Take on a Cool World: Does Trappist-1c Have an Atmosphere, 2022-2023, \$19K (PI: Laura Kreidberg, 18 observing hours)

Co-I, JWST Cycle 1, The First and Only Multi-wavelength Map of an Ultra-short-period sub-Earth, 2022-2023, \$18K (PI: Michael Zhang, 13 observing hours)

Co-I, JWST Cycle 1, The first near-infrared spectroscopic phase-curve of a super-Earth, 2022-2023, \$16K (PI: Nestor Espinoza, 15 observing hours)

Co-I, JWST Early Release Science, The Transiting Exoplanet Community Early Release Science Program, 2017-2023 (PI: Natalie Batalha, 78 observing hours)

Co-I, NASA Exoplanets Research Program, The Imitation Game: Construction of a Habitable Exoplanet Detection Machine, 2020-2023, \$22K (PI: Jonathan Jiang)

Co-I, HST Cycle 28, Confirming a Tentative Detection of an Atmosphere around a Potentially Rocky Planet, 2021-2023, \$30K (PI: Thomas Barclay, 8 observing orbits)

Co-I, HST Cycle 27, Searching for Secondary Atmospheres in a System of Benchmark Worlds, 2021-2022, \$64K (PI: Thomas Barclay, 28 observing orbits)

Co-I, NASA WFIRST Science Investigation Teams and Adjutant Scientists, Optimizing WFIRST Coronagraph Science, 2016-2021, \$114K (PI: Bruce Macintosh)

Co-I, HST Cycle 25, Model Atmospheres and Spectral Irradiance Library of the Exoplanet Host Stars Observed in the MUSCLES Survey, 2018-2020, \$86K (PI: Jeffrey Linsky)

Co-I, NASA Planetary Data Archiving, Restoration, and Tools, Restoring and Archiving Voyager 1 Cruise Images of Uranus and Neptune, 2018-2020, \$17K (PI: Daniel Wenkert)

Co-I, NASA TESS General Investigator, Characterizing the Super-Earth 55 Cnc e: The TESS Opportunity, 2019 (PI: Diana Dragomir)

Co-I, NASA WFIRST Preparatory Science, Detecting and Characterizing Exoplanets with the WFIRST Coronagraph: Colors of Planets in Standard and Designer Bandpasses, 2015-2018, \$74K (PI: Margaret Turnbull)

Co-I, Spitzer Cycle 14, A Test for the Existence of An Atmosphere on a Terrestrial Exoplanet Orbiting a Small Star, 2018 (PI: Laura Kreidberg, 101 observing hours)

Co-I, Spitzer Cycle 9, The First Orbital Phase Curve of a Rocky Exoplanet, 2012 (PI: Brice-Olivier Demory, 75 observing hours)

Science PI, NASA Hubble Postdoctoral Fellowship, Chemical Fingerprints of Alien Worlds – Towards an Evolutionary View of Mars and Terrestrial Exoplanet Atmospheres, 2013-2015, \$317K

Science PI, NASA Earth and Space Science Fellowship, Photochemistry of Super Earth Exoplanet Atmospheres, 2011-2013, \$60K

INVITED TALKS

Seminars and Colloquia

2025 Ludwig Maximilian University of Munich, Joint Astrophysics Colloquium

2024 Max Planck Institute for Astronomy, Exocoffee

2024 Rocky Worlds Discussion

2024 UC Riverside, Astrobiology Seminar

2023 Tokyo Institute of Technology, Earth-Life Science Institute Seminar

2023 UCLA, Planetary Science Seminar

2023 Caltech, DIX Planetary Science Seminar

2021 University of Arizona, Lunar and Planetary Laboratory Colloquium

2021 NASA Nexus for Exoplanet System Science, CLEVER Planets Seminar

2021 Institute of Planetary Research, German Aerospace Center, Seminar

2021 Northwestern University, Astrophysics Seminar

2021 National Astronomical Observatory of Japan, Seminar
 2019 California State University, Los Angeles, Physics and Astronomy Seminar
 2019 Max Planck Institute for Astronomy, Origins of Life Seminar
 2019 Purdue University, West Lafayette, IN, Department Seminar
 2018 Geneva Observatory, Seminar
 2018 UCLA, Planetary Science Seminar
 2018 University of Florida, Astronomy Seminar
 2017 CNRS Orléans, Space Science Seminar
 2017 Caltech, Geological and Planetary Sciences Seminar
 2017 Academia Sinica, Astronomy Colloquium
 2016 California State University, Northridge, Physics and Astronomy Seminar
 2016 ETH Zurich, Astrophysics Seminar
 2016 University of Bern, Space Research Seminar
 2016 Geneva Observatory, Seminar
 2016 Arizona State University, Astrobiology Seminar
 2014 Caltech, Kliegel Lectures in Planetary Sciences
 2014 UCLA, Planetary Seminar
 2013 UCLA, iPLEX Lunch Seminar
 2013 Caltech, Yuk Lunch Seminar
 2012 Harvard-Smithsonian Center for Astrophysics, SSP Seminar
 2012 Institute for Advanced Study, Seminar

