

# Curriculum Vitae – Chang-Goo Kim

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## Education

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Mar 2005– **Ph. D in Astronomy**, Advisor: Prof. Woong-Tae Kim  
Feb 2011 Department of Physics and Astronomy, Seoul National University (SNU), Korea  
Mar 2001– **B. S in Astronomy**  
Feb 2005 Department of Physics and Astronomy, Seoul National University, Korea

## Current Position

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

## Employment

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Sep 2017 – **Flatiron Research Fellow**  
Aug 2018 Center for Computational Astrophysics (CCA), Flatiron Institute  
Sep 2013 – **Postdoctoral Research Associate**  
Aug 2016 Department of Astrophysical Sciences, Princeton University  
Oct 2011 – **CITA National Fellow**  
Aug 2013 Department of Physics and Astronomy, University of Western Ontario, Canada  
Mar 2011 – **BK21 Postdoctoral Research Fellow**  
Aug 2011 Department of Physics and Astronomy, Seoul National University, Korea

## Teaching Experience

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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 scientific computing and numerical analysis – root-finding, numerical integration, linear algebra, linear regression

## Research Advisor

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2016 – present **PhD thesis projects; 5 papers published**  
Sanghyuk Moon (SNU, current), Lachlan Lancaster (Princeton, current), Woorak Choi (Yonsei, current), Alwin Mao (Princeton, PhD in 2020), Munan Gong (Princeton, PhD in 2017)  
2018 – present **Semester/summer projects for graduate students; 3 papers published**  
Minghao Guo (Princeton, current), Nora Linzer (Princeton, current), Erin Kado-Fong (Princeton, 2018), Aditi Vijayan (CCA via [KSPA](#), 2018), Kareem El-Badry (CCA via [KSPA](#), 2018)

2014 – *present* **Junior/senior/summer projects for undergraduate students; 1 paper published**  
 Ish Kaul (Princeton, current), Ryan Golant (Princeton, 2019), Mohammad Refat (CCA via [AstroCom NYC](#), 2018), Roberta Raileanu (Princeton, 2014)

## Grants

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2022–2024 **PI**, NASA Astrophysics Theory Program; \$415,564  
 2019 **PI**, Chandra cycle 21 (Theory); \$85,000  
 2018–2021 **Co-I**, NASA TCAN (PI: Julian Borrill); \$1,398,099

## Observing Proposals

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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

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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

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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”  
 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, JOSS

## Invited Reviews

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2019 **Invited Review**, [Cosmic turbulence and magnetic fields: physics of baryonic matter across time and scales](#), Cargèse, 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**

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2022            **Colloquium**, University of Florida, Gainesville, FL  
2022            **Colloquium**, University of Wisconsin-Madison, Madison, MI  
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**

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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, Cargèse, 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

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- **Eve C. Ostriker**  
[eco@astro.princeton.edu](mailto:eco@astro.princeton.edu), +1-609-258-7240  
 Professor, Department of Astrophysical Sciences, Princeton University
- **Rachel S. Somerville**  
[rsomerville@flatironinstitute.org](mailto: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](mailto:gbryan@astro.columbia.edu), +1-212-854-6837  
 Professor, Department of Astronomy, Columbia University
- **James M. Stone**  
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 Professor, School of Natural Sciences, Institute for Advanced Study
- **Woong-Tae Kim**  
[wkim@astro.snu.ac.kr](mailto: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](mailto:amiel@astro.tau.ac.il), 03-6407590  
 Professor, Department of Astronomy, Tel Aviv University
- **Raphael Flauger**  
[flauger@physics.ucsd.edu](mailto: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 2021-11-22):

refereed: 36 — citations: 1376 — h-index: 18

**Refereed Publications (first author papers: 15 — citations: 1053 — h-index: 13)** \_\_\_\_\_

36. **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) [7 citations]
35. **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) [29 citations]
34. **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) [16 citations]
33. **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) [101 citations]
32. **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) [90 citations]
31. **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) [86 citations]
30. **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) [71 citations]
29. **Kim, Chang-Goo**; Ostriker, Eve C., *Momentum Injection by Supernovae in the Interstellar Medium*, ApJ, **802**, 99, 2015 (arXiv:1410.1537) [233 citations]
28. **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) [42 citations]
27. **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]
26. **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) [150 citations]
25. **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) [116 citations]
24. **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]
23. **Kim, Chang-Goo**; Kim, Woong-Tae; Ostriker, Eve C., *Galactic Spiral Shocks with Thermal Instability*, ApJ, **681**, 1148, 2008 (arXiv:0804.0139) [49 citations]



22. **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)

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21. Lancaster, Lachlan; Ostriker, Eve C.; Kim, Jeong-Gyu; **Kim, Chang-Goo**, *Star Formation Regulation and Self-pollution by Stellar Wind Feedback*, ApJ, **922**, 2021 (arXiv:2110.05508)
20. 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*, ApJ, **919**, 53, 2021 (arXiv:2105.00120) [7 citations]
19. 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) [9 citations]
18. 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) [11 citations]
17. 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)
16. Koo, Bon-Chul; **Kim, Chang-Goo**; Park, Sangwook; Ostriker, Eve C., *Radiative Supernova Remnants and Supernova Feedback*, ApJ, **905**, 35, 2020 (arXiv:2011.06322) [2 citations]
15. Seon, Kwang-il; **Kim, Chang-Goo**, *Ly $\alpha$  Radiative Transfer: Monte Carlo Simulation of the Wouthuysen-Field Effect*, ApJS, **250**, 9, 2020 (arXiv:2005.00238) [9 citations]
14. 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) [9 citations]
13. 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) [19 citations]
12. 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) [7 citations]
11. 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) [15 citations]
10. 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) [30 citations]

#### Refereed Publications (co-author)

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9. Pandya, V. *et al.* (incl. **CGK**; 8/17), *Characterizing mass, momentum, energy, and metal outflow rates of multiphase galactic winds in the FIRE-2 cosmological simulations*, MNRAS, **508**, 2979, 2021 (arXiv:2103.06891) [9 citations]
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) [15 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) [12 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) [22 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) [9 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) [42 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) [34 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) [20 citations]
1. Safraneck-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) [35 citations]

#### Papers under Review

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- Moon, Sanghyuk; Kim, Woong-Tae; **Kim, Chang-Goo**; Ostriker, Eve C., *Effects of Varying Mass Inflows on Star Formation in Nuclear Rings of Barred Galaxies*, 2021 (arXiv:2110.14882)
- 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

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- **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*.