

# Ke Zhang

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## Research Interests

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Planet formation, Protoplanetary disks, Astrochemistry

## Education

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### California Institute of Technology

Ph.D. in Astrophysics. Advisor: Geoffrey A. Blake

Thesis: Volatiles in Protoplanetary Disks

Pasadena, CA USA

10/2009 – 06/2015

### Beijing Normal University

M.S. in Astrophysics

B.S. in Astronomy

Beijing, CHINA

09/2005 – 07/2008

09/2001 – 07/2005

## Professional Employment

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### Assistant Professor

Department of Astronomy, University of Wisconsin-Madison

Madison, WI USA

08/2020 – Present

### NASA Hubble Fellow

Department of Astronomy, University of Michigan

Ann Arbor, MI USA

08/2017 – 07/2020

### Postdoctoral Researcher

Department of Astronomy, University of Michigan

Ann Arbor, MI USA

07/2015 – 07/2017

## Awards and Honors

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- Scialog Fellow: Signatures of Life in the Universe 03/2020
- NASA Hubble Fellowship (330k) 01/2017
- NASA Sagan Fellowship (declined) 01/2017
- The ALMA Ambassadors Postdoctoral Program (10k) 01/2017
- The Chinese government award for outstanding self finance students Abroad (6k) 03/2015
- Academic fellowship, Beijing Normal University 09/2006
- Excellent Students Awards, Beijing Municipality Government 06/2005
- Chongying scholarship, Beijing Normal University 2002-2004

## Current and pending external research support

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- The Evolution of Gas in Protoplanetary Disks (PI. Zhang), NSF Astronomy and Astrophysics Research Grants, \$444,233, 2022/09-2025/08
- NSF Graduate Research Fellowship, graduate student Estephani Torresvillanueva, \$147,000, 2023-2026
- NRAO Student Observing Support Award (PI. Zhang), \$31,414 to support UW-Madison graduate student Estephani Torresvillanueva, 2022/01-2023/10
- A DSHARP-MIRI Treasury survey of Chemistry in Planet-forming Regions (PI. Salyk, co-I. Zhang), JWST GO1 Grants, \$36,494 for UW-Madison, 2023/04-2026/03

## Accepted Observing Proposals

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### Telescope proposals led by my group.....

ALMA (183h), JWST(64.5h), NOEMA (90h), CARMA (58h), IRAM 30m (10h).

- JWST GO2, Building on ALMA: a JWST legacy survey of the chemical evolution of planet-forming disks 05/2023  
64.5h, PI. Zhang
- ALMA Cycle 9, A unique gas tracer of pebble drift in protoplanetary disks 08/2022  
A grade, 9h, PI. Zhang
- ALMA Cycle 9, Weighing the Elias 2-27 protoplanetary disk: a crucial test for a new mass measurement technique 08/2022  
A grade, 3.5 h, PI. Trapman
- ALMA Cycle 9, Measuring accurate gas masses of the planet-forming disks in Lupus 08/2022  
B grade, 26.5 h, PI. Trapman
- ALMA Cycle 8, Large program, 103 hours (PI. Zhang, K, A grade) 08/2021  
AGE-PRO: the ALMA survey of Gas Evolution in PROtoplanetary disks
- ALMA Cycle 8, regular program 08/2021  
A unique gas tracer of pebble drift in protoplanetary disks (B grade, 9h)  
Physical Conditions of the Young HL Tau disk (B grade, 3h)
- NOEMA, The first robust mass measurement of a Herbig disk (B grade, 10h) 05/2021
- NOEMA, CO as a Tracer of Pebble Growth and Drift in Protoplanetary disks (A grade, 20h) 05/2020
- ALMA Cycle 7, Physical Conditions of the Young HL Tau disk (B grade, 3.5h) 08/2019
- NOEMA, The Chemistry of Planet Formation within the First Myr (A grade, 16h) 05/2019
- ALMA Cycle 6, Gas mass in circumstellar disks younger than 1Myr (C grade, 8h) 08/2018
- NOEMA, Does CO depletion happen within the first Myr of disk formation (B grade, 9h) 11/2017
- NOEMA, Gas mass distribution in the HD 163296 protoplanetary disk (A grade, 12.4h) 05/2017
- ALMA Cycle 4, regular program, C grade 08/2016  
Hydrocarbon emission rings in protoplanetary disks  
A Benchmark study to characterize physical structure of protostar system
- NOEMA, Probing disk chemical changes driven by dust growth at the earliest stage (A grade, 8h) 05/2016
- IRAM 30 m, Hydrocarbon molecular emission in young disks (A grade, 10h) 11/2015
- ALMA Cycle 3, Is planet formation preferentially initiated near snowline? (C grade) 08/2015
- CARMA, Volatiles in Protoplanetary disks (16h) 11/2014
- CARMA, Volatiles in Protoplanetary disks (42h) 11/2013

