Curriculum Vitae – Chang-Goo Kim

Department of Astrophysical Sciences
Princeton University
4 Ivy Lane, Princeton
NJ 08544, USA

+1-609-933-1180
http://changgoo.github.io
ORCID: 0000-0003-2896-3725
cgkim@astro.princeton.edu

Education

Mar 2005– Feb 2011 **Ph. D in Astronomy,** Advisor: Prof. Woong-Tae Kim
Department of Physics and Astronomy, Seoul National University, Korea

Mar 2001– Feb 2005 **B. S in Astronomy**
Department of Physics and Astronomy, Seoul National University, Korea

Current Position

Sep 2018 – **Associate Research Scholar**
Department of Astrophysical Sciences, Princeton University

Employment

Sep 2017 – Aug 2018 **Flatiron Research Fellow**
Center for Computational Astrophysics (CCA), Flatiron Institute

Sep 2016 – Aug 2017 **Associate Research Scholar**
Department of Astrophysical Sciences, Princeton University

Sep 2013 – Aug 2016 **Postdoctoral Research Associate**
Department of Astrophysical Sciences, Princeton University

Oct 2011 – Aug 2013 **CITA National Fellow**
Department of Physics and Astronomy, University of Western Ontario, Canada

Mar 2011 – Aug 2011 **BK21 Postdoctoral Research Fellow**
Department of Physics and Astronomy, Seoul National University, Korea

Teaching Experience

2019 – *present* **Sanghyuk Moon,** Graduate student at Seoul National University
Star Formation in Galactic Nuclear Rings – Ph. D. thesis project (with Woong-Tae Kim and Eve Ostriker)

2019 – *present* **Lachlan Lancaster,** Graduate student at Princeton University
Globular Cluster Formation in Giant Molecular Clouds – Ph. D. thesis project (with Jeong-Gyu Kim and Eve Ostriker)

2017 – *present* **Woorak Choi,** Graduate student at Yonsei University
Ram pressure stripping in resolved multiphase ISM simulations – Ph.D thesis project (with Aeree Chung)

2019 – 2020 **Ryan Golant,** Undergraduate student at Princeton University
Effect of early feedback in regulating star formation rates – Summer research, Senior thesis (with Eve Ostriker)

2018 – 2020 **Alwin Mao,** Graduate student at Princeton University
Bound gas, Dense gas, and Star Formation: a Deceptively Simple Braid – Ph. D. thesis project (with Eve Ostriker)

2018 – 2019 **Erin Kado-Fong,** Graduate student at Princeton University
Diffuse ionized gas in star-forming galactic disks – Semester project (with Jeong-Gyu Kim and Eve Ostriker)

2018 – 2019 **Aditi Vijayan,** Graduate student at the Indian Institute of Science
Kinematics and dynamics of multiphase outflows – Summer research via Kavli Summer Program in Astrophysics (with Lucia Armillotta, Eve Ostriker, Miao Li)

2018 – 2019 **Kareem El-Badry,** Graduate student at the UC Berkeley
Evolution of supernovae-driven superbubbles with conduction and cooling – Summer research via Kavli Summer Program in Astrophysics (with Eve Ostriker)

2018 **Mohammad Refat,** Undergraduate student at the CUNY
Metallicity fluctuations in TIGRESS – Summer research via AstroCom NYC

2018 – 2019 **Erin Flowers,** Graduate student at Princeton University
Turbulence driving and outflows by clustered Supernovae – Semester project (with Eve Ostriker)

2014 – 2015 **Roberta Raileanu,** Undergraduate student at Princeton University
Superbubbles in the multiphase ISM and the loading of galactic winds – Junior Thesis and Summer research (with Eve Ostriker)

2021 **Bootcamp Lecturer,** Undergraduate Summer Research Program at Princeton University

