

JAEHAN BAE

Curriculum Vitae

Carnegie Institution of Washington
Earth and Planets Laboratory
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ACADEMIC POSITIONS

NASA Hubble Fellowship Program Sagan Postdoctoral Fellow 09/2019 – present
Carnegie Earth and Planets Laboratory

Vera Rubin Postdoctoral Fellow 09/2017 – 08/2019
Carnegie Department of Terrestrial Magnetism

Postdoctoral Fellow 05/2017 – 08/2017
Department of Astronomy, University of Michigan

Research Associate 04/2008 – 06/2011
Korea Astronomy and Space Science Institute

EDUCATION

Ph.D. in Astronomy & Astrophysics 09/2011 – 04/2017
University of Michigan
Thesis Title: Studies of Young, Star-forming Circumstellar Disks
Advisor: Prof. Lee Hartmann

M.S. in Astronomy 03/2006 – 02/2008
Seoul National University, South Korea
Thesis Title: Properties of Interstellar Turbulence Driven by Localized Explosive Sources
Advisor: Prof. Woong-Tae Kim

B.S. in Astronomy with highest GPA 03/2002 – 02/2006
Seoul National University, South Korea
Thesis Title: Kelvin-Helmholtz Instability in Ionized, Incompressible Fluids
Advisor: Prof. Woong-Tae Kim

AWARDS

Fellowships and Scholarships

- NASA Hubble Fellowship Program Sagan Fellow 01/2019
- Carnegie Vera Rubin Postdoctoral Fellowship 02/2017
- UM Rackham Dissertation Fellowship 05/2016
- National Research Foundation of Korea Research Fellowship 03/2006 – 02/2008
- Undergraduate Scholarship for Academic Excellence 03/2002 – 02/2006

Prizes

- Ralph B. Baldwin Prize in Astrophysics and Space Science 11/2018

Grants

- NASA Exoplanets Research Program (PI: Mawet) 10/2018
- NSF Astronomy and Astrophysics (PI: Monnier) 08/2018
- NASA Emerging Worlds (PI: Hartmann, **Science PI: Bae**) 12/2016
- UM Rackham Graduate Student Research Grant 09/2016
- UM Rackham Conference Travel Grant 2015, 2016, 2017

PUBLICATIONS

37 published + 2 submitted peer-reviewed papers (15 as first author)

858 total citations with h-index of 20 as of October 2020 [Source: SAO/NASA ADS]

The entire publication list is attached at the end of this curriculum vitae.

RESEARCH INTERESTS

planet-protoplanetary disk interaction, planet formation, hydrodynamic/magnetohydrodynamic instabilities, exoplanets, accretion disks, FU Orionis objects

TEACHING/MENTORING EXPERIENCE

Research Advisor

- PhD student Han Gyeol Yun, Seoul National University 01/2018 – present
- Undergraduate student Brian Cook, University of Michigan Fall 2015

Teaching Assistant

- Led Astro 361 “Astronomical Techniques” lab sections, University of Michigan Fall 2015
- Led Astro 101 “Introductory Astronomy: The Solar System and the Search for Life Beyond Earth” discussion sections, University of Michigan Winter 2012

Certificates

- The NASA Center for Astronomy Education Regional Teaching Exchange 01/2012

SERVICE AND OUTREACH

Carnegie Institution Diversity, Equity, and Inclusion Postdoc Committee

US Extremely Large Telescope Key Science Program Working Group

NASA Advanced Supercomputer Facility Pilot User

Conference Organizer & Committee

- Visualizing the Kinematics of Planet Formation 10/2019
- 7th National Capital Area Disks Meeting 09/2018

Panelist

- NSF Astronomy & Astrophysics Program
- NASA Earth and Space Science Fellowship

External Reviewer

- NASA Emerging Worlds
- NASA Exoplanets Research Program
- Chilean National Science and Technology Commission Regular Grant Competition