Invited Conference Talks

2024 Lorentz Center Workshop on Neutral and Ion Photochemistry in Planetary Atmospheres, Leiden, Netherlands
 2024 COSPAR Scientific Assembly, Panel on Habitable Worlds Observatory, Busan, South Korea
 2024 ISSI Workshop on the Geoscience of (Exo)planets, Bern, Switzerland
 2024 Ringberg Castle Workshop on Small Exoplanets, Germany
 2023 Scialog Conference on Signatures of Life in the Universe, Tuscon, AZ
 2022 Exoplanets in Our Backyard 2, Albuquerque, NM
 2022 Chianti International Workshop on Atmospheres, Florence, Italy
 2021 Planetary Science and Astrobiology Decadal Survey, Mars Panel
 2019 234th Meeting of the American Astronomical Society, St Louis, MO
 2019 EGU General Assembly, Vienna, Austria
 2018 Defining the Landscape for Precision Radial Velocity (PRV) Science in the 2018-2028 Time Frame, Pasadena, CA
 2018 Technology for Direct Detection and Characterization of Exoplanets, Pasadena, CA
 2017 Asia Oceania Geosciences Society 14th Annual Meeting, Singapore
 2016 NASA Starshade Technology Workshop, Pasadena, CA

- 2016 Community Astrophysics with WFIRST, Guest Observer and Archival Science, Pasadena, CA
- 2016 227th Meeting of the American Astronomical Society, Kissimmee, FL
- 2015 Exoplanetary Atmospheres and Habitability, Nice, France
- 2015 IAU XXIX General Assembly, Honolulu, HI
- 2015 Planetary Systems: a Synergistic View, Quy Nhon, Vietnam
- 2015 Physics of Exoplanets: From Earth-sized to Mini Neptunes, Santa Barbara, CA

MEDIA REPORTS AND PUBLIC OUTREACH

- 2024 Featured speaker for SETI Live
- 2024 *A Magma Ocean Fuels This Exoplanet's Atmosphere*, by AGU Eos
- 2024 *Milestone discovery as JWST confirms atmosphere on an Earth-like exoplanet*, by Nature News
- 2024 *NASA's Webb Hints at Possible Atmosphere Surrounding Rocky Exoplanet*, NASA press release and media coverage by AP, Reuters, ABC, Scientific American, Space.com, Gizmodo, Astronomy, etc.
- 2024 *NASA's James Webb Space Telescope could help solve these 5 exoplanet puzzles*, by Science News
- 2022 *JWST Science Feature Volcanic Worlds*, NASA/STScI press release
- 2021 *How to Find Hidden Oceans on Distant Worlds? Use Chemistry*, NASA press release
- 2021 *Where are the water worlds? New tool to find out*, by EarthSky
- 2021 *The Water on Mars Vanished – This Might Be Where It Went*, by NY Times, National Geographic, and multiple media outlets
- 2019 *A Rare Look at the Surface of a Rocky Exoplanet*, NASA press release
- 2018 Science advisor for "Signs of Life", an award-winning planetarium show at the Griffith Observatory, Los Angeles (premiered in May 2022)
- 2017 *Lava or Not, Exoplanet 55 Cancri e Likely to Have Atmosphere*, by National Geographic
- 2017 *Our Living Planet Shapes the Search for Life Beyond Earth*, by NASA News
- 2017 Panel Discussion on the movie "Arrival" at the Los Angeles Public Library
- 2017 *Signs of Alien Air Herald a New Era of Exoplanet Discoveries*, by Scientific American
- 2016 *Testing for Methane on Mars*, by Airspacemag.com
- 2015 *Mystery on Mars: Does Methane Really Indicate Life?* by Space.com
- 2015 *Mars' Ancient Atmosphere Wasn't Very Thick After All*, by Discovery Channel
- 2015 *Helium-Filled Exoplanets Likely Float Throughout the Galaxy*, by Discovery Channel and Space.com
- 2013 *Investigating Exoplanet Surfaces*, by Astrobiology Magazine
- 2012 *Mars Snowflakes Are as Tiny as Red Blood Cells*, by CBS, Nature, Discovery Channel, National Geographic, and Space.com
- 2011 *How Astronomers May Hunt for Life on Alien Planets*, by Astrobiology Magazine

PUBLICATIONS

103 refereed publications, 25 first-author papers, h-index = 40 (using NASA ADS)

*student advisee, #postdoc advisee and research group member, ^equal contribution

ADS Library: <https://ui.adsabs.harvard.edu/public-libraries/im9iiqF6Se268wGNIdielA>

Copies of the papers are available at: <https://renyuplanet.github.io/publication.html>