2005 – 2010 **Graduate Student Instructor (Teaching Assistant),** Seoul National University
- Grading problem sets and leading problem-solving sessions for courses including *Solar System Astronomy and Lab., Astronomical Observation & Lab. I & II, Astronomy and Lab., Introduction to Astrophysics I & II, Stars and Stellar Systems, Man & the Universe*.
- Designing and leading the Lab class for Introduction to Astronomy
- Teaching programming languages and analysis tools including Fortran, C, and IDL.
- Teaching scientific computing and numerical analysis – root-finding, numerical integration, linear algebra, linear regression

Grants

2021 **PI**, NASA Astrophysics Theory Program; $415,564 (submitted)
2021 **PI**, HST cycle 29 AR; $120,000 (submitted)
2019 **PI**, Chandra cycle 21 Theory; $85,000
2021 **Co-I**, Chandra cycle 23 Theory (PI: Lachlan Lancaster); $75,000
2018–2021 **Co-I**, NASA TCAN (PI: Julian Borrill); $1,398,099

Observing Proposals

2021 **Co-I**, HST cycle 29 GO (PI: Erin Kado-Fong); submitted
2019 **Co-I**, VLA Extra Large proposal (PI: Adam Leroy); LGLBS
2019 **Co-I**, VLA Regular proposal (PI: Woorak Choi), 7.4 hours, rank B

Computing Time Allocations

2022–2024 **15M CPU hrs (540k SBUs), PI**, NASA HECC (submitted)
2018–2021 **80M CPU hrs, Co-I**, NERSC, (PI: Julian Borrill)
2016–2021 **24M CPU hrs (850k SBUs), Co-I**, NASA HECC, (PI: Eve Ostriker)

Professional Activities and Service

2017 – 2022 **Working Group Leader,** SMAUG (Simulating Multiscale Astrophysics to Understand Galaxies) collaboration
leading the working group for "Resolved ISM, Star formation, and Stellar feedback" in the international collaboration funded by the Simons Foundation

2018 – 2021 **Subnet Leader,** NASA Theoretical and Computational Astrophysics Networks
leading the MHD simulation subnet in the multi-institutional collaboration funded by NASA entitled "Modeling Polarized Galactic Foregrounds for CMB Missions"

2021 – **Working Group Member,** LGLBS
21-cm line and L-band continuum emission over the full area of the six actively star-forming Local Group galaxies using 1800 hours of "L band" (1-2 GHz) observations in all VLA configurations

2020 – **HI Working Group Member,** GASKAP
high spectral resolution survey of the HI and OH lines in the Milky Way and Magellanic Systems

2019 – 2020 **Working Group Member,** SPICA Nearby Galaxies
member of the SPICA science case development team for "Diffuse gas in galaxies"

2017 – 2019 **Working Group Member,** PICO collaboration
contributing galactic foreground modeling for a probe-class mission concept study funded by NASA entitled "Probe of Inflation and Cosmic Origins"

2020, 2021 **Reviewer**, NASA FINESST

2017 **Review Panelist**, NSF AAG Program

2016 – 2017 **Organizer**, Star Formation/ISM Rendezvous Seminars at Princeton University

2012 – **Referee**, ApJ, ApJL, MNRAS

Invited Reviews

2019 **Invited Review**, Cosmic turbulence and magnetic fields: physics of baryonic matter across time and scales, Cargése, France

2019 **Invited Review**, Linking galaxies from the Epoch of initial star-formation to today, Sydney, Australia

