

# JAEHAN BAE

## Curriculum Vitae

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Department of Terrestrial Magnetism  
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### ACADEMIC POSITIONS

<b>NASA Sagan Fellow</b>	09/2019 –
Carnegie Department of Terrestrial Magnetism	
<b>Vera Rubin Postdoctoral Fellow</b>	09/2017 – present
Carnegie Department of Terrestrial Magnetism	
<b>Postdoctoral Fellow</b>	05/2017 – 08/2017
Department of Astronomy, University of Michigan	
<b>Research Associate</b>	04/2008 – 06/2011
Korea Astronomy and Space Science Institute	

### EDUCATION

<b>Ph.D. in Astronomy &amp; Astrophysics</b>	09/2011 – 04/2017
University of Michigan	
Thesis Title: Studies of Young, Star-forming Circumstellar Disks	
Advisor: Prof. Lee Hartmann	
<b>M.S. in Astronomy</b>	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>B.S. in Astronomy with highest GPA</b>	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

#### **Grants**

• NASA Exoplanets Research Program (PI: Mawet)	10/2018
• NSF Astronomy and Astrophysics (\$616,283, PI: Monnier)	08/2018
• NASA Emerging Worlds (\$180,000, PI: Hartmann)	12/2016
• UM Rackham Graduate Student Research Grant (\$3,000)	09/2016
• UM Rackham Conference Travel Grant (\$558, \$1,050, \$800)	2015, 2016, 2017

#### **Prizes**

• Ralph B. Baldwin Prize in Astrophysics and Space Science	11/2018
• UM Astronomy Preview Weekend Poster Prize Winner	11/2015

## PUBLICATIONS

24 published/accepted peer-reviewed papers (13 as first author)  
The entire publication list is attached at the end.

## RESEARCH INTERESTS

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

## ACCEPTED PROPOSALS

### Computation Proposals

- XSEDE Research Allocation, 27,360 GPU hours (\$6,473), **PI: Bae** 12/2018  
“An Investigation of Planet-induced Gap Opening in Three Dimensions”
- NASA Pleiades, 4,800,000 Standard Billing Units (\$768,000), PI: Hartmann 08/2018  
“Propagating Spiral Waves in Protoplanetary Disks”
- XSEDE Startup Allocation, 5,000 GPU hours (\$1,517), **PI: Bae** 08/2018  
“An Investigation of Planet-induced Gap Opening in Three Dimensions”
- NASA Pleiades, 24,250 Standard Billing Units (\$5,820), PI: Hartmann 10/2017  
“Propagating Spiral Waves in Protoplanetary Disks”
- XSEDE Research Allocation, 22,365 GPU hours (\$3,267), 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 (\$96,000), 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

- 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”

## TEACHING/MENTORING EXPERIENCE

### Research Advisor

- Co-advising a PhD student Hangyeol Yun, Seoul National University 01/2018 – present
- Co-advised an undergraduate student Brian Cook, University of Michigan Fall 2015

### Graduate Student Instructor

- 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

## 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

## PROGRAMMING LANGUAGES AND ANALYSIS TOOLS

C, C++, Fortran, MPI, OpenMP, Python, IDL, VisIt, CASA

## SERVICE AND OUTREACH

### Panelist

- NASA Earth and Space Science Fellowship
- UM Astronomy Undergraduate Poster Competition

### External Reviewer

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

### Conference Scientific Organizing Committee

- 7th National Capital Area Disks Meeting 09/2018

**US Extremely Large Telescope Key Science Program Working Group** 08/2018 – present

**NASA Advanced Supercomputer Facility Pilot User** 08/2018 – present

### Journal Referee

- Astronomy & Astrophysics 2018 –
- Astronomy and Computing 2017 –
- New Astronomy 2017 –
- Monthly Notices of the Royal Astronomical Society 2017 –
- Astrophysics and Space Science 2016 –
- The Astrophysical Journal 2016 –

### Journal Club Organizer

- Carnegie DTM Astronomy Journal Club 09/2018 – present
- UM Star Formation Journal Club 09/2014 – 08/2015

**IAU-Sponsored Public Exoplanet Naming Contest** 12/2014 – 10/2015

**UM Astronomy Graduate Student Representative** 09/2014 – 08/2015

## PRESENTATIONS

### Invited Talks, Seminars, and Colloquia

- 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
- 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

- Planet-Forming Disks, Como, Italy 03/2019
- 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

13. Bae, J., Pinilla, P., & Birnstiel, T., “Diverse Protoplanetary Disk Morphology Produced by a Jupiter-mass Planet”, 2018, *The Astrophysical Journal Letters*, 864, 26 [\[ADS\]](#)
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

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*, in press [\[ADS\]](#)
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, accepted to *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, 12 [\[ADS\]](#) [\[PRESS\]](#)

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 [\[ADS\]](#)