Papers under Review

- #Mantas Zilinskas, Christiaan van Buchem, Sebastian Zieba, Yamila Miguel, Emily Sandford, **Renyu Hu**, Leoni Janssen, Jayshil A. Patel, Aaron Bello-Arufe, Diana Dragomir, Shang-Min Tsai, and Michael Zhang (2025), *Characterizing the Atmosphere of 55 Cancri e – 1D Forward Model Grid for Current and Future JWST Observations*, **A&A**, under review
- Apurva V. Oza, ... **Renyu Hu**, et al. (2025), *Volcanic Satellites Tidally Venting Na, K, SO₂ in Optical & Infrared Light*, **MNRAS**, under review
- Collin Cherubim, Robin Wordsworth, Danica Adams, Dan J. Bower, Paolo A. Sossi, and **Renyu Hu** (2025), *An Oxidation Gradient Straddling the Small Planet Radius Valley*, **AAS Journals**, under review
- Brandon Park Coy, ... **Renyu Hu**, et al. (2025), *Population-level Hypothesis Testing with Rocky Planet Emission Data: A Tentative Trend in the Brightness Temperatures of M-Earths*, **AAS Journals**, under review
- #Zachary Burr, Vincent Kofman, **Renyu Hu**, #Mario Damiano, and Geronimo L. Villanueva (2025), *Effects of Heterogeneous Surfaces and Atmospheric Dynamics on Reflectance Spectroscopy of Earth-like Exoplanets*, **AAS Journals**, under review
- #Aaron Bello-Arufe, #Mario Damiano, Katherine Bennett, **Renyu Hu**, Luis Welbanks, Ryan MacDonald, Darryl Seligman, David Sing, #Armen Tokadjian, #Apurva Oza, and #Jeehyun Yang (2025), *A volcanic atmosphere on the sub-Earth L 98-59 b*, **AAS Journals**, under review
- Michael Greklek-McKeon, ... **Renyu Hu**, et al. (2025), *Tidally Heated Sub-Neptunes, Refined Planetary Compositions, and Confirmation of a Third Planet in the TOI-1266 System*, **AAS Journals**, under review
- Rena A. Lee, ... **Renyu Hu**, et al. (2025), *TOI-6324b: An Earth-Mass Ultra-Short-Period Planet Transiting a Nearby M Dwarf*, **AAS Journals**, under review
- Elsa Ducrot, ... **Renyu Hu**, et al. (2025), *No thick atmosphere around TRAPPIST-1 b and c*, **Nature Astronomy**, under review
- Björn Benneke, ... **Renyu Hu**, et al. (2025), *JWST Reveals CH₄, CO₂, and H₂O in a Metal-rich Miscible Atmosphere on a Two-Earth-Radius Exoplanet*, **AAS Journals**, under review (arXiv: 2403.03325)
- Christopher D. Parkinson, Stephen W. Bougher, Franklin P. Mills, **Renyu Hu**, Guillaume Gronoff, Jiazheng Li, Amanda Brecht, and Yuk L. Yung (2025), *Venus as an Exoplanet: I. An*

Initial Exploration of the 3-D Energy Balance for a CO₂ Exoplanetary Atmosphere Around an M-Dwarf Star, **J. Geophys. Res. Planets**, under review (arXiv: 2205.10958)

Refereed Publications – Major Contributions

2025

[M60] *Kimberly Paragas, Heather A. Knutson, **Renyu Hu**, Bethany L. Ehlmann, Giulia Alemanno, Jörn Helbert, Alessandro Maturilli, Michael Zhang, and George Rossman (2025), *A New Spectral Library for Modeling the Surfaces of Hot, Rocky Exoplanets*, **ApJ**, in press

[M59] #Mario Damiano, #Zachary Burr, **Renyu Hu**, Vanessa Bailey, Jennifer Burt, Tiffany Kataria, and Bertrand Mennesson (2024), *Effects of planetary mass uncertainties on the interpretation of the reflectance spectra of Earth-like exoplanets*, **AJ**, in press

[M58] *Danica Adams, #Markus Scheucher, **Renyu Hu**, Bethany Ehlmann, *Trent B. Thomas, Robin Wordsworth, Eva L. Scheller, Rob Lillis, Kayla Smith, Heike Rauer, and Yuk L. Yung (2024), *Episodic Warm Climates on Early Mars Primed by Crustal Hydration*, **Nature Geoscience**, in press

2024

[M57] #Armen Tokadjian, **Renyu Hu**, and #Mario Damiano (2024), *The Detectability of CH₄/CO₂/CO and N₂O Biosignatures through Reflection Spectroscopy of Terrestrial Exoplanets*, **AJ**, 168, 292

[M56] #Mario Damiano, Stuart Shaklan, **Renyu Hu**, et al. (2024), *Starshade Exoplanet Data Challenge: What We Learned*, **Journal of Astronomical Telescopes, Instruments, and Systems**, 10, 048001

[M55] #Jeehyun Yang and **Renyu Hu** (2024), *Chemical Mapping of Temperate Sub-Neptune Atmospheres: Constraining the Deep Interior H₂O/H₂ Ratio from the Atmospheric CO₂/CH₄ Ratio*, **ApJ Letters**, 971, L48

[M54] **Renyu Hu**, #Aaron Bello-Arufe, Micheal Zhang, et al. (2024), *A Secondary Atmosphere on the Rocky Exoplanet 55 Cancri e*, **Nature**, 630, 609

[M53] #Mario Damiano, #Aaron Bello-Arufe, #Jeehyun Yang, and **Renyu Hu** (2024), *LHS 1140 b is a potentially habitable water world*, **ApJ Letters**, 968, L22

[M52] Collin Cherubim, Robin Wordsworth, **Renyu Hu**, and Evgenya Shkolnik (2024), *Strong fractionation of deuterium and helium in sub-Neptune atmospheres along the radius valley*, **ApJ**, 967, 139

[M51] #Jeehyun Yang and **Renyu Hu** (2024), *Automated chemical reaction network generation and its application to exoplanet atmospheres*, **ApJ**, 966, 189

[M50] Michael Zhang, **Renyu Hu**, Julie Inglis, et al. (2024), *GJ 367b is a dark, hot, airless sub-Earth*, **ApJ Letters**, 961, L44

2023

[M49] #Mario Damiano, **Renyu Hu**, and Bertrand Mennesson (2023), *Reflected Spectroscopy of Small Exoplanets. III. Probing the UV Band to Measure Biosignature Gases*, **AJ**, 166, 157

[M48] **Renyu Hu**, Fabrice Gaillard, and Edwin Kite (2023), *Narrow loophole for H₂-dominated atmospheres on habitable rocky planets around M dwarfs*, **ApJ Letters**, 948, L20

[M47] *Trent Thomas, **Renyu Hu**, and Daniel Y. Lo (2023), *Constraints on the size and composition of the ancient Martian atmosphere from coupled CO₂-N₂-Ar isotopic evolution models*, **PSJ**, 4, 41