2016 **Invited Review**, How Galaxies Form Stars, Stockholm, Sweden

Invited Colloquia

2020 **Colloquium**, University of Georgia, Athens, GA – remote talk

2020 **Colloquium**, University of Waterloo, Waterloo, ON, Canada

2019 **Colloquium**, University of Maryland, College Park, MD

2019 **Colloquium**, Australia National University, Canberra, Australia

2018 **Colloquium**, Yonsei University, Seoul, Korea

2018 **Colloquium**, Korea Astronomy and Space Science Institute, Daejeon, Korea

2017 **Colloquium**, Osaka University, Osaka, Japan

2017 **Colloquium**, University of California, Santa Barbara, CA

2016 **Colloquium**, Shanghai Jiao Tong University, Shanghai, China

2016 **Colloquium**, Korea Astronomy and Space Science Institute, Daejeon, Korea

2016 **Colloquium**, Seoul National University, Seoul, Korea

2014 **Colloquium**, Korea Astronomy and Space Science Institute, Daejeon, Korea

2014 **Colloquium**, Seoul National University, Seoul, Korea
2014 **Colloquium**, Korea Institute for Advanced Study, Seoul, Korea
2011 **Colloquium**, National Institute for Mathematical Sciences, Daejeon, Korea
2011 **Colloquium**, Yonsei University, Seoul, Korea

Conference/Workshop/Seminar

2021 **Invited Talk**, Midwest Magnetic Field Meeting 2021, Madison, WI (remote)
2020 **Invited Talk**, CMB-S4 Workshop, UChicago (remote)
2020 **Invited Talk**, Cosmological Analyses Featuring Galactic Foreground Emission, Lattes, France – cancelled due to the pandemic
2019 **Contributed Talk**, Feedback and its Role in Galaxy Formation, Spetses, Greece
2019 **Poster**, Linking the Milky Way and Nearby Galaxies, Helsinki, Finland
2019 **Invited Talk**, Multi-phase Gas Workshop, CCA, New York, NY
2019 **Invited Talk**, Athena++ Workshop 2019, UNLV, Las Vegas, NV
2018 **Contributed Talk**, THINKSHOP15, Potsdam, Germany
2018 **Invited Talk**, The Milky Way in the age of Gaia, Orsay, France
2018 **Invited Talk**, Kavli Summer Program in Astrophysics, CCA, New York, NY
2018 **Invited Talk**, MPPC Workshop, Princeton, NJ
2018 **Invited Talk**, CMB Foreground Workshop at CCA, New York, NY
2018 **Invited Talk**, Computational Galaxy Formation at Ringberg Castle, Germany
2017 **Invited Talk**, CMB Foreground Workshop at UCSD, San Diego, CA
2017 **Invited Talk**, The ISM beyond 3D, Orsay, France
2017 **Invited Talk**, Astrophysics Seminar, UCSB, Santa Barbara, CA
2016 **Invited Talk**, 7th East-Asia Numerical Astrophysics Meeting, Beijing, China
2016 **Invited Talk**, Computational Galaxy Formation at Ringberg Castle, Germany
2015 **Contributed Talk**, Magnetic Fields in the Universe V, Cargése, France
2015 **Contributed Talk**, IAU Symposium #315, Honolulu, HI
2015 **Invited Talk**, IAS Informal Seminar, IAS, Princeton, NJ
2014 **Invited Talk**, 6th East-Asia Numerical Astrophysics Meeting, Suwon, Korea
2014 **Invited Talk**, KITP Program – Gravity's Loyal Opposition, Santa Barbara, CA
2013 **Invited Talk**, CITA National Fellow Meeting, Toronto, Canada
2013 **Contributed Talk**, KAS Spring Meeting, Daecheon, Korea
2012 **Invited Talk**, IAU General Assembly – SpS12, Beijing, China
2012 **Contributed Talk**, AAS Meeting #221, Long Beach, CA

References

- **Eve C. Ostriker**
  eco@astro.princeton.edu, +1-609-258-7240
  Professor, Department of Astrophysical Sciences, Princeton University
- **Rachel S. Somerville**
  rsomerville@flatironinstitute.org, +1-848-445-8964
  Group Leader, Center for Computational Astrophysics, Flatiron Institute

- **Greg L. Bryan** (co-sign with Prof. Somerville)
  gbryan@astro.columbia.edu, +1-212-854-6837
  Professor, Department of Astronomy, Columbia University
- **James M. Stone**
  jmstone@ias.edu, +1-609-734-8054
  Professor, School of Natural Sciences, Institute for Advanced Study
- **Woong-Tae Kim**
  wkim@astro.snu.ac.kr, +82-2-880-6769
  Professor, Department of Physics and Astronomy, Seoul National University
- **Amiel Sternberg**
  amiel@astro.tau.ac.il, 03-6407590
  Professor, Department of Astronomy, Tel Aviv University
- **Raphael Flauger**
  flauger@physics.ucsd.edu, +1-858-534-7504
  Professor, Department of Physics, University of California, San Diego