### Telescope time approved as co-I.....

#### JWST time

- JWST GO1, A DSHARP-MIRI Treasury survey of Chemistry in Planet-forming Regions 03/2021  
27.7 h, PI. Salyk
- JWST GO1, The deepest search for rare molecules and isotopologues in planet-forming disks 03/2021  
13.4 h, PI. Pontoppidan
- JWST GO1, The Chemistry of Planet Formation: A JWST-ALMA Survey of 4 Planet-Forming Disks 03/2021  
12.8 h, PI. Öberg

- JWST GO1, *Detecting a Young 2 Jupiter Mass Planet Embedded in the Disk of HD 163296*  
7.8 h, PI. Cugno 03/2021
- ALMA time as co-Is**
- ALMA Cycle 9, *Dust evolution in planet-forming disks: from early stages to the end of disk lifetime*  
B grade, 33.2 h, PI. Perez 08/2022
- ALMA Cycle 9, *Witnessing Giant Planet Formation in the Act*  
B grade, 6 h, PI. Law 08/2022
- ALMA Cycle 9, *Zooming into the small disks*  
B grade, 34 h, PI. Long 08/2022
- ALMA Cycle 8, *A snowline origin for the substructures in the Class I disk GY 91?*  
B grade, 6.2 h, PI. Huang 08/2021
- ALMA Cycle 7, *A Novel Exploration of Gas Content in Protoplanetary Disks*  
A grade, 10.8 h, PI. Anderson 08/2019
- ALMA Cycle 7, *Unique Constraints on the Origin of Carbon in Terrestrial Worlds*  
A grade, 8.9 h, PI. Bergin 08/2019
- ALMA Cycle 6, *Chemistry of Planet formation*  
Large program, A grade, 130 hours, PI. Oberg, 08/2018
- ALMA Cycle 6, *Tracing Gas Dissipation in the Transition Stage*  
B grade, 7 h, PI. Anderson 08/2018
- ALMA Cycle 4, *The first constraints on the volatile Nitrogen abundance in TW Hya*  
A grade, 1.7 h, PI. Schwarz 08/2016
- ALMA Cycle 3 DDT, *Measuring the Size of a New Dwarf Planet Candidate*  
A grade, 6 h, PI. Gerdes 11/2016
- ALMA Cycle 3, *The 12C/13C isotopic ratio in protoplanetary disk (B grade, 1.4 h, PI. Bergin)* 08/2016
- ALMA Cycle 3, *A Novel Approach to observing the gas-dissipation timescale of protoplanetary disk*  
B grade, 6.6 h, PI. Anderson 08/2016
- ALMA Cycle 1, *Do inner disk winds have an outer disk counterpart? (1 h, PI. Salyk)* 09/2011

## Expertise

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### **(sub)mm synthesis imaging:**

Interferometric observation and data reduction for both continuum and spectral line (ALMA, NOEMA)

### **Infrared observation:**

Spectral line and spectro-astrometric observations and high dynamic range data reduction

### **Radiative transfer modeling:**

modeling of the thermal dust and spectral line emission from circumstellar disks, for both rotational and rovibrational tracers

### **Chemical evolution simulation:**

modeling kinetic evolutions of molecules and ions in astronomical environments

## Observing Experience

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- Keck II/NIRSPEC, Mauna Kea, 20 nights
- Gemini North/Michelle, Mauna Kea, 2 nights

- CARMA, Big Pine, 31 days, array operations and commissioning
- CSO/FFTS1, Mauna Kea, 2 nights

## Publications

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h-index 20, >2000 citations [link to publication list on NASA/ADS](#)