IAU-Sponsored Public Exoplanet Naming Contest

12/2014 – 10/2015

UM Astronomy Graduate Student Representative

09/2014 – 08/2015

Journal Referee

- Astronomy & Astrophysics
- Astronomy and Computing
- Astrophysics and Space Science
- Journal of the Korean Astronomical Society
- Monthly Notices of the Royal Astronomical Society
- New Astronomy
- The Astrophysical Journal

ACCEPTED PROPOSALS**Computation Proposals**

- NASA Pleiades, 291,200 Standard Billing Units **PI: Bae** 10/2020
“Constraining Initial Phases of Planet Formation”
- TACC Longhorn, 12,420 node hours, **PI: Bae** 09/2020
“Planet-disk Interaction in Three Dimensions”
- NASA Pleiades, 150,000 Standard Billing Units **PI: Bae** 09/2019
“Constraining Initial Phases of Planet Formation”
- NASA Pleiades, 300,000 Standard Billing Units, **PI: Hartmann** 09/2019
“Propagating Spiral Waves in Protoplanetary Disks”
- XSEDE Research Allocation, 27,360 GPU hours, **PI: Bae** 12/2018
“An Investigation of Planet-induced Gap Opening in Three Dimensions”
- NASA Pleiades, 4,800,000 Standard Billing Units, **PI: Hartmann** 08/2018
“Propagating Spiral Waves in Protoplanetary Disks”
- XSEDE Startup Allocation, 5,000 GPU hours, **PI: Bae** 08/2018
“An Investigation of Planet-induced Gap Opening in Three Dimensions”
- NASA Pleiades, 24,250 Standard Billing Units, **PI: Hartmann** 10/2017
“Propagating Spiral Waves in Protoplanetary Disks”
- XSEDE Research Allocation, 22,365 GPU hours, **PI: Hartmann** 03/2017
“Three-dimensional Local Isothermal Hydrodynamic Simulations of the Spiral Wave Instability in Astrophysical Disks”
- NASA Pleiades, 400,000 Standard Billing Units, **PI: Hartmann** 01/2017
“Propagating Spiral Waves in Protoplanetary Disks”
- XSEDE Startup Allocation, 150,000 Service Units, **PI: Hartmann** 09/2015
“Investigating Protostellar Accretion Outbursts in Three Dimensions”

Observation Proposals

- VLT/X-shooter, 0.5 hours, **PI: Benisty** 12/2019
“Unveiling the Inner Disk Properties in PDS 70, a Disk Hosting Multiple Planets”
- VLT/SPHERE, 25.5 hours, **PI: Benisty** 12/2019
“A High Contrast Search for Planets and Substructures in Transition Disks”
- Gemini 2020A, 3.8 hours, **PI: Park** 12/2019
“Follow-up High-resolution Spectroscopic Observations of a Periodic Variable Protostar EC 53”
- JCMT Large Program, **PI: Herczeg** 12/2019
“The JCMT Transient Survey: Fainter Objects, Higher Masses, Longer Timescales”
- NOAO/LCOGT, 11 hours, **PI: Thanathibodee** 12/2019
“Characterizing the Photometric Variability of the Protoplanet Host Star PDS70”
- ALMA Cycle 7 A Priority, 11.6 hours, **PI: Benisty** 07/2019
“First Characterization of a Multi-planetary System at the Stage of Formation”
- ALMA Cycle 7 B Priority, 33.2 hours, **PI: Teague** 07/2019
“Mapping the 3D Kinematic Structure of Planet Formation”
- ALMA Cycle 7 B Priority, 15.7 hours, **PI: Facchini** 07/2019
“Tracing Volatile Delivery onto Forming Giant Planets PDS 70b and c”
- ESO VLT SPHERE, 3 hours, **PI: Müller** 07/2019
“Planets in the Transition Disk around TW Hydrae: The Most Sensitive Search with SPHERE”

