

Chia-Yu Hu

Curriculum Vitae

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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.**
Institute of Astrophysics, National Taiwan University, Taipei, Taiwan
- 2022–2024 **Postdoctoral Associate.**
Department of Astronomy, 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”, colloquium, University of Tampa (*invited*)
- 2024/01 “Understanding galaxy formation through the physics of the interstellar medium”, colloquium, Southern Methodist University (*invited*)
- 2024/01 “Understanding galaxy formation through the physics of the interstellar medium”, colloquium, University of Florida (*invited*)
- 2024/01 “Understanding galaxy formation through the physics of the interstellar medium”, colloquium, National Taiwan University (*invited*)
- 2024/01 “The Life Cycle of Gas, Molecules, and Dust in and around Galaxies: a Bottom-up View”, colloquium, NTHU (*invited*)
- 2023/12 “Understanding galaxy formation through the physics of the interstellar medium”, colloquium, National Yang Ming Chiao Tung University (*invited*)

- 2023/06 “Code comparison in galaxy-scale simulations with resolved supernova feedback: Lagrangian vs. Eulerian methods”, ASIAA colloquium
- 2023/06 “Co-evolution of dust and chemistry in resolved galaxy simulations”, Department Colloquium, National Tsing Hua University
- 2023/06 “Co-evolution of dust and chemistry in resolved galaxy simulations”, Department Colloquium, 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 cosmology 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 “H₂ 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 colloquium
- 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 galaxies’, 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.**, Schrubba, 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: La-
grangian 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.**, Schrubba, 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., Schrubba 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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