### All first-author publications.....

13. **Zhang, K.**, Booth, A. S., Law, C. J., Bosman, A. D., Schwarz, K. R., Bergin, E. A., Öberg, K. I., Andrews, S. M., Guzmán, V. V., and et al. Molecules with ALMA at Planet-forming Scales (MAPS). V. CO Gas Distributions. *ApJS* 257, 1 (Nov. 2021), 5
12. **Zhang, K.**, Schwarz, K. R., and Bergin, E. A. Rapid Evolution of Volatile CO from the Protostellar Disk Stage to the Protoplanetary Disk Stage. *ApJL* 891, 1 (Mar. 2020), L17
11. **Zhang, K.**, Bosman, A. D., and Bergin, E. A. Excess C/H in Protoplanetary Disk Gas from Icy Pebble Drift Across the CO Snowline. *ApJL* 891, 1 (Mar. 2020), L16
10. **Zhang, K.**, Bergin, E. A., Schwarz, K., Krijt, S., and Ciesla, F. Systematic Variations of CO Gas Abundance with Radius in Gas-rich Protoplanetary Disks. *ApJ* 883, 1 (Sep 2019), 98
9. **Zhang, K.**, Bergin, E. A., Blake, G. A., Cleeves, L. I., and Schwarz, K. R. Mass inventory of the giant-planet formation zone in a solar nebula analogue. *Nature Astronomy* 1 (June 2017), 0130
8. **Zhang, K.**, Bergin, E. A., Blake, G. A., Cleeves, L. I., Hogerheijde, M., Salinas, V., and Schwarz, K. R. On the Commonality of 10-30 AU Sized Axisymmetric Dust Structures in Protoplanetary Disks. *ApJL* 818 (Feb. 2016), L16
7. **Zhang, K.**, Blake, G. A., and Bergin, E. A. Evidence of Fast Pebble Growth Near Condensation Fronts in the HL Tau Protoplanetary Disk. *ApJL* 806 (June 2015), L7
6. **Zhang, K.**, Crockett, N., Salyk, C., Pontoppidan, K., Turner, N. J., Carpenter, J. M., and Blake, G. A. Dimming and CO absorption toward the AA Tau protoplanetary disk: An infalling flow caused by disk instability? *ApJ* 805 (May 2015), 55
5. **Zhang, K.**, Isella, A., Carpenter, J. M., and Blake, G. A. Comparison of the Dust and Gas Radial Structure in the Transition Disk [PZ99] J160421.7-213028. *ApJ* 791 (Aug. 2014), 42
4. **Zhang, K.**, Pontoppidan, K. M., Salyk, C., and Blake, G. A. Evidence for a Snow Line beyond the Transitional Radius in the TW Hya Protoplanetary Disk. *ApJ* 766 (Apr. 2013), 82
3. **Zhang, K.**, Jiang, B. W., and Li, A. On Magnesium Sulfide as the Carrier of the 30  $\mu\text{m}$  Emission Feature in Evolved Stars. *ApJ* 702, 1 (Sept. 2009), 680–685
2. **Zhang, K.**, Jiang, B. W., and Li, A. On the carriers of the 21 $\mu\text{m}$  emission feature in post-asymptotic giant branch stars. *MNRAS* 396, 3 (July 2009), 1247–1256
1. **Zhang, K.**, Jiang, B.-W., and Li, A.-G. The 21 micron feature in the circumstellar envelopes around highly evolved stars. *Progress in Astronomy* 24, 1 (Mar. 2006), 43–53

### Publications from my group at UW-Madison.....

4. Kalscheur, M., Long, F., Long, D., **Zhang, K.**, Bergin, E., Zhang, S., Zhu, Z., and Trapman, L. Substructures in Compact Disks of the Taurus Star-forming Region. *ApJ submitted* (2022)
3. Trapman, L., **Zhang, K.**, van't Hoff, M. L. R., Hogerheijde, M. R., and Bergin, E. A. A Novel Way of Measuring the Gas Disk Mass of Protoplanetary Disks Using  $\text{N}_2\text{H}^+$  and  $\text{C}^{18}\text{O}$ . *ApJL* 926, 1 (Feb. 2022), L2
2. Trapman, L., Tabone, B., Rosotti, G., and **Zhang, K.** Effect of MHD Wind-driven Disk Evolution on the Observed Sizes of Protoplanetary Disks. *ApJ* 926, 1 (Feb. 2022), 61

- 1 **Zhang, K.**, Booth, A. S., Law, C. J., Bosman, A. D., Schwarz, K. R., Bergin, E. A., Öberg, K. I., Andrews, S. M., Guzmán, V. V., and et al. Molecules with ALMA at Planet-forming Scales (MAPS). V. CO Gas Distributions. *ApJS* 257, 1 (Nov. 2021), 5