- ALMA Cycle 6 DDT, 12.7 hours, PI: Benisty 04/2019
“First Characterization of a Multi-planetary System at the Stage of Formation”
- ALMA Cycle 6 DDT, 20.2 hours, PI: Teague 02/2019
“Confirmation of an Embedded Planet in the Disk of TW Hya”
- Magellan 2019A Semester, 0.5 night, PI: Teague 12/2018
“Searching For a Wide Separation Jupiter-Mass Planet Around AS 209”
- ALMA Cycle 6 C Priority, 7.9 hours, PI: Zhang 07/2018
“Substructures in Small Protoplanetary Disks”
- VLT MUSE Science Verification, 1.8 hours, PI: Girard 06/2018
“Morphology and Dynamics of Two T Tauri Disks, Planet Formation Sites”
- Gemini Large Program, 80 hours, PI: Monnier 06/2016
“Scattered Light Imaging of YSOs: Probing the Fundamental Stages of Planet Formation”
- JCMT Large Program, 139 hours, PI: Herczeg 11/2015
“A Transient Search for Variable Protostars: How Do Stars Gain Their Mass?”
- ALMA Cycle 3 C Priority, 4.9 hours, **PI: Bae** 08/2015
“Searching for Infall-disk Interactions in HL Tau”

OBSERVING EXPERIENCE

MDM Observatory

- Spectroscopic monitoring of AGNs, 6 nights 03/2012

Korean VLBI Network

- Water and methanol maser surveys of young stellar objects, 50+ nights 06/2009 – 04/2011

Seoul Radio Astronomy Observatory

- Molecular line surveys of young stellar objects, 4 nights 04/2009

PRESENTATIONS

Invited Talks, Seminars, and Colloquia

- 9th East Asian Numerical Astrophysics Meeting Invited Talk, Okinawa, Japan 09/2021
- Yale University Exoplanet Seminar, New Haven, CT 11/2020
- Origins Seminar, University of Arizona, Tucson, AZ 10/2020
- MPA Planet and Star Formation Department Seminar, Munich, Germany 10/2020
- NHFP Symposium, STScI, Baltimore, MD 09/2020
- University of Chicago Colloquium, Chicago, IL 02/2020
- STScI Colloquium, Baltimore, MD 01/2020
- Carnegie Exoplanetary Worlds Workshop, Washington, DC 10/2019
- NHFP Symposium, Washington, DC 10/2019
- Korea Astronomy and Space Science Institute Colloquium, Daejeon, Korea 07/2019
- Seoul National University Seminar, Seoul, Korea 07/2019
- Kyung Hee University Colloquium, Yongin, Korea 07/2019
- Gordon Research Seminars Discussion Leader: Origins of Solar System, South Hadley, MA 06/2019
- Carnegie HQ Lunch & Learn, Washington, DC 05/2019
- Princeton University Exoplanet Lunches, Princeton, NJ 05/2019
- Ralph Baldwin Prize Lecture, Ann Arbor, MI 04/2019
- Planet-Forming Disks, Como, Italy 03/2019
- University of Maryland CosmoMeet, College Park, MD 01/2019
- University of Michigan Star and Planet Formation Seminar, Ann Arbor, MI 01/2019
- Carnegie DTM Seminar, Washington, DC 06/2018

- STScI Exoplanet, Star, and Planet Seminar, Baltimore, MD 05/2018
- Carnegie DTM Support Staff Lunch & Learn, Washington, DC 03/2018
- University of Wyoming Astronomy Colloquium, Laramie, WY 02/2018
- Southwest Research Institute Colloquium, Boulder, CO 02/2018
- NASA Goddard Extrasolar Planets Seminar, Greenbelt, MD 01/2018
- Harvard/CfA Stars & Planets Seminar, Boston, MA 11/2016
- MIT MKI/EAPS Exoplanet Tea, Boston, MA 11/2016
- Princeton SFIR Seminar, Princeton, NJ 10/2016
- Korea Astronomy and Space Science Institute Colloquium, Daejeon, Korea 06/2014