2022

[M46] Steffen Buessecker, Hiroshi Imanaka, Tucker Ely, **Renyu Hu**, Stephen J. Romaniello, and Hinsby Cadillo-Quiroz (2022), *Marine mineral-catalyzed NO and N₂O formation on the anoxic early Earth*, **Nature Geoscience**, 15, 1056

[M45] Robert A. West, Philip Dumont, **Renyu Hu**, Vijay Natraj, James Breckinridge, and Pin Chen (2022), *Spectropolarimetry as a Means to Address Cloud Composition and Habitability for a Cloudy Exoplanetary Atmosphere in the Habitable Zone*, **ApJ**, 940, 183

[M44] #Mario Damiano, **Renyu Hu**, et al. (2022), *A transmission spectrum of the sub-Earth planet L98-59 b in 1.1 – 1.7 μm*, **AJ**, 164, 225

[M43] #Mario Damiano and **Renyu Hu** (2022), *Reflected spectroscopy of small planets II: characterization of terrestrial exoplanets*, **AJ**, 163, 299

[M42] **Renyu Hu** and *Trent Thomas (2022), *A nitrogen-rich atmosphere on ancient Mars consistent with isotopic evolution models*, **Nature Geoscience**, 15, 106

2021

[M41] #Mario Damiano and **Renyu Hu** (2021), *Reflected spectroscopy of small exoplanets I: determining the atmospheric composition of sub-Neptune planets*, **AJ**, 162, 200

[M40] **Renyu Hu**, #Mario Damiano, #Markus Scheucher, Edwin Kite, Sara Seager, and Heike Rauer (2021), *Unveiling shrouded oceans on temperate sub-Neptunes via transit signatures of solubility equilibria vs. gas thermochemistry*, **ApJ Letters**, 921, L8

[M39] **Renyu Hu** (2021), *Photochemistry and Spectral Characterization of Temperate and Gas-Rich Exoplanets*, **ApJ**, 921, 27

[M38] *Danica Adams, Yangcheng Luo, Michael L. Wong, Patrick Dunn, Madeline Christensen, Chuanfei Dong, **Renyu Hu**, and Yuk Yung (2021), *Nitrogen Fixation on Early Mars*, **Astrobiology**, 21, 8

[M37] Eva L. Scheller, Bethany Ehlmann, **Renyu Hu**, *Danica Adams, and Yuk Yung (2021), *Long-Term Drying of Mars by Sequestration of Ocean-Scale Volumes of Water in the Crust*, **Science**, 372, 56

[M36] **Renyu Hu**, Sergi R. Hildebrandt, #Mario Damiano, Stuart Shaklan, Stefan Martin, and Doug Lisman (2021), *Starshade Exoplanet Data Challenge*, **Journal of Astronomical Telescopes, Instruments, and Systems**, 7, 021216

[M35] **Renyu Hu**, Doug Lisman, Stuart Shaklan, Stefan Martin, Phil Willems, and Kendra Short (2021), *Overview and Reassessment of Noise Budget of Starshade Exoplanet Imaging*, **Journal of Astronomical Telescopes, Instruments, and Systems**, 7, 021205

2020

[M34] #Mario Damiano, **Renyu Hu**, and Sergi Hildebrandt (2020), *Multi-orbital-phase and Multiband Characterization of Exoplanetary Atmospheres with Reflected Light Spectra*, **AJ**, 160, 206

[M33] #Mario Damiano and **Renyu Hu** (2020), *ExoREL-R: A Bayesian Inverse Retrieval Framework for Exoplanetary Reflected Light Spectra*, **AJ**, 159, 175

[M32] **Renyu Hu**, *Luke Peterson, and Eric T. Wolf (2020), *O₂- and CO-Rich Atmospheres for Potentially Habitable Environments on TRAPPIST-1 Planets*, **ApJ**, 888, 122

[M31] Clara Sousa-Silva, Sara Seager, Sukrit Ranjan, Janusz Jurand Petkowski, Zhuchang Zhan, **Renyu Hu**, and William Bains (2020), *Phosphine as a Biosignature Gas in Exoplanet Atmospheres*, **Astrobiology**, 20, 2

2019

[M30] **Renyu Hu** (2019), *Information in the Reflected Light Spectra of Widely Separated Giant Exoplanets*, **ApJ**, 887, 166

[M29] **Renyu Hu** and *Héctor Delgado Diaz (2019), *Stability of Nitrogen in Planetary Atmospheres in Contact with Liquid Water*, **ApJ**, 886, 126

[M28] Megan Mansfield, Edwin S. Kite, **Renyu Hu**, et al. (2019), *Identifying Atmospheres on Rocky Exoplanets through Infrared High Albedo*, **ApJ**, 886, 141

[M27] Laura Kreidberg, ^Daniel Koll, ^Caroline Morley, ^**Renyu Hu**, et al. (2019), *Absence of a Thick Atmosphere on the Terrestrial Exoplanet LHS 3844b*, **Nature**, 573, 87

[M26] **Renyu Hu** (2019), *Predicted Diurnal Variation of the Deuterium to Hydrogen Ratio in Water at the Surface of Mars Caused by Mass Exchange with the Regolith*, **Earth Planet Sci Lett**, 519, 192

[M25] #Yui Kawashima, **Renyu Hu**, and Masahiro Ikoma (2019), *Detectable Molecular Features above Hydrocarbon Haze via Transmission Spectroscopy with JWST: Case Studies of GJ 1214b, GJ 436b, HD 97658b, and Kepler-51b*, **ApJ Letters**, 876, L5

2018

[M24] *Tre'Shunda James and **Renyu Hu** (2018), *Photochemical Oxygen in Non-1 Bar CO₂ Atmospheres of Terrestrial Exoplanets*, **ApJ**, 867, 17