## Co-author publications.....

36. Anderson, D. E., Cleeves, L. I., Blake, G. A., Bergin, E. A., **Zhang, K.**, Carpenter, J. M., and Schwarz, K. R. New Constraints on Protoplanetary Disk Gas Masses in Lupus. *ApJ* 927, 2 (Mar. 2022), 229
35. Huang, J., Bergin, E. A., Öberg, K. I., Andrews, S. M., Teague, R., Law, C. J., Kalas, P., Aikawa, Y., Bae, J., Bergner, J. B., Booth, A. S., Bosman, A. D., Calahan, J. K., Cataldi, G., Cleeves, L. I., Czekala, I., Ilee, J. D., Le Gal, R., Guzmán, V. V., Long, F., Loomis, R. A., Ménard, F., Nomura, H., Qi, C., Schwarz, K. R., Tsukagoshi, T., van't Hoff, M. L. R., Walsh, C., Wilner, D. J., Yamato, Y., and **Zhang, K.**. Molecules with ALMA at Planet-forming Scales (MAPS). XIX. Spiral Arms, a Tail, and Diffuse Structures Traced by CO around the GM Aur Disk. *ApJS* 257, 1 (Nov. 2021), 19
34. Teague, R., Bae, J., Aikawa, Y., Andrews, S. M., Bergin, E. A., Bergner, J. B., Boehler, Y., Booth, A. S., Bosman, A. D., Cataldi, G., Czekala, I., Guzmán, V. V., Huang, J., Ilee, J. D., Law, C. J., Le Gal, R., Long, F., Loomis, R. A., Ménard, F., Öberg, K. I., Pérez, L. M., Schwarz, K. R., Sierra, A., Walsh, C., Wilner, D. J., Yamato, Y., and **Zhang, K.**. Molecules with ALMA at Planet-forming Scales (MAPS). XVIII. Kinematic Substructures in the Disks of HD 163296 and MWC 480. *ApJS* 257, 1 (Nov. 2021), 18
33. Booth, A. S., Tabone, B., Ilee, J. D., Walsh, C., Aikawa, Y., Andrews, S. M., Bae, J., Bergin, E. A., Bergner, J. B., Bosman, A. D., Calahan, J. K., Cataldi, G., Cleeves, L. I., Czekala, I., Guzmán, V. V., Huang, J., Law, C. J., Le Gal, R., Long, F., Loomis, R. A., Ménard, F., Nomura, H., Öberg, K. I., Qi, C., Schwarz, K. R., Teague, R., Tsukagoshi, T., Wilner, D. J., Yamato, Y., and **Zhang, K.**. Molecules with ALMA at Planet-forming Scales (MAPS). XVI. Characterizing the Impact of the Molecular Wind on the Evolution of the HD 163296 System. *ApJS* 257, 1 (Nov. 2021), 16
32. Bosman, A. D., Bergin, E. A., Loomis, R. A., Andrews, S. M., van't Hoff, M. L. R., Teague, R., Öberg, K. I., Guzmán, V. V., Walsh, C., Aikawa, Y., Alarcón, F., Bae, J., Bergner, J. B., Booth, A. S., Cataldi, G., Cleeves, L. I., Czekala, I., Huang, J., Ilee, J. D., Law, C. J., Le Gal, R., Liu, Y., Long, F., Ménard, F., Nomura, H., Pérez, L. M., Qi, C., Schwarz, K. R., Sierra, A., Tsukagoshi, T., Yamato, Y., Wilner, D. J., and **Zhang, K.**. Molecules with ALMA at Planet-forming Scales (MAPS). XV. Tracing Protoplanetary Disk Structure within 20 au. *ApJS* 257, 1 (Nov. 2021), 15
31. Sierra, A., Pérez, L. M., **Zhang, K.**, Law, C. J., Guzmán, V. V., Qi, C., Bosman, A. D., Öberg, K. I., Andrews, S. M., Long, F., Teague, R., Booth, A. S., Walsh, C., Wilner, D. J., Ménard, F., Cataldi, G., Czekala, I., Bae, J., Huang, J., Bergner, J. B., Ilee, J. D., Benisty, M., Le Gal, R., Loomis, R. A., Tsukagoshi, T., Liu, Y., Yamato, Y., and Aikawa, Y. Molecules with ALMA at Planet-forming Scales (MAPS). XIV. Revealing Disk Substructures in Multiwavelength Continuum Emission. *ApJS* 257, 1 (Nov. 2021), 14
30. Aikawa, Y., Cataldi, G., Yamato, Y., **Zhang, K.**, Booth, A. S., Furuya, K., Andrews, S. M., Bae, J., Bergin, E. A., Bergner, J. B., Bosman, A. D., Cleeves, L. I., Czekala, I., Guzmán, V. V., Huang, J., Ilee, J. D., Law, C. J., Le Gal, R., Loomis, R. A., Ménard, F., Nomura, H., Öberg, K. I., Qi, C., Schwarz, K. R., Teague, R., Tsukagoshi, T., Walsh, C., and Wilner, D. J. Molecules with ALMA at Planet-forming Scales (MAPS). XIII. HCO<sup>+</sup> and Disk Ionization Structure. *ApJS* 257, 1 (Nov. 2021), 13
29. Le Gal, R., Öberg, K. I., Teague, R., Loomis, R. A., Law, C. J., Walsh, C., Bergin, E. A., Ménard, F., Wilner, D. J., Andrews, S. M., Aikawa, Y., Booth, A. S., Cataldi, G., Bergner, J. B., Bosman, A. D., Cleeves, L. I., Czekala, I., Furuya, K., Guzmán, V. V., Huang, J., Ilee, J. D., Nomura, H., Qi, C., Schwarz, K. R., Tsukagoshi, T., Yamato, Y., and **Zhang, K.**. Molecules with ALMA at Planet-forming Scales (MAPS). XII. Inferring the C/O and S/H Ratios in Protoplanetary Disks with Sulfur Molecules. *ApJS* 257, 1 (Nov. 2021), 12
28. Ilee, J. D., Walsh, C., Booth, A. S., Aikawa, Y., Andrews, S. M., Bae, J., Bergin, E. A., Bergner, J. B., Bosman, A. D., Cataldi, G., Cleeves, L. I., Czekala, I., Guzmán, V. V., Huang, J., Law, C. J., Le Gal, R., Loomis, R. A., Ménard, F., Nomura, H., Öberg, K. I., Qi, C., Schwarz, K. R., Teague, R., Tsukagoshi, T.,