Contributed Conference Talks

- 235th American Astronomical Society Meeting, Honolulu, HI 01/2020
- Chesapeake Bay Area Exoplanet Meeting, Newark, DE 09/2019
- 7th National Capital Area Disks Meeting, Baltimore, MD 09/2018
- Star and Planet Formation in the Southwest, Oracle, AZ 03/2018
- 231th American Astronomical Society Meeting, Washington, DC 01/2018
- Gordon Research Seminars: Origins of Solar System, South Hadley, MA 06/2017
- 229th American Astronomical Society Meeting (dissertation talk), Grapevine, TX 01/2017
- Workshop on Young Solar Systems, Sant Cugat, Spain 04/2016
- Frontier in Star Formation, Ann Arbor, MI 06/2015
- 2011 Korean Astronomical Society Meeting, Cheong-Ju, Korea 04/2011
- 2008 Korean Astronomical Society Meeting, Kyung-Ju, Korea 04/2008

Posters

- Gordon Research Conference: Origins of Solar System, South Hadley, MA 06/2019
- The Origin of Galaxies, Stars, and Planets in the Era of ALMA, Pasadena, CA 11/2017
- Gordon Research Conference: Origins of Solar System, South Hadley, MA 06/2017
- Gordon Research Conference: Origins of Solar System, South Hadley, MA 06/2015
- UM Research Computing Symposium, Ann Arbor, MI 11/2014
- Circumstellar Disks and Planet Formation, Ann Arbor, MI 10/2014
- UM Research Computing Symposium, Ann Arbor, MI 11/2013
- Gordon Research Conference: Origins of Solar System, South Hadley, MA 06/2013
- Star Formation through Spectroimaging, Taipei, Taiwan 06/2011

PUBLICATIONS

First Author

15. Bae, J., Teague, R., & Zhu, Z., “Observational Signatures of Tightly Wound Spirals Driven by Buoyancy Resonances in Protoplanetary Disks”, 2020, submitted to *The Astrophysical Journal*
14. Bae, J., Zhu, Z., Baruteau, C., et al. “An Ideal Testbed for Planet-disk Interaction: Two Giant Protoplanets in Resonance Shaping the PDS 70 Protoplanetary Disk”, 2019, *The Astrophysical Journal Letters*, 884, L41 [\[ADS\]](#)
13. Bae, J., Pinilla, P., & Birnstiel, T., “Diverse Protoplanetary Disk Morphology Produced by a Jupiter-mass Planet”, 2018, *The Astrophysical Journal Letters*, 864, L26 [\[ADS\]](#)
12. Bae, J., & Zhu, Z., “Planet-driven Spiral Arms in Protoplanetary Disks: II. Implications”, 2018, *The Astrophysical Journal*, 859, 119 [\[ADS\]](#)
11. Bae, J., & Zhu, Z., “Planet-driven Spiral Arms in Protoplanetary Disks: I. Formation Mechanism”, 2018, *The Astrophysical Journal*, 859, 118 [\[ADS\]](#)