[M23] Chester E. Harman, Ryan Felton, **Renyu Hu**, et al. (2018), *Abiotic O₂ Levels on Planets around F, G, K, and M Stars: Effects of Lightning-Produced Catalysts in Eliminating Oxygen False Positives*, **ApJ**, 866, 56

[M22] Ji Wang, Dimitri Mawet, **Renyu Hu**, et al. (2018), *Baseline Requirements for Detecting Biosignatures with the HabEx and LUVOIR Mission Concepts*, **Journal of Astronomical Telescopes, Instruments, and Systems**, 4, 035001

2017

[M21] *Isabel Angelo and **Renyu Hu** (2017), *A Case for an Atmosphere on Super-Earth 55 Cancri e*, **AJ**, 154, 6

[M20] Ji Wang, Dimitri Mawet, Garreth Ruane, **Renyu Hu**, and Björn Benneke (2017), *Observing Exoplanets with High Dispersion Coronagraphy. I. The scientific potential of current and next-generation large ground and space telescopes*, **AJ**, 153, 183

2016

[M19] **Renyu Hu**, Anthony Bloom, *Peter Gao, Charles E. Miller, and Yuk L. Yung (2016), *Hypotheses for near-surface exchange of methane on Mars*, **Astrobiology**, 16, 539

2015

[M18] **Renyu Hu**, David Kass, Bethany L. Ehlmann, and Yuk L. Yung (2015), *Tracing the Fate of Carbon and the Atmospheric Evolution of Mars*, **Nature Communications**, 6, 10003

[M17] Avi Shporer and **Renyu Hu** (2015), *Studying Atmosphere-Dominated Hot Jupiter Kepler Phase Curves: Evidence that Inhomogeneous Atmospheric Reflection is Common*, **AJ**, 150, 112

[M16] **Renyu Hu**, Sara Seager, and Yuk L. Yung (2015), *Helium Atmospheres on Warm Neptune- and Sub-Neptune-Sized Exoplanets and Applications to GJ 436 b*, **ApJ**, 807, 8

[M15] *Peter Gao, **Renyu Hu**, Tyler Robinson, Cheng Li, and Yuk L. Yung (2015), *Stabilization of CO₂ Atmospheres on Exoplanets around M Dwarf Stars*, **ApJ**, 806, 249

[M14] **Renyu Hu**, Brice-Oliver Demory, Sara Seager, Nikole Lewis, and Adam P. Showman (2015), *A Semi-Analytical Model of Visible-Wavelength Phase Curves of Exoplanets and Applications to Kepler-7 b and Kepler-10 b*, **ApJ**, 802, 51

2014 and before

[M13] **Renyu Hu** and Sara Seager (2014), *Photochemistry in Terrestrial Exoplanet Atmospheres III: Photochemistry and Thermochemistry in Thick Atmospheres on Super Earths*, **ApJ**, 784, 63

[M12] Sara Seager, William Bains, and **Renyu Hu** (2013), *Biosignature Gases in H₂-Dominated Exoplanet Atmospheres*, **ApJ**, 777, 95

- [M11] Sara Seager, William Bains, and **Renyu Hu** (2013), *A Biomass Model for Exoplanet Biosignature Gases*, **ApJ**, 775, 104
- [M10] **Renyu Hu**, Sara Seager, and William Bains (2013), *Photochemistry in Terrestrial Exoplanet Atmospheres II: H₂S and SO₂ Photochemistry in Anoxic Atmospheres*, **ApJ**, 769, 6
- [M9] **Renyu Hu**, Sara Seager, and William Bains (2012), *Photochemistry in Terrestrial Exoplanet Atmospheres I: Photochemistry Model and Benchmark Cases*, **ApJ**, 761, 166
- [M8] **Renyu Hu** and Shuang-Nan Zhang (2012), *Quasars' Optical Polarization and Balmer Edge Feature Revealed by Ultra-violet, and Polarized Visible to Near Infrared Emissions*, **MNRAS**, 426, 2847-2858
- [M7] **Renyu Hu**, Kerri Cahoy, and Maria T. Zuber (2012), *Mars CO₂ Condensation Above the North and South Poles Revealed by Radio Occultation, Climate Sounding, and Laser Ranging*, **J. Geophys. Res.**, 117, E07002
- [M6] **Renyu Hu**, Bethany L. Ehlmann, and Sara Seager (2012), *Theoretical Spectra of Terrestrial Exoplanet Surfaces*, **ApJ**, 752, 7-21
- [M5] **Renyu Hu** (2010), *Transport of the First Rocks of the Solar System by X-winds*, **ApJ**, 725, 1421-1428
- [M4] Yu-Qing Lou and **Renyu Hu** (2010), *General Polytopic Magnetofluid under Self-Gravity: Voids and Shocks*, **New Astronomy**, 15, 198-214
- [M3] **Renyu Hu** and Yu-Qing Lou (2009), *Magnetic Massive Stars as Magnetar Progenitors*, **MNRAS**, 396, 878-886
- [M2] **Renyu Hu** and Yu-Qing Lou (2008), *Self-Similar Champagne Flow of Polytopic HII Regions*, **MNRAS**, 390, 1619-1634
- [M1] **Renyu Hu**, Yulia V. Bogdanova, Christopher J. Owen, Claire Foullon, Andrew N. Fazakerley, and Henri Rème (2008), *Cluster Observations of the Mid-Altitude Cusp under Strong Northward Interplanetary Magnetic Field*, **J. Geophys. Res.**, 113, A07S05