- Wilner, D. J., Yamato, Y., and **Zhang, K.** Molecules with ALMA at Planet-forming Scales (MAPS). IX. Distribution and Properties of the Large Organic Molecules HC<sub>3</sub>N, CH<sub>3</sub>CN, and c-C<sub>3</sub>H<sub>2</sub>. *ApJS* 257, 1 (Nov. 2021), 9
27. Alarcón, F., Bosman, A. D., Bergin, E. A., **Zhang, K.**, Teague, R., Bae, J., Aikawa, Y., Andrews, S. M., Booth, A. S., Calahan, J. K., Cataldi, G., Czekala, I., Huang, J., Ilee, J. D., Law, C. J., Le Gal, R., Liu, Y., Long, F., Loomis, R. A., Ménard, F., Öberg, K. I., Schwarz, K. R., van't Hoff, M. L. R., Walsh, C., and Wilner, D. J. Molecules with ALMA at Planet-forming Scales (MAPS). VIII. CO Gap in AS 209-Gas Depletion or Chemical Processing? *ApJS* 257, 1 (Nov. 2021), 8
  26. Bosman, A. D., Alarcón, F., Bergin, E. A., **Zhang, K.**, van't Hoff, M. L. R., Öberg, K. I., Guzmán, V. V., Walsh, C., Aikawa, Y., Andrews, S. M., Bergner, J. B., Booth, A. S., Cataldi, G., Cleaves, L. I., Czekala, I., Furuya, K., Huang, J., Ilee, J. D., Law, C. J., Le Gal, R., Liu, Y., Long, F., Loomis, R. A., Ménard, F., Nomura, H., Qi, C., Schwarz, K. R., Teague, R., Tsukagoshi, T., Yamato, Y., and Wilner, D. J. Molecules with ALMA at Planet-forming Scales (MAPS). VII. Substellar O/H and C/H and Superstellar C/O in Planet-feeding Gas. *ApJS* 257, 1 (Nov. 2021), 7
  25. Guzmán, V. V., Bergner, J. B., Law, C. J., Öberg, K. I., Walsh, C., Cataldi, G., Aikawa, Y., Bergin, E. A., Czekala, I., Huang, J., Andrews, S. M., Loomis, R. A., **Zhang, K.**, and et al. Molecules with ALMA at Planet-forming Scales (MAPS). VI. Distribution of the Small Organics HCN, C<sub>2</sub>H, and H<sub>2</sub>CO. *ApJS* 257, 1 (Nov. 2021), 6
  24. Law, C. J., Teague, R., Loomis, R. A., Bae, J., Öberg, K. I., Czekala, I., Andrews, S. M., Aikawa, Y., Alarcón, F., Bergin, E. A., et al., and **Zhang, K.** Molecules with ALMA at Planet-forming Scales (MAPS). IV. Emission Surfaces and Vertical Distribution of Molecules. *ApJS* 257, 1 (Nov. 2021), 4
  23. Law, C. J., Loomis, R. A., Teague, R., Öberg, K. I., Czekala, I., Andrews, S. M., Huang, J., Aikawa, Y., Alarcón, F., Bae, J., Bergin, E. A., et al., and **Zhang, K.** Molecules with ALMA at Planet-forming Scales (MAPS). III. Characteristics of Radial Chemical Substructures. *ApJS* 257, 1 (Nov. 2021), 3
  22. Czekala, I., Loomis, R. A., Teague, R., Booth, A. S., Huang, J., Cataldi, G., Ilee, J. D., Law, C. J., Walsh, C., Bosman, A. D., et al., and **Zhang, K.** Molecules with ALMA at Planet-forming Scales (MAPS). II. CLEAN Strategies for Synthesizing Images of Molecular Line Emission in Protoplanetary Disks. *ApJS* 257, 1 (Nov. 2021), 2
  21. Öberg, K. I., Guzmán, V. V., Walsh, C., Aikawa, Y., Bergin, E. A., Law, C. J., Loomis, R. A., et al., and **Zhang, K.** Molecules with ALMA at Planet-forming Scales (MAPS). I. Program Overview and Highlights. *ApJS* 257, 1 (Nov. 2021), 1
  20. Bosman, A. D., Alarcón, F., **Zhang, K.**, and Bergin, E. A. Destruction of Refractory Carbon Grains Drives the Final Stage of Protoplanetary Disk Chemistry. *ApJ* 910, 1 (Mar. 2021), 3
  19. Anderson, D. E., Blake, G. A., Cleaves, L. I., Bergin, E. A., **Zhang, K.**, Schwarz, K. R., Salyk, C., and Bosman, A. D. Observing Carbon and Oxygen Carriers in Protoplanetary Disks at Mid-infrared Wavelengths. *ApJ* 909, 1 (Mar. 2021), 55
  18. Calahan, J. K., Bergin, E., **Zhang, K.**, Teague, R., and et al. The TW Hya Rosetta Stone Project. III. Resolving the Gaseous Thermal Profile of the Disk. *ApJ* 908, 1 (Feb. 2021), 8
  17. Alarcón, F., Teague, R., **Zhang, K.**, Bergin, E. A., and Barraza-Alfaro, M. Chemical Evolution in a Protoplanetary Disk within Planet Carved Gaps and Dust Rings. *ApJ* 905, 1 (Dec. 2020), 68
  16. Krijt, S., Bosman, A. D., **Zhang, K.**, Schwarz, K. R., Ciesla, F. J., and Bergin, E. A. CO Depletion in Protoplanetary Disks: A Unified Picture Combining Physical Sequestration and Chemical Processing. *ApJ* 899, 2 (Aug. 2020), 134
  15. Long, D. E., **Zhang, K.**, Teague, R., and Bergin, E. A. Hints of a Population of Solar System Analog Planets from ALMA. *ApJL* 895, 2 (June 2020), L46