10. **Bae, J.**, Zhu, Z., & Hartmann, L., “On the Formation of Multiple Concentric Rings and Gaps in Protoplanetary Disks”, 2017, *The Astrophysical Journal*, 850, 201 [ADS]
9. **Bae, J.**, Nelson, R. P., & Hartmann, L., “The Spiral Wave Instability Induced by a Giant Planet: I. Particle Stirring in the Inner Regions of Protoplanetary Disks”, 2016, *The Astrophysical Journal*, 833, 126 [ADS]
8. **Bae, J.**, Nelson, R. P., Hartmann, L., & Richard, S., “Self-destructing Spiral Waves: Global Simulations of a Spiral-wave Instability in Accretion Disks”, 2016, *The Astrophysical Journal*, 829, 13 [ADS]
7. **Bae, J.**, Zhu, Z., & Hartmann, L., “Planetary Signatures in the SAO 206462 (HD 135344B) Disk: A Spiral Arm Passing Through Vortex?”, 2016, *The Astrophysical Journal*, 819, 134 [ADS]
6. **Bae, J.**, Hartmann, L., & Zhu, Z., “Are Protoplanetary Disks Born With Vortices? Rossby Wave Instability Driven by Protostellar Infall”, 2015, *The Astrophysical Journal*, 805, 15 [ADS]
5. **Bae, J.**, Hartmann, L., Zhu, Z., & Nelson, R. P., “Accretion Outbursts in Self-gravitating Protoplanetary Disks”, 2014, *The Astrophysical Journal*, 795, 61 [ADS]
4. **Bae, J.**, Hartmann, L., Zhu, Z., & Gammie, C., “The Long-term Evolution of Photoevaporating Protoplanetary Disks”, 2013, *The Astrophysical Journal*, 774, 57 [ADS]
3. **Bae, J.**, Hartmann, L., Zhu, Z., & Gammie, C., “Variable Accretion Outbursts in Protostellar Evolution”, 2013, *The Astrophysical Journal*, 764, 141 [ADS]
2. **Bae, J.-H.**, Kim, K.-T., Yoon, S.-Y., et al., “A Multi-epoch, Simultaneous Water and Methanol Maser Survey Toward Intermediate-mass Young Stellar Objects”, 2011, *The Astrophysical Journal Supplement Series*, 196, 21 [ADS]
1. **Bae, J.-H.**, & Byun, D.-Y., “Analysis of KVN 21m Radio Antenna Optics using Ray-tracing Method”, 2009, *Journal of Astronomy and Space Sciences*, 26, 187 [ADS]

Co-Author

24. Ginski, C., Facchini, S., Huang, J., et al. “Disk Evolution Study Through Imaging of Nearby Young Stars (DESTINYs): Late Infall Causing Disk Misalignment and Dynamic Structures in SU Aur”, 2020, submitted to *The Astrophysical Journal Letters*
23. Kraus, S., Kreplin, A., Young, A. K., et al. “Disk Tearing in a Young Triple Star System with Misaligned Disk/Orbit Planes”, 2020, *Science*, 369, 1233 [ADS][PRESS]
22. Uyama, T., Currie, T., Christiaens, V., et al. “SCEXAO/CHARIS High-contrast Imaging of Spirals and Darkening Features in the HD 34700 A Protoplanetary Disk”, 2020, *The Astrophysical Journal*, 900, 135 [ADS]
21. Facchini, S., Benisty, M., **Bae, J.**, et al., “Annular Substructures in the Transition Disks Around LkCa 15 and J1610”, 2020, *Astronomy & Astrophysics*, 639, 121 [ADS]
20. Thanathibodee, T., Molina, B., Calvet, N., et al., “Variable Accretion onto Protoplanet Host Star PDS 70”, 2020, *The Astrophysical Journal*, 892, 81 [ADS]
19. Uyama, T., Muto, T., Mawet, D., et al. “Near-Infrared Imaging of a Spiral in the CQ Tau Disk”, 2020, *The Astronomical Journal*, 159, 118 [ADS]