Additional Refereed Publications

- [A43] Thomas Barclay, ... **Renyu Hu**, et al. (2025), *The transmission spectrum of the potentially rocky planet L 98-59 c*, **AJ**, in press (arXiv: 2301.10866)
- [A42] Kento Masuda, ... **Renyu Hu**, et al. (2024), *A Fourth Planet in the Kepler-51 System Revealed by Transit Timing Variations*, **AJ**, 168, 294
- [A41] #Apurva V. Oza, ... **Renyu Hu**, et al. (2024), *Redshifted Sodium Transient Near Exoplanet Transit*, **ApJ Letters**, 973, L53
- [A40] Jayshil A. Patel, ... **Renyu Hu**, et al. (2024), *JWST reveals a rapid and strong day side variability of 55 Cancri e*, **A&A**, in press (arXiv: 2407.12898)

- [A39] Fei Dai, ... **Renyu Hu**, et al. (2024), *An Earth-sized Planet on the Verge of Tidal Disruption*, **AJ**, 168, 101
- [A38] Aarynn L. Carter, ... **Renyu Hu**, et al. (2024), *A benchmark JWST near-infrared spectrum for the exoplanet WASP-39 b*, **Nature Astronomy**, 8, 1008
- [A37] Taylor J. Bell, ... **Renyu Hu**, et al. (2024), *Nightside clouds and disequilibrium chemistry on the hot Jupiter WASP-43b*, **Nature Astronomy**, 8, 879
- [A36] Michaël Gillon, ... **Renyu Hu**, et al. (2024), *Detection of an Earth-sized exoplanet orbiting the nearby ultracool dwarf star SPECULOOS-3*, **Nature Astronomy**, 8, 865
- [A35] TRAPPIST-1 JWST Community Initiative, Julien de Wit, ... **Renyu Hu**, et al. (2024), *A roadmap for the atmospheric characterization of terrestrial exoplanets with JWST*, **Nature Astronomy**, 8, 810
- [A34] Cheyanne Shariat, Yasuhiro Hasegawa, Bradley Hansen, Mathew Yu, and **Renyu Hu** (2024), *Predicting the Dominant Formation Mechanism of Multiplanetary Systems*, **ApJ Letters**, 964, L13
- [A33] Xintong Lyu, Daniel Koll, Nicholas B. Cowan, **Renyu Hu**, Laura Kreidberg, and Brain Rose (2024), *Super-Earth LHS3844b is tidally locked*, **ApJ**, 964, 152
- [A32] Nicholas F. Wogan, Natasha E. Batalha, Kevin Zahnle, Joshua Krissansen-Totten, Shang-Min Tsai, and **Renyu Hu** (2024), *JWST observations of K2-18b can be explained by a gas-rich mini-Neptune with no habitable surface*, **ApJ Letters**, 963, L7
- [A31] Diana Powell, ... **Renyu Hu**, et al. (2024), *Sulphur dioxide in the mid-infrared transmission spectrum of WASP-39b*, **Nature**, 626, 979
- [A30] Sukrit Ranjan, Edward W. Schwieterman, Michaela Leung, Chester E. Harman, and **Renyu Hu** (2023), *The Importance of the Upper Atmosphere to CO/O₂ Runaway on Habitable Planets Orbiting Low-mass Stars*, **ApJ Letters**, 958, L15
- [A29] Emma Esparza-Borges, ... **Renyu Hu**, et al. (2023), *Detection of Carbon Monoxide in the Atmosphere of WASP-39b Applying Standard Cross-correlation Techniques to JWST NIRSpec G395H Data*, **ApJ Letters**, 955, L19
- [A28] Andrew P. Lincowski, ... **Renyu Hu**, et al. (2023), *Potential Atmospheric Compositions of TRAPPIST-1 c Constrained by JWST/MIRI Observations at 15 μm*, **ApJ Letters**, 955, L7
- [A27] Sebastian Zieba, ... **Renyu Hu**, et al. (2023), *No thick carbon dioxide atmosphere on the rocky exoplanet TRAPPIST-1 c*, **Nature**, 620, 746
- [A26] Shang-min Tsai, ... **Renyu Hu**, et al. (2023), *Photochemically-produced SO₂ in the atmosphere of WASP-39 b*, **Nature**, 617, 483
- [A25] David Grant, ... **Renyu Hu**, et al. (2023), *Detection of carbon monoxide's 4.6 micron fundamental band structure in WASP-39b's atmosphere with JWST NIRSpec G395H*, **ApJ Letters**, 949, L15