14. Anderson, D. E., Blake, G. A., Bergin, E. A., **Zhang, K.**, Carpenter, J. M., Schwarz, K. R., Huang, J., and Öberg, K. I. Probing the Gas Content of Late-stage Protoplanetary Disks with  $\text{N}_2\text{H}^+$ . *ApJ* 881, 2 (Aug 2019), 127
13. Salyk, C., Lacy, J., Richter, M., **Zhang, K.**, Pontoppidan, K., Carr, J. S., Najita, J. R., and Blake, G. A. A High-resolution Mid-infrared Survey of Water Emission from Protoplanetary Disks. *ApJ* 874, 1 (Mar. 2019), 24
12. Schwarz, K. R., Bergin, E. A., Cleeves, L. I., **Zhang, K.**, Öberg, K. I., Blake, G. A., and Anderson, D. E. Unlocking CO Depletion in Protoplanetary Disks. II. Primordial C/H Predictions inside the CO Snowline. *ApJ* 877, 2 (Jun 2019), 131
11. Rubinstein, A. E., Macías, E., Espaillat, C. C., **Zhang, K.**, Calvet, N., and Robinson, C. A Cavity of Large Grains in the Disk around the Group II Herbig Ae/Be Star HD 142666. *ApJ* 860, 1 (June 2018), 7
10. Schwarz, K. R., Bergin, E. A., Cleeves, L. I., **Zhang, K.**, Öberg, K. I., Blake, G. A., and Anderson, D. Unlocking CO Depletion in Protoplanetary Disks. I. The Warm Molecular Layer. *ApJ* 856 (Mar. 2018), 85
9. Chen, X. H., Li, A., and **Zhang, K.** On Graphene in the Interstellar Medium. *ApJ* 850, 1 (Nov. 2017), 104
8. Bergin, E. A., Du, F., Cleeves, L. I., Blake, G. A., Schwarz, K., Visser, R., and **Zhang, K.** Hydrocarbon Emission Rings in Protoplanetary Disks Induced by Dust Evolution. *ApJ* 831 (Nov. 2016), 101
7. Schwarz, K. R., Bergin, E. A., Cleeves, L. I., Blake, G. A., **Zhang, K.**, Öberg, K. I., van Dishoeck, E. F., and Qi, C. The Radial Distribution of  $\text{H}_2$  and CO in TW Hya as Revealed by Resolved ALMA Observations of CO Isotopologues. *ApJ* 823 (June 2016), 91
6. Blevins, S. M., Pontoppidan, K. M., Banzatti, A., **Zhang, K.**, Najita, J. R., and et al. Measurements of Water Surface Snow Lines in Classical Protoplanetary Disks. *ApJ* 818, 1 (Feb. 2016), 22
5. Salyk, C., Lacy, J. H., Richter, M. J., **Zhang, K.**, Blake, G. A., and Pontoppidan, K. M. Detection of Water Vapor in the Terrestrial Planet Forming Region of a Transition Disk. *ApJL* 810, 2 (Sept. 2015), L24
4. Salyk, C., Pontoppidan, K., Corder, S., Muñoz, D., **Zhang, K.**, and Blake, G. A. ALMA Observations of the T Tauri Binary System AS 205: Evidence for Molecular Winds and/or Binary Interactions. *ApJ* 792, 1 (Sept. 2014), 68
3. Jiang, B. W., **Zhang, K.**, Li, A., and Lisse, C. M. Crystalline Silicates in Evolved Stars. I. Spitzer/Infrared Spectrograph Spectroscopy of IRAS 16456-3542, 18354-0638, and 23239+5754. *ApJ* 765, 1 (Mar. 2013), 72
2. Bergin, E. A., Cleeves, L. I., Gorti, U., **Zhang, K.**, Blake, G. A., Green, J. D., Andrews, S. M., Evans, II, N. J., Henning, T., Öberg, K., Pontoppidan, K., Qi, C., Salyk, C., and van Dishoeck, E. F. An old disk still capable of forming a planetary system. *ApJ* 765, 1 (Jan. 2013), 644–646
1. Jiang, B. W., **Zhang, K.**, and Li, A. On Silicon Carbide Grains as the Carrier of the  $21\ \mu\text{m}$  Emission Feature in Post-Asymptotic Giant Branch Stars. *ApJL* 630, 1 (Sept. 2005), L77–L80