List of Publications (ADS, Google Scholar)
Name: student advised/co-advised by me
Publication metrics (based on NASA ADS, as of *2021-06-30*):
refereed: 33 — citations: 1205 — h-index: 17

Refereed Publications (first author papers: 15 — citations: 973 — h-index: 13)

33. **Kim, Chang-Goo**; Ostriker, Eve C.; Fielding, Drummond B.; Smith, Matthew C. *et al.*, *A Framework for Multiphase Galactic Wind Launching Using TIGRESS*, ApJ, **903**, 2020 (arXiv:2010.09090) [4 citations]
32. **Kim, Chang-Goo**; Ostriker, Eve C.; Somerville, Rachel S.; Bryan, Greg L. *et al.*, *First Results from SMAUG: Characterization of Multiphase Galactic Outflows from a Suite of Local Star-forming Galactic Disk Simulations*, ApJ, **900**, 61, 2020 (arXiv:2006.16315) [18 citations]
31. **Kim, Chang-Goo**; Choi, Steve K.; Flauger, Raphael, *Dust Polarization Maps from TIGRESS: E/B Power Asymmetry and TE Correlation*, ApJ, **880**, 106, 2019 (arXiv:1901.07079) [14 citations]
30. **Kim, Chang-Goo**; Ostriker, Eve C., *Numerical Simulations of Multiphase Winds and Fountains from Star-forming Galactic Disks. I. Solar Neighborhood TIGRESS Model*, ApJ, **853**, 173, 2018 (arXiv:1801.03952) [93 citations]
29. **Kim, Chang-Goo**; Ostriker, Eve C., *Three-phase Interstellar Medium in Galaxies Resolving Evolution with Star Formation and Supernova Feedback (TIGRESS): Algorithms, Fiducial Model, and Convergence*, ApJ, **846**, 133, 2017 (arXiv:1612.03918) [81 citations]
28. **Kim, Chang-Goo**; Ostriker, Eve C.; Raileanu, Roberta, *Superbubbles in the Multiphase ISM and the Loading of Galactic Winds*, ApJ, **834**, 25, 2017 (arXiv:1610.03092) [79 citations]
27. **Kim, Chang-Goo**; Ostriker, Eve C., *Vertical Equilibrium, Energetics, and Star Formation Rates in Magnetized Galactic Disks Regulated by Momentum Feedback from Supernovae*, ApJ, **815**, 67, 2015 (arXiv:1511.00010) [66 citations]
26. **Kim, Chang-Goo**; Ostriker, Eve C., *Momentum Injection by Supernovae in the Interstellar Medium*, ApJ, **802**, 99, 2015 (arXiv:1410.1537) [215 citations]
25. **Kim, Chang-Goo**; Ostriker, Eve C.; Kim, Woong-Tae, *Three-dimensional Hydrodynamic Simulations of Multiphase Galactic Disks with Star Formation Feedback. II. Synthetic H I 21 cm Line Observations*, ApJ, **786**, 64, 2014 (arXiv:1403.5566) [37 citations]
24. **Kim, Chang-Goo**; Basu, Shantanu, *Long-term Evolution of Decaying Magnetohydrodynamic Turbulence in the Multiphase Interstellar Medium*, ApJ, **778**, 88, 2013 (arXiv:1309.4996) [4 citations]
23. **Kim, Chang-Goo**; Ostriker, Eve C.; Kim, Woong-Tae, *Three-dimensional Hydrodynamic Simulations of Multiphase Galactic Disks with Star Formation Feedback. I. Regulation of Star Formation Rates*, ApJ, **776**, 1, 2013 (arXiv:1308.3231) [142 citations]
22. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Regulation of Star Formation Rates in Multiphase Galactic Disks: Numerical Tests of the Thermal/Dynamical Equilibrium Model*, ApJ, **743**, 25, 2011 (arXiv:1109.0028) [113 citations]
21. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Galactic Spiral Shocks with Thermal Instability in Vertically Stratified Galactic Disks*, ApJ, **720**, 1454, 2010 (arXiv:1006.4691) [17 citations]
20. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Galactic Spiral Shocks with Thermal Instability*, ApJ, **681**, 1148, 2008 (arXiv:0804.0139) [48 citations]

19. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Interstellar Turbulence Driving by Galactic Spiral Shocks*, ApJ, **649**, 2006 (arXiv:astro-ph/0608161) [42 citations]

Refereed Publications (second author/student led)

18. Lancaster, Lachlan; Ostriker, Eve C.; Kim, Jeong-Gyu; **Kim, Chang-Goo**, *Efficiently Cooled Stellar Wind Bubbles in Turbulent Clouds. II. Validation of Theory with Hydrodynamic Simulations*, ApJ, **914**, 90, 2021 (arXiv:2104.07722) [3 citations]
17. Lancaster, Lachlan; Ostriker, Eve C.; Kim, Jeong-Gyu; **Kim, Chang-Goo**, *Efficiently Cooled Stellar Wind Bubbles in Turbulent Clouds. I. Fractal Theory and Application to Star-forming Clouds*, ApJ, **914**, 89, 2021 (arXiv:2104.07691) [3 citations]
16. Moon, Sanghyuk; Kim, Woong-Tae; **Kim, Chang-Goo**; Ostriker, Eve C., *Star Formation in Nuclear Rings with the TIGRESS Framework*, ApJ, **914**, 9, 2021 (arXiv:2104.10349)
15. Koo, Bon-Chul; **Kim, Chang-Goo**; Park, Sangwook; Ostriker, Eve C., *Radiative Supernova Remnants and Supernova Feedback*, ApJ, **905**, 35, 2020 (arXiv:2011.06322)
14. Seon, Kwang-il; **Kim, Chang-Goo**, *Lyα Radiative Transfer: Monte Carlo Simulation of the Wouthuysen-Field Effect*, ApJS, **250**, 9, 2020 (arXiv:2005.00238) [7 citations]
13. Mao, S. Alwin; Ostriker, Eve C.; **Kim, Chang-Goo**, *Cloud Properties and Correlations with Star Formation in Self-consistent Simulations of the Multiphase ISM*, ApJ, **898**, 52, 2020 (arXiv:1911.05078) [7 citations]
12. Kim, Woong-Tae; **Kim, Chang-Goo**; Ostriker, Eve C., *Local Simulations of Spiral Galaxies with the TIGRESS Framework. I. Star Formation and Arm Spurs/Feathers*, ApJ, **898**, 35, 2020 (arXiv:2006.05614) [9 citations]
11. Kado-Fong, Erin; Kim, Jeong-Gyu; Ostriker, Eve C.; **Kim, Chang-Goo**, *Diffuse Ionized Gas in Simulations of Multiphase, Star-forming Galactic Disks*, ApJ, **897**, 143, 2020 (arXiv:2006.06697) [3 citations]
10. Vijayan, Aditi; **Kim, Chang-Goo**; Armillotta, Lucia; Ostriker, Eve C. *et al.*, *Kinematics and Dynamics of Multiphase Outflows in Simulations of the Star-forming Galactic Interstellar Medium*, ApJ, **894**, 12, 2020 (arXiv:1911.07872) [8 citations]
9. El-Badry, Kareem; Ostriker, Eve C.; **Kim, Chang-Goo**; Quataert, Eliot *et al.*, *Evolution of supernovae-driven superbubbles with conduction and cooling*, MNRAS, **490**, 1961, 2019 (arXiv:1902.09547) [24 citations]

Refereed Publications (co-author)

