Chia-Yu Hu

Curriculum Vitae

National Taiwan University
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Research Interests

computational galaxy formation, stellar feedback, galactic winds, interstellar chemistry, dust evolution, radiative transfer, turbulence modeling, numerical methods.

Education

2012–2016 **Ph.D. in Astrophysics**.
Ludwig Maximilian University of Munich, Munich, Germany
Thesis: "*Star formation and molecular hydrogen in dwarf galaxies*"
Adviser: Dr. Thorsten Naab

2007–2010 **M.S. in Astrophysics**.
National Taiwan University, Taipei, Taiwan

2003–2007 **B.E. in Materials Science and Engineering**.
National Taiwan University, Taipei, Taiwan

Academic Appointments

2024– **Assistant Professor**.
National Taiwan University, Taipei, Taiwan

2022–2024 **Postdoctoral Associate**.
University of Florida, Gainesville, USA

2019–2022 **Postdoctoral Researcher**.
Max Planck Institute for Extraterrestrial Physics, Garching, Germany

2016–2019 **Flatiron Research Fellow**.
Center for Computational Astrophysics, Flatiron Institute, New York, USA

Awards

2016 **Rudolf-Kippenhahn Prize** (best student publication)

Professional Service

Journal Referee (since 2016, 23 verified reviews)
Monthly Notices of the Royal Astronomical Society
Astrophysical Journal

Proposal Reviewer
Invited panelist on the NSF, Astronomy and Astrophysics Research Grants (2023, 2024)
External reviewer for DiRAC supercomputing proposal (2018)

Students Advised/Co-advised

Noah Katz (undergraduate, University of Florida, 2023 –), Alexa Ernce (undergraduate, University of Florida, 2023 –), Sidney Lower (Ph.D. student, University of Florida, 2023 –), Alon Gurman (Ph.D. student, Tel Aviv University, 2021 –), Ulrich Steinwandel (Ph.D. student, Max Planck Institute for Astrophysics, 2017–2019), Natalia Lahén (Ph.D. student, University of Helsinki, 2017–2019), Jaimee-Ian Rodriguez (undergraduate, Hunter College, 2017–2018)

Teaching

University of Florida

April 2023 AST 6336 "Physics of the Interstellar Medium" (graduate), guest lecturer

Fall 2023 AST 1002 "Discover the Universe" (introductory astronomy, undergrad)

Outreach

April 2024 Invited speaker at the Women in CS & Engineering Club – talked about how computer science students can apply their skills across other STEM fields.

2023 – Portable planetarium shows with "StarLab" in elementary schools in Gainesville.

2023 – Collaborating scientist in the "Scientist in Every Florida School" (SEFS) program for virtual visits to K-12 public schools with limited access to educational resources.

Open-source Code on Github

AstroChemistry.jl

A chemistry network designed for post-processing hydrodynamical simulations.

OctreeBH.jl

An efficient octree for N-body problems using the Barnes-Hut method.

ParticalGridMapper.jl

Mapping Lagrangian data onto an adaptive mesh.

Computer Skills

Julia, Python, C/C++, FORTRAN, IDL

Colloquia and Seminars

2024/02 "The cycle of interstellar gas in and around galaxies", colloqium, University of Tampa (*invited*)

2024/01 "Understanding galaxy formation through the physics of the interstellar medium", colloqium, Southern Methodist University (*invited*)

2024/01 "Understanding galaxy formation through the physics of the interstellar medium", colloqium, University of Florida (*invited*)

2024/01 "Understanding galaxy formation through the physics of the interstellar medium", colloqium, National Taiwan University (*invited*)

2024/01 "The Life Cycle of Gas, Molecules, and Dust in and around Galaxies: a Bottom-up View", colloqium, NTHU (*invited*)

2023/12 "Understanding galaxy formation through the physics of the interstellar medium", colloqium, National Yang Ming Chiao Tung University (*invited*)

2023/06 "Code comparison in galaxy-scale simulations with resolved supernova feedback: Lagrangian vs. Eulerian methods", ASIAA colloqium

2023/06 "Co-evolution of dust and chemistry in resolved galaxy simulations", Department Colloqium, National Tsing Hua University