## Talks

### professional talks

- Invited talk, *water in Protoplanetary disks*, JPL seminar 09/2023
- Contributed talk, IAU Astrochemistry Symposium, MI USA 07/2023
- Invited talk, *Gas Evolution of Protoplanetary disks*  
the Origins of Solar Systems Gordon Research Conference, MA, USA 06/2023
- Seminar, UW-Madison Astronomy Monday Seminar 05/2022

- Colloquium, University of Chicago 04/2022
- Invited talk, Origins of Life, Artificial Life & Astrobiology Seminar Series of UW-Madison 03/2022
- Invited talk, "The Volatile Content of Planets that Form Early", Netherlands 11/2021
- Invited talk, "Planet-forming Disks: From Surveys to Answers", Netherlands 09/2021
- Seminar, University of Iowa, Astronomy/Space Physics Seminar 03/2021
- Invited talk, MPIA planet formation group 01/2021
- Contributed talk, AAS winter conference, online 01/2021
- Contributed talk, Astrochemical Frontiers, IAU online conference 07/2020
- Seminar, University of Arizona 11/2019
- Colloquium, Ohio State University 10/2019
- Seminar, Canadian Institute for Theoretical Astrophysics, Toronto, Canada 08/2019
- Invited talk, Community Science workshop of Origins Space Telescope 06/2019
- Contributed talk, Hubble Symposium 03/2019
- Colloquium, University of Florida 03/2019
- Colloquium, University of Wisconsin-Madison 02/2019
- Colloquium, University of Rochester 02/2019
- Contributed talk, Exoplanet research conference in the Great Lake area 12/2018
- Contributed talk, "Astrochemistry: Past, Present, and Future, Pasadena", CA 07/2018
- Contributed talk, Hubble Symposium 03/2018
- Colloquium, University of Wisconsin-Madison 03/2018
- Colloquium, University of Illinois at Urbana-Champaign 01/2018
- Invited talk, "Protoplanetary disk formation and evolution", Netherlands 07/2017
- Contributed talk, IAU Astrochemistry VII, Chile 03/2017
- Lunch talk, NRAO TUNA lunch talk 02/2017
- Invited talk, "Comets: A new vision after Rosetta/Philae", France 11/2016
- Contributed talk, "Young Solar Systems", Barcelona, Spain 04/2016
- Colloquium, University of Michigan 09/2015
- Lunch talk, CfA radio and geoastronomy division lunch talk, Chile 10/2014
- Contributed talk, AAS winter conference, Washington, D.C 01/2014
- Lunch talk, Yuk lunch seminar talk, CA 12/2013
- Lunch talk, NRAO TUNA lunch talk, Charlottesville, VA 11/2012
- Public talks**.....
- Science talk at the Space Place of the UW-Madison, Department of Astronomy 07/2022
- NASA Webb Space Telescope Community Event at Frankfort Public library district (virtual) 10/2021
- Earth 2.0, UW-Madison Astronomy Public talk series (virtual) 05/2021



## Service

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### External

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- Selected referee of Nature, Nature Astronomy, ApJ, ApJL, A&A, MNRAS letters, Planetary and Space Science 2014-Present
- ALMA Proposal Review Panelist 06/2021
- JWST GO1 Proposal Review Panelist 02/2021
- PhD thesis committee member for Jenny Calahan, University of Michigan 11/2020-Present
- co-organizer of JWST proposal workshop at University of Michigan 03/2020
- ALMA Proposal Review Panelist 06/2019
- NASA proposal review Panelist 08/2019
- External Reviewer for NASA FINESST program 03/2019
- Hubble Space Telescope Review Panelist 05/2018
- External Reviewer for NASA emerging world program 2017
- External Reviewer for NASA Astrobiology Institute 2017
- Organizer and lecturer of NRAO/ALMA proposal workshop at UMich 03/2017
- Organizer of UM Astronomy department colloquium series 06/2017-04/2018
- IRAM NOEMA/30m Telescope Time Allocation Committee, University of Michigan 09/2015-07/2020