8. Pandya, V. *et al.* (incl. **CGK**; 11/13), *First Results from SMAUG: The Need for Preventative Stellar Feedback and Improved Baryon Cycling in Semianalytic Models of Galaxy Formation*, ApJ, **905**, 4, 2020 (arXiv:2006.16317) [11 citations]
7. Gong, Munan; Ostriker, Eve C.; **Kim, Chang-Goo**; Kim, Jeong-Gyu, *The Environmental Dependence of the X_{CO} Conversion Factor*, ApJ, **903**, 142, 2020 (arXiv:2009.14631) [8 citations]
6. Fielding, D. B. *et al.* (incl. **CGK**; 7/15), *First Results from SMAUG: Uncovering the Origin of the Multiphase Circumgalactic Medium with a Comparative Analysis of Idealized and Cosmological Simulations*, ApJ, **903**, 32, 2020 (arXiv:2006.16316) [15 citations]
5. Murray, Claire E.; Peek, J. E. G.; **Kim, Chang-Goo**, *Extracting the Cold Neutral Medium from H I Emission with Deep Learning: Implications for Galactic Foregrounds at High Latitude*, ApJ, **899**, 15, 2020 (arXiv:2006.16490) [7 citations]

4. Murray, C. E. *et al.* (incl. **CGK**; 7/7), *The 21-SPONGE H I Absorption Line Survey. I. The Temperature of Galactic H I*, ApJS, **238**, 14, 2018 (arXiv:1806.06065) [33 citations]
3. Gong, Munan; Ostriker, Eve C.; **Kim, Chang-Goo**, *The X_{CO} Conversion Factor from Galactic Multiphase ISM Simulations*, ApJ, **858**, 16, 2018 (arXiv:1803.09822) [32 citations]
2. Murray, Claire E.; Stanimirović, Snežana; **Kim, Chang-Goo**; Ostriker, Eve C. *et al.*, *Recovering Interstellar Gas Properties with Hi Spectral Lines: A Comparison between Synthetic Spectra and 21-SPONGE*, ApJ, **837**, 55, 2017 (arXiv:1612.02017) [17 citations]
1. Safranek-Shrader, Chalence; Krumholz, Mark R.; **Kim, Chang-Goo**; Ostriker, Eve C. *et al.*, *Chemistry and radiative shielding in star-forming galactic discs*, MNRAS, **465**, 885, 2017 (arXiv:1605.07618) [33 citations]

Papers under Review

- Clark, S. E.; **Kim, Chang-Goo**; Hill, J. Colin; Hensley, Brandon S., *The Origin of Parity Violation in Polarized Dust Emission and Implications for Cosmic Birefringence*, 2021 (arXiv:2105.00120)
- Pandya, V. *et al.* (incl. **CGK**; 8/17), *Characterizing mass, momentum, energy and metal outflow rates of multi-phase galactic winds in the FIRE-2 cosmological simulations*, 2021 (arXiv:2103.06891) [5 citations]
- Motwani, Bhawna; Genel, Shy; Bryan, Greg L.; **Kim, Chang-Goo** *et al.*, *First results from SMAUG: Insights into star formation conditions from spatially-resolved ISM properties in TNG50*, 2020 (arXiv:2006.16314) [6 citations]

Conference Proceedings

- **Kim, Chang-Goo**; Ostriker, Eve C., 2016 (arXiv:1511.00018), In P. Jablonka, P. André, and F. van der Tak, editors, *From Interstellar Clouds to Star-Forming Galaxies: Universal Processes?*, volume 315 of *IAU Symposium*, pages 38–41, *Feedback Regulated Turbulence, Magnetic Fields, and Star Formation Rates in Galactic Disks*.
- **Kim, Chang-Goo**; Ostriker, Eve C.; Kim, Woong-Tae, 2015 (arXiv:1211.5161), Highlights of Astronomy, 16:609–610, March 2015, *Numerical modeling of multiphase, turbulent galactic disks with star formation feedback*.