- [A24] Lili Alderson, ... **Renyu Hu**, et al. (2023), *Early Release Science of the exoplanet WASP-39b with JWST NIRSpec NIRSpec G395H*, **Nature**, 614, 664
- [A23] Zafar Rustamkulov, ... **Renyu Hu**, et al. (2023), *Early Release Science of the exoplanet WASP-39b with JWST NIRSpec PRISM*, **Nature**, 614, 659
- [A22] Ahrer Eva-Maria, ... **Renyu Hu**, et al. (2023), *Early Release Science of the exoplanet WASP-39b with JWST NIRCам*, **Nature**, 614, 653
- [A21] JWST Transiting Exoplanet Community Early Release Science Team (2023), *Identification of carbon dioxide in an exoplanet atmosphere*, **Nature**, 614, 649
- [A20] Emily A. Whittaker, Matej Malik, Jegug Ih, Eliza M.-R. Kempton, Megan Mansfield, Jacob L. Bean, Edwin S. Kite, Daniel D. B. Koll, Timothy W. Cronin, and **Renyu Hu** (2022), *The Detectability of Rocky Planet Surface and Atmosphere Composition with the JWST: The Case of LHS 3844b*, **AJ**, 164, 258
- [A19] Stefan Martin, ... **Renyu Hu**, et al. (2022), *Next-generation active telescope for space astronomy*, **Journal of Astronomical Telescopes, Instruments, and Systems**, 8, 044005
- [A18] Jiazheng Li, Jonathan H. Jiang, Huanzhou Yang, Dorian S. Abbot, **Renyu Hu**, Thaddeus D. Komacek, Stuart J. Bartlett, and Yuk L. Yung (2022), *Rotation Period Detection for Earth-like Exoplanets*, **AJ**, 163, 27
- [A17] Caprice L. Phillips, Ji Wang, Sarah Kendrew, Thomas P. Greene, **Renyu Hu**, Jeff Valenti, Wendy R. Panero, and Joseph Schulze (2021), *Detecting Biosignatures in the Atmospheres of Gas Dwarf Planets with the James Webb Space Telescope*, **ApJ**, 923, 144
- [A16] Michael Zhang, Heather A. Knutson, Lile Wang, Fei Dai, Antonija Oklopčić, and **Renyu Hu** (2021), *No Escaping Helium from 55 Cnc e*, **AJ**, 161, 181
- [A15] Andrew Romero-Wolf, ... **Renyu Hu**, et al. (2021), *Starshade Rendezvous: Exoplanet Orbit Constraints from Multi-Epoch Direct Imaging*, **Journal of Astronomical Telescopes, Instruments, and Systems**, 7, 021219
- [A14] Andrew Romero-Wolf, ... **Renyu Hu**, et al. (2021), *Starshade Rendezvous: Exoplanet Sensitivity and Observing Strategy*, **Journal of Astronomical Telescopes, Instruments, and Systems**, 7, 021210
- [A13] Sukrit Ranjan, Edward W. Schwieterman, Chester Harman, Alexander Fateev, Clara Sousa-Silva, Sara Seager, and **Renyu Hu** (2020), *Photochemistry of Anoxic Abiotic Habitable Planet Atmospheres: Impact of New H₂O Cross-Sections*, **ApJ**, 896, 148
- [A12] Charles Beichman, ... **Renyu Hu**, et al. (2020), *Searching for Planets Orbiting α Cen A with the James Webb Space Telescope*, **PASP**, 132, 015002
- [A11] Jonathan Jiang, Xuan Ji, Nicholas Cowan, **Renyu Hu**, and Zonghong Zhu (2019), *Empirical Predictions for the Period Distribution of Planets to be Discovered by the Transiting Exoplanet Survey Satellite*, **AJ**, 158, 96

- [A10] R. O. Parke Loyd, ... **Renyu Hu**, et al. (2018), *The Muscles Treasury Survey. V. FUV Flares On Active And Inactive M Dwarfs*, **ApJ**, 867, 71
- [A9] Yuk L. Yung, ... **Renyu Hu**, et al. (2018), *Methane on Mars and Habitability: Challenges and Responses*, **Astrobiology**, 18, 1221
- [A8] Eliza M.-R. Kempton, ... **Renyu Hu**, et al. (2018), *A Framework for Prioritizing the TESS Planetary Candidates Most Amenable to Atmospheric Characterization*, **PASP**, 130, 114401
- [A7] Jacob L. Bean, ... **Renyu Hu**, et al. (2018), *The Transiting Exoplanet Community Early Release Science Program for JWST*, **PASP**, 130, 114402
- [A6] Jonathan H. Jiang, Albert J. Zhai, Jay Herman, Chengxing Zhai, **Renyu Hu**, Hui Su, Vijay Natraj, Jiazheng Li, Feng Xu, and Yuk L. Yung (2018), *Using Deep Space Climate Observatory Measurements to Study the Earth as An Exoplanet*, **AJ**, 156, 26
- [A5] Charles Beichman, ... **Renyu Hu**, et al. (2018), *Validation and Initial Characterization of the Long Period Planet Kepler-1654 b*, **AJ**, 155, 158
- [A4] Edward Schwieterman, ... **Renyu Hu**, et al. (2018), *Exoplanet Biosignatures: A Review of Remotely Detectable Signs of Life*, **Astrobiology**, 18, 663
- [A3] Bethany Ehlmann, ... **Renyu Hu**, et al. (2016), *The sustainability of habitability on terrestrial planets: Insights, questions, and needed measurements from Mars for understanding the evolution of Earth-like worlds*, **J. Geophys. Res. Planets**, 121, 1927
- [A2] Brice-Oliver Demory, ... **Renyu Hu**, et al. (2016), *A map of the large day-night temperature gradient of a super-Earth exoplanet*, **Nature**, 532, 207
- [A1] R. O. Parke Loyd, Allison Youngblood, Christian Schneider, Alexander Brown, **Renyu Hu**, Jeffrey Linsky, Cynthia S. Froning, Seth Redfield, Sarah Rugheimer, and Feng Tian (2016), *The MUSCLES Treasury Survey III: X-ray to Infrared Spectra of 11 M and K Stars*, **ApJ**, 824, 102

Reports, White Papers, Book Chapters, and Conference Proceedings

- [R23] Rhonda Morgan, ... **Renyu Hu**, et al. (2024), *HWO Yield Sensitivities in the NIR and NUV*, Proc. SPIE 13092, Space Telescopes and Instrumentation 2024: Optical, Infrared, and Millimeter Wave, 1836 (arXiv: 2410.16492)
- [R22] Zahra Ahmed, Simone D'Amico, **Renyu Hu**, and Mario Damiano (2023), *Exoplanet detection from starshade images using convolutional neural networks*, Proc. SPIE 12680, Techniques and Instrumentation for Detection of Exoplanets XI, 1268028
- [R21] Isaac Smith, ... **Renyu Hu**, et al. (2021), *Solar-System-Wide Significance of Mars Polar Science*, White paper to the Planetary Science and Astrobiology Decadal Survey 2023-2032 (BAAS, 53, 301)