### Service at UW-Madison

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- Undergraduate advisor, Astronomy Department 09/2022-Present
- Colloquium organizer of Astronomy Department 09/2022-Present
- Committee of three for Estephani TorresVillanueva, Ka Wai, Bob Aloisi, Hongxing Chen 09/2022-08/2023
- PhD thesis committee member for Dan Rybarczyk, Astronomy Department 05/2023
- Chair of Graduate Admission Committee, Astronomy Department 09/2021-04/2022
- Member of Prelim Committee, Astronomy Department 09/2021-Present
- PhD thesis committee member for William Thompson, Chemistry Department 10/2021-Present
- PhD thesis committee member for Logan Jones, Astronomy Department 07/2021
- Committee of three for Bob Aloisi, Estephani TorresVillanueva, Daniel Rybarczyk, Rachel McClure, Ka Wai, & Dorsa Majidi, Astronomy Department 09/2021-08/2022
- Committee of three for Roark Habegger, Michael Rosenthal, Ka Wai, & Evan Linck Astronomy Department 09/2020-08/2021
- Member of Graduate Admission Committee, Astronomy Department 09/2020-04/2021
- Member of Strategic plan steering Committee, Astronomy Department 09/2020-08/2021
- Telescope Time Allocation Committee, Astronomy Department 09/2020-Present

## Teaching and Mentoring

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### Teaching

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- ASTRON 103, The Evolving Universe: Stars, Galaxies, and Cosmology 2023Spring

- ASTRON 320, Physics of the Interstellar Medium, UW-Madison, Instructor 2022Fall
- ASTRON 340, Solar System Physics, UW-Madison, Instructor 2022Spring
- ASTRON 700, Basic Astrophysics I - Radiation, UW-Madison, Instructor 2021Fall
- ASTRON 320, Physics of the Interstellar Medium, UW-Madison, Instructor 2020Fall
- AST 401 Exoplanets, University of Michigan, Substitute Teacher 02/2019
- AST 115 Introductory Astrobiology, University of Michigan, Substitute Teacher 09/2017-11/2017
- AST 115 New Discoveries in Astronomy, University of Michigan, Guest Lecture 09/2015, 02/2016
- AY 117 Statistics and Data Analysis, Caltech, Graduate Teaching Assistant 2012Spring
- AY 125 High-Energy Astrophysics, Caltech, Graduate Teaching Assistant 2011Spring
- AY 102 Physics of the Interstellar Medium, Caltech, Graduate Teaching Assistant 2010Winter
- AY 123 Structure and Evolution of Stars, Caltech, Graduate Teaching Assistant 2010Fall
- Introduction to FORTRAN, Beijing Normal University, Graduate Teaching Assistant 2006Spring

## Mentoring.....

### Postdocs advised

- Leon Trapman, UW-Madison 11/2020-Present

### Graduate students advised

- Estephani TorresVillanueva, UW-Madison graduate student 08/2021-Present
- Jenny Calahan, UMich graduate student, co-advised with Edwin Bergin 09/2018-07/2020
- Felipe Alarcon Pena, UMich graduate student, co-advised with Edwin Bergin 09/2018-07/2020
- Christopher Merchantz, UMich, co-advised with Edwin Bergin 09/2017-06/2018

### Undergraduate students advised

- Nina Weichmann, UW-Madison 02/2023-present
- Ella Chevalier, UW-Madison 09/2022-present
- Leopold Hutnik, UW-Madison, senior student 10/2022 – present
- Vicki Braianova, UW-Madison 09/2021-12/2022
- Anna Conly, UW-Madison REU student 06/2021-08/2021
- Olive Zhang, UW-Madison, co-advised with Leon Trapman 03/2021-04/2022
- Ben Capistrant, UW-Madison 09/2020-11/2021
- Matt Kalscheur, UW-Madison post-bachelor student 09/2020-08/2021
- Deryl Long, UMich, co-advised with Edwin Bergin 06/2019-08/2020
- Yuan Chen, UMich visting student, co-advised with Edwin Bergin 09/2018-01/2019
- Maria Laura Ribeiro, Post bachelor student, co-advised with Edwin Bergin 09/2018- 03/2019
- Tia Jin, UMich, co-advised with Edwin Bergin 09/2017-12/2017
- Jingyuan Li, Caltech, co-advised with Geoffrey Blake 06/2011-08/2011
- Stacy King, Caltech, co-advised with Geoffrey Blake 06/2010-08/2010