2023/06 "Co-evolution of dust and chemistry in resolved galaxy simulations", Department Colloqium, National Central University

2023/02 "Co-evolution of the interstellar dust and chemistry in low-metallicity dwarf galaxies", Thunch seminar, Princeton University (*invited*)

2023/02 "Co-evolution of the interstellar dust and chemistry in simulated dwarf galaxies with a resolved interstellar medium", CTC Seminar, University of Maryland, (*invited*)

2022/12 "Co-evolution of the interstellar dust and chemistry in dwarf galaxies", CAR Seminar, University of Hertfordshire, virtual (*invited*)

2022/08 "Code comparison in galaxy scale simulations with resolved supernova feedback: Lagrangian vs. Eulerian methods", AGORA annual workshop, virtual (*invited*)

2022/06 "Interstellar chemistry and dust in supernova feedback-resolved galaxy simulations", ASIAA colloquium, virtual (*invited*)

2021/10 "The dependence of XCO on metallicity, intensity, and spatial scales", CCA galaxy meeting, virtual

2021/05 "Metallicity dependence of the H/H2 and C+/C/CO distributions in a resolved self-regulating interstellar medium", Cologne ISM meeting, virtual

2021/03 "Metallicity dependence of the H/H2 and C+/C/CO distributions in a resolved self-regulating interstellar medium", MPA comology seminar, virtual

2021/03 "Metallicity dependence of the H/H2 and C+/C/CO distributions in a resolved self-regulating interstellar medium", CCA galaxy meeting (virtual)

2020/05 "H_2 and CO formation in a self-regulated ISM", CCA galaxy meeting (virtual)

2020/10 "Metallicity dependence of molecular gas in a self-regulating ISM", SWIFAR colloquium, China (*invited*)

2019/06 "Dust evolution in hydrodynamical simulations", Origins Space Telescope community science meeting, New York (*invited*)

2017/11 "Resolving supernova-driven outflows in full-disk simulations", ASIAA colloqium

2017/03 "The interstellar medium in dwarf galaxies", SFIR seminar, Princeton (*invited*)

Conferences and Symposiums

2022/07 "Interstellar chemistry and dust in supernova feedback-resolved galaxy simulations", conference "A Holistic View of Stellar Feedback and Galaxy Evolution", Ascona, Switzerland

2022/04 "Supernovae-resolved galactic scale simulations: differences between Eulerian and Lagrangian codes", Ringberg galaxy workshop, Germany (*invited*)

2021/11 "Metallicity dependence of the XCO factor in a multiphase interstellar medium', IAU symposium "the predictive power of computational astrophysics", virtual

2021/05 "Metallicity dependence of the H/H2 and C+/C/CO distributions in a resolved self-regulating interstellar medium", ISM 2021 conference, virtual

2019/12 "Feedback, chemistry, and turbulence in the ISM: insights from small-scale simulations", ASIAA galaxy workshop 2019, Taiwan (*invited*)

2019/03 "Dust sputtering by supernova shocks in hydrodynamical simulations", Dusting the Universe, Tucson

2018/09 "The interstellar medium in dwarf galaxies", Gotham Fest, New York (*invited*)

2018/08 "Supernova-driven winds in simulated dwarf galaxies", IAU symposium, Dwarf Galaxies: From the Deep Universe to the Present, Vienna

2018/03 "Galactic outflows/winds in dwarf galaxies", Ringberg galaxy workshop, Germany (*invited*)

2017/05 "Resolved simulations of isolated dwarf galaxyies', Tri-state Postdoc Symposium, New York (*invited*)

2017/03 "Galactic winds in dwarf galaxies with resolved supernova feedback", Flatiron Fellow Symposium, New York (*invited*)

2017/01 "Stellar feedback in dwarf galaxies under self-consistent FUV radiation fields", Flatiron Fellow Symposium, New York (*invited*)

2016/05 "The (non-ionizing) interstellar radiation in resolved dwarf galaxies', Ringberg galaxy workshop, Germany (*invited*)

Publications

26 in total with 1134 citations (11 first authored with 636 citations) based on *Google Scholar*