- [R20] Vlada Stamenkovic, ... **Renyu Hu**, et al. (2021), *Deep Trek: Science of Subsurface Habitability & Life on Mars*, White paper to the Planetary Science and Astrobiology Decadal Survey 2023-2032 (BAAS, 53, 250)
- [R19] Liming Li, ... **Renyu Hu**, et al. (2021), *Radiant Energy Budgets and Internal Heat of Planets and Moons*, White paper to the Planetary Science and Astrobiology Decadal Survey 2023-2032 (BAAS, 53, 137)
- [R18] Scott Gaudi, Sara Seager, ... **Renyu Hu**, et al. (2020), *The Habitable Exoplanet Observatory (HabEx) Mission Concept Study Final Report* (arXiv: 2001.06683)
- [R17] Kendra Short, ... **Renyu Hu**, et al. (2019), *NASA's Focused Starshade Technology Development and its Synergy with Future Mission Concepts*, White paper to the Astro2020 Decadal Survey (BAAS, 51, 190)
- [R16] Paul Scowen, ... **Renyu Hu**, et al. (2019), *ANUBIS – A Probe-Class UVO Space Observatory*, White paper to the Astro2020 Decadal Survey (BAAS, 51, 132)
- [R15] Sara Seager, Jeremy N. Kasdin, ... **Renyu Hu**, et al. (2019), *Starshade Rendezvous Probe Mission*, White paper to the Astro2020 Decadal Survey (BAAS, 51, 106)
- [R14] Mark Swain, Mike Werner, Gautam Vasisht, Clara Sousa-Silva, and **Renyu Hu** (2019), *Maintaining Infrared Exoplanet Transit and Eclipse Measurement Capability in the Post JWST Era*, White paper to the Astro2020 Decadal Survey (BAAS, 51, 33)
- [R13] **Renyu Hu**, et al. (2019), *The Super-Earth Opportunity - Search for Habitable Exoplanets in the 2020s*, White paper to the Astro2020 Decadal Survey (arXiv: 1903.05258)
- [R12] Benjamin Rackham, ... **Renyu Hu**, et al. (2019), *Constraining Stellar Photospheres as an Essential Step for Transmission Spectroscopy of Small Exoplanets*, White paper to the Astro2020 Decadal Survey (arXiv: 1903.06152)
- [R11] Charles Beichman, ... **Renyu Hu**, et al. (2019), *Direct Imaging and Spectroscopy of Exoplanets with the James Webb Space Telescope*, White paper to the Astro2020 Decadal Survey
- [R10] Jonathan Fortney, ... **Renyu Hu**, et al. (2019), *The Need for Laboratory Measurements and Ab Initio Studies to Aid Understanding of Exoplanetary Atmospheres*, White paper to the Astro2020 Decadal Survey (arXiv: 1905.07064)
- [R9] Daniel Apai, ... **Renyu Hu**, et al. (2018), *Understanding Stellar Contamination in Exoplanet Transmission Spectra as an Essential Step in Small Planet Characterization*, White paper to the NAS Committee on Exoplanet Science Strategy (arXiv: 1803.08708)
- [R8] Shawn Domagal-Goldman, ... **Renyu Hu**, et al. (2018), *Life Beyond the Solar System: Remotely Detectable Biosignatures*, White paper to the NAS Committee on Astrobiology Science Strategy (arXiv: 1801.06714)

- [R7] Daniel Apai, ... **Renyu Hu**, et al. (2017), *Exploring Other Worlds: Science Questions for Future Direct Imaging Missions*, ExoPAG SAG 15 Report (arXiv: 1708.02821)
- [R6] Dimitri Mawet, ... **Renyu Hu**, et al. (2016), *Keck Planet Imager and Characterizer: concept and phased implementation*, in Proceedings of SPIE 9909, Adaptive Optics Systems V
- [R5] Kevin France, ... **Renyu Hu**, et al. (2015), *Characterizing the Habitable Zones of Exoplanetary Systems with a Large Ultraviolet/Visible/Near-IR Space Observatory*, in response to NASA call for white papers: Large Astrophysics Missions to Be Studied by NASA Prior to the 2020 Decadal Survey (arXiv:1505.01840)
- [R4] **Renyu Hu** (2014), *Ammonia, Water Clouds and Methane Abundances of Giant Exoplanets and Opportunities for Super-Earth Exoplanets*, Report of a quick study of science return from direct-imaging exoplanet missions, commissioned by the NASA Exoplanet Exploration Program (arXiv: 1412.7582)
- [R3] **Renyu Hu** (2014), *Photochemistry in Terrestrial Exoplanet Atmospheres*, Invited Chapter in Planetary Exploration and Science: Recent Results and Advances, ed. S. Jin et al., Springer-Verlag
- [R2] Roy van Boekel, Björn Benneke, Kevin Heng, **Renyu Hu**, et al. (2012), *The Exoplanet Characterization Observatory (EChO): performance model EclipseSim and applications*, in Proceedings of SPIE 8442, Space Telescopes and Instrumentation 2012: Optical, Infrared, and Millimeter Wave
- [R1] **Renyu Hu** and Yu-Qing Lou (2008), *Rebound Shock Breakouts of Exploding Massive Stars: A MHD Void Model*, in AIP Conference Proceedings, 1065, 310-313 (arXiv: 0808.3905)