18. Laws, A. S. E., Harries, T. J., Setterholm, B. R. et al., “Irregular Dust Features Around Intermediate-mass Young Stars with GPI: Signs of Youth or Misaligned Disks?”, 2020, *The Astrophysical Journal*, 888, 7 [ADS]
17. Thanathibodee, T., Calvet, N., **Bae, J.**, et al., “Magnetospheric Accretion as a Source of $H\alpha$ Emission from Proto-planets around PDS 70”, 2019, *The Astrophysical Journal*, 885, 94 [ADS]
16. Mesa, D., Keppler, M., Cantalloube, F., et al. “VLT/SPHERE Exploration of the Young Multiplanetary System PDS 70”, 2019, *Astronomy & Astrophysics*, 632, A25 [ADS]
15. Teague, R., **Bae, J.**, Huang, J., & Bergin, E. A., “Spiral Structure in the Gas Disk of TW Hya”, 2019, *The Astrophysical Journal Letters*, 884, L56 [ADS]
14. Yun, H. G., Kim, W.-T., **Bae, J.**, & Han, C., “Properties of Density and Velocity Gaps Induced by a Planet in a Protoplanetary Disk”, 2019, *The Astrophysical Journal*, 884, 142 [ADS]
13. Teague, R., **Bae, J.**, & Bergin, E. A., “Meridional Flows in the Disk Around a Young Star”, 2019, *Nature*, 574, 378 [ADS] [PRESS]
12. Isella, A., Benisty, M., Teague, R., et al., “Submillimeter emission associated with candidate protoplanets”, 2019, *The Astrophysical Journal Letters*, 879, L25 [ADS] [PRESS]
11. Keppler, M., Teague, R., **Bae, J.**, et al., “Highly structured disk around the planet host PDS 70 revealed by high-angular resolution observations with ALMA”, 2019, *Astronomy & Astrophysics*, 625, A118 [ADS]
10. Monnier, J. D., Harries, T. J., **Bae, J.**, et al., “Multiple Spiral Arms in the Disk Around Intermediate-mass Binary HD 34700A”, 2019, *The Astrophysical Journal*, 872, 122 [ADS]
9. Teague, R., **Bae, J.**, Birnstiel, T., et al., “Evidence For a Vertical Dependence on the Pressure Structure in AS 209”, 2018, *The Astrophysical Journal*, 868, 113 [ADS]
8. De Rosa, G., Fausnaugh, M. M., Grier, C. J., et al., “Velocity-resolved Reverberation Mapping of Five Bright Seyfert I Galaxies”, 2018, *The Astrophysical Journal*, 866, 133 [ADS]
7. Teague, R., **Bae, J.**, Bergin, E. A., et al., “A Kinematical Detection of Two Embedded Jupiter-mass Planets in HD 163296”, 2018, *The Astrophysical Journal Letters*, 860, L12 [ADS] [PRESS]
6. Hartmann, L., & **Bae, J.**, “How do T Tauri Stars Accrete?”, 2018, *Monthly Notices of the Royal Astronomical Society*, 474, 88 [ADS]
5. Herczeg, G. J., Johnstone, D., Mairs, S., et al., “How do stars gain their mass? A JCMT/SCUBA-2 Transient Survey of Protostars in Nearby Star Forming Regions”, 2017, *The Astrophysical Journal*, 849, 43 [ADS]
4. Niinuma, K., Lee, S.-S., Kino, M., et al., “VLBI Observations of Bright AGN Jets with the KVN and VERA Array (KaVA): Evaluation of Imaging Capability”, 2014, *Publications of the Astronomical Society of Japan*, 66, 103 [ADS]
3. Matsumoto, N., Hirota, T., Sugiyama, K., et al., “The First Very Long Baseline Interferometry Image of a 44 GHz Methanol Maser with the KVN and VERA Array (KaVA)”, 2014, *The Astrophysical Journal*, 789, 1 [ADS]

2. Lee, S.-S., Byun, D.-Y., Oh, C. S., et al., “Single-Dish Performance of KVN 21 m Radio Telescopes: Simultaneous Observations at 22 and 43 GHz”, 2011, *Publications of the Astronomical Society of Pacific*, 123, 1398 [\[ADS\]](#)
1. Kim, K.-T., Byun, D.-Y., Je, D.-H., et al., “100-GHz Band Test Observations of the KVN 21 m Radio Telescopes”, 2011, *Journal of the Korean Astronomical Society*, 44, 81 [\[ADS\]](#)