[26] Gurman, A., **Hu, C.-Y.**, Sternberg, A., van Dishoeck, E. F.,

[CII] Emission in a Self-Regulated Interstellar Medium, 2024, ApJ, 965 , 179 [arXiv:2308.07338]

[25] Lower, S., Narayanan, D., **Hu, C.-Y.**, Privon, G. C.,

Cosmic Sands II: Challenges in Predicting and Measuring High-z Dust Temperatures, 2024, ApJ, 965 , 123 [arXiv:2306.07338]

[24] Smith, M. C., Fielding, D. B., Bryan, G. L., Kim, C.-G., Ostriker, E. C., Somerville, R. S., Stern, J., Su, K.-Y., Weinberger, R., **Hu, C.-Y.**, Forbes, J. C., Hernquist, L., Burkhart, B., Li, Y.

Arkenstone I: A Novel Method for Robustly Capturing High Specific Energy Outflows In Cosmological Simulations, 2024, MNRAS, 527, 1216 [arXiv:2301.07116]

[23] Narayanan, D., Smith, J. D., Hensley, B., Li, Q., **Hu, C.-Y.**, Sandstrom, K., Torrey, P.

A Framework for Modeling Polycyclic Aromatic Hydrocarbon Emission in Galaxy Evolution Simulations, 2023, ApJ 951 100 [arXiv:2301.07136]

[22] **Hu, C.-Y.**, Sternberg, A., van Dishoeck, E. F.,

Co-evolution of Dust and Chemistry in Galaxy Simulations with a Resolved Interstellar Medium, 2023, ApJ 952 140 [arXiv:2301.05247]

[21] Lahén, N., Naab, T., Kauffmann, G., Szecsi, D., Hislop, J. M., Rantala, A., Kozyreva, A., Walch, S., **Hu, C.-Y.**,

Formation of star clusters and enrichment by massive stars in simulations of low-metallicity galaxies with a fully sampled initial stellar mass function, 2023, MNRAS, 522 (2), 3092 [arXiv:2211.15705]

[20] Bisbas, T. G., van Dishoeck, E. F., **Hu, C.-Y.**, Schruba, A.,

PDFchem: A new fast method to determine ISM properties and infer environmental parameters using probability distributions, 2022, MNRAS, 519 (1), 729 [arXiv:2211.12974]

[19] **Hu, C.-Y.**, Smith, M. C., Teyssier, R., Bryan, G., L., Verbeke, R., Emerick, A., Somerville, R. S., Burkhart, B., Li, Y., Forbes, J. C., Starkenburg, T.,

Code Comparison in Galaxy Scale Simulations with Resolved Supernova Feedback: Lagrangian vs. Eulerian Methods, 2023, ApJ 950 132 [arXiv:2208.10528]

[18] Bisbas, T. G., Walch S., Naab T., Lahén, N., Herrera-Camus, R., Steinwandel, U. P., Fotopoulou, C. M., **Hu, C.-Y.**, Johansson, P. H.,

The origin of the [CII]-deficit in a simulated dwarf galaxies starburst, 2022, ApJ 934 115, [arXiv:2205.08905]

[17] **Hu, C.-Y.**, Schruba, A., Sternberg, A., van Dishoeck, E. F.,

Dependence of X_{CO} on metallicity, intensity, and spatial scale in a self-regulated interstellar medium, 2022, ApJ, 931 28, [arXiv:2201.03885]

[16] **Hu, C.-Y.**, Sternberg, A., van Dishoeck, E. F.,

Metallicity dependence of the H/H_2 and $C^+/C/CO$ distributions in a resolved self-regulating interstellar medium, 2021, ApJ, 920, 44, [arXiv:2103.03889]

[15] Smith M. C., Bryan G. L., Somerville, R. S., **Hu, C.-Y.**, Teyssier, R., Burkhart B., Hernquist L.,

Efficient early stellar feedback can suppress galactic outflows by reducing supernova clustering, 2020, MNRAS, 506, 3882, [arXiv:2009.11309]

[14] Lahén, N., Naab, T., Johansson, P. H., Elmegreen, B, **Hu, C.-Y.**, Walch, S.,

Structure and rotation of young massive star clusters in a simulated dwarf starburst, 2020, ApJ, 904, 71, [arXiv:2008.04320]

[13] **Hu, C.-Y.**, Chiang, C.-T.

A Priori Validation of Subgrid-scale Models for Astrophysical Turbulence, 2020, ApJ, 900, 29, [arXiv:2003.13780]

[12] Steinwandel U. P., Moster B. P., Naab T., **Hu, C.-Y.**, Walch S.

Hot phase generation by supernovae in ISM simulations: resolution, chemistry, and thermal conduction, 2020, MNRAS, 495, 1035, [arXiv:1907.13153]

[11] Lahén, N., Naab, T., Johansson, P. H., Elmegreen, B, **Hu, C.-Y.**, Walch, S., Steinwandel, U. P., Moster, B. P.

The GRIFFIN Project - Formation of Star Clusters with Individual Massive Stars in a Simulated Dwarf Galaxy Starburst, 2020, ApJ, 891, 2 [arXiv:1911.05093]

[10] Lahén, N., Naab, T., Johansson, P. H., Elmegreen, B, **Hu, C.-Y.**, Walch, S.,

The formation of low-metallicity globular clusters in dwarf galaxy mergers, 2019, ApJL, 879, L18, [arXiv:1905.09840]

[9] **Hu, C.-Y.**, Zhukovska, S., Somerville, R. S., Naab, T.

Thermal and nonthermal dust sputtering in hydrodynamical simulations of the multiphase interstellar medium, 2019, MNRAS, 487, 3252 [arXiv:1902.01368]

[8] **Hu, C.-Y.**,

Supernova-driven winds in simulated dwarf galaxies, 2019, MNRAS, 483, 3363 [arXiv:1805.06614]

[7] Kruijssen J. M. D., Schruba A., Hygate, A. P. S., **Hu, C.-Y.**, Haydon D. T., Longmore, S. N.,

An uncertainty principle for star formation - II. A new method for characterizing the cloud-scale physics of star formation and feedback across cosmic history, 2018, MNRAS, 479, 1866 [arXiv:1805.00012]

[6] **Hu, C.-Y.**, Naab, T., Glover, S. C. O., Walch, S., Clark, P. C.,

Variable interstellar radiation fields in simulated dwarf galaxies: supernovae versus photo-electric heating, 2017, MNRAS, 471, 2151 [arXiv:1701.08779]

[5] Núñez, A., Ostriker, J. P., Naab, T., Oser, L., **Hu, C.-Y.**, Choi, E.,

Modeling for Stellar Feedback in Galaxy Formation Simulations, 2017, ApJ, 836, 204 [arXiv:1701.01082]

[4] Choi, E., Ostriker, J. P., Naab, T., Somerville, R. S., Hirschmann, M., Núñez, A., **Hu, C.-Y.**, Oser, L.,

Physics of Galactic Metals: Evolutionary Effects due to Production, Distribution, Feedback & Interaction with Black Holes, 2017, ApJ, 844, 31 [arXiv:1610.09389]

[3] **Hu, C.-Y.**, Naab, T., Walch, S., Glover, S. C. O., Clark, P. C.,

Star formation and molecular hydrogen in dwarf galaxies: a non-equilibrium view, 2016, MNRAS, 458, 3528 [arXiv:1510.05644]

[2] **Hu, C.-Y.**, Naab, T., Walch, S., Moster, B. P., Oser, L.,
SPHGal: smoothed particle hydrodynamics with improved accuracy for galaxy simulations, 2014, MNRAS, 443, 1173 [arXiv:1402.1788]

[1] **Hu, C.-Y.**, Chen, C.-C., Chen, P.,
Near-Field Effects of Cherenkov Radiation Induced by Ultra High Energy Cosmic Neutrinos, 2012, Astroparticle Physics, 35, 421 [arXiv:1012.5155]

References

[1] Dr. Thorsten Naab
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[2] Prof. Amiel Sternberg
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asternberg@flatironinstitute.org

[3] Prof. Greg L. Bryan
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[5] Prof. Ewine F. van Dishoeck
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