

Ke Zhang

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RESEARCH INTERESTS

Planet formation, Protoplanetary disks, Astrochemistry, (sub)mm Interferometry, Infrared spectroscopy

EDUCATION

CALIFORNIA INSTITUTE OF TECHNOLOGY

Pasadena, CA USA

Ph.D. Astrophysics Advisor: Geoffrey A. Blake

10/2009 – 06/2015

Thesis: Volatiles in Protoplanetary Disks

BEIJING NORMAL UNIVERSITY

Beijing, CHINA

M.S. Astrophysics

09/2005 – 07/2008

B.S. Astronomy

09/2001 – 07/2005

PROFESSIONAL APPOINTMENT

ASSISTANT PROFESSOR

Madison, WI USA

Department of Astronomy, University of Wisconsin-Madison

08/2020-

HUBBLE FELLOW

Ann Arbor, MI USA

Department of Astronomy, University of Michigan

08/2017-08/2020

POSTDOCTORAL RESEARCHER

Ann Arbor, MI USA

Department of Astronomy, University of Michigan

07/2015-08/2017

AWARDS AND HONORS

- Hubble Fellowship (~330k), Sagan Fellowship (declined) 01/2017
- The ALMA Ambassadors Postdoctoral Program (10k) 01/2017
- The Chinese Government Award for Outstanding Students Abroad (6k) 03/2015
- Sub-millimeter Array fellowship (declined) 01/2015
- AAS International travel grant 03/2015
- Travel grant, the Graduate student office of Caltech 09/2014
- Meyerson travel grant, Department of Astronomy, Caltech 08/2014
- Academic fellowship, Beijing Normal University 09/2006
- Excellent Students Awards, Beijing Municipality Government 06/2005
- Chongying scholarship, Beijing Normal University 2002-2004

OBSERVING EXPERIENCE AND TRAINING

Keck II 10m Telescope, Mauna Kea: 20 nights (NIRSPEC)

Gemini North, Mauna Kea: 2 nights (Michelle)

CARMA, Big Pine: 31 days, array operations and commissioning

CSO, Mauna Kea: 2 nights (FFTS1)

JWST Proposal Planning Workshop (Pasadena, CA)

12/2017

NRAO NAASC Training for organizing ALMA workshop (Charlottesville, VA)

02/2017

last updated Jun 29, 2019

NRAO NAASC Data Reduction Party (Charlottesville, VA)	01/2017
NRAO/ALMA Community Day at IPAC (Pasadena, CA)	10/2013
NRAO NAASC visit for ALMA Cycle 0 data reduction (Charlottesville, VA)	11/2012
Caltech CASA Radio Analysis Workshop (Pasadena, CA)	01/2012
CARMA Summer School (Bigpine, CA)	07/2011
Herschel Data Processing Workshop (Pasadena, CA)	02/2011

TECHNICAL SKILLS

(sub)mm synthesis imaging: interferometric observation and data reduction for both continuum and spectral line ((ALMA, NOEMA)

Infrared observation: spectral line (Keck/NIRSPEC, Spitzer/IRS, Herschel/PACS) 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

Software: Python, IDL, Fortran, Latex, CASA, RADMC3D, RADLite, RAC2D, GILDAS

ACCEPTED OBSERVING PROPOSALS

- NOEMA, A grade, 16 hours (**PI. Zhang, K.**) 05/2019
Title: The Chemistry of Planet Formation within the First Myr
- NOEMA, B grade, 15 hours (**PI. Zhang, K.**) 11/2018
Title: Gas mass in circumstellar disks younger than 1Myr
- ALMA Cycle 6, **Large program**, 130 hours (#2018.1. 01055. L, S, PI. Öberg, K) 08/2018
Title: Chemistry of Planet formation
- ALMA Cycle 6, C grade, 8 hours (#2018.1.00535. S, PI. **Zhang, K.**) 08/2018
Title: Substructures in Small Protoplanetary Disks
- ALMA Cycle 6, B grade, 7 hours (#2018.1.00623. S, PI. Anderson, D) 08/2018
Title: Tracing Gas Dissipation in the Transition Stage
- NOEMA, B grade, 9 hours (**PI. Zhang, K.**) 10/2017
Title: Does CO depletion happen within the first Myr of disk formation
- NOEMA, A grade, 12.4 hours (**PI. Zhang, K.**) 06/2017
Title: Measuring the gas mass distribution in the HD 163296 protoplanetary disk
- ALMA Cycle 4, A grade, 1.7 hours (#2016.1.00592.S, PI. Schwarz, K.) 08/2016
Title: The first constraints on the volatile Nitrogen abundance in TW Hya
- ALMA Cycle 4, C grade (**PI. Zhang, K.**) 08/2016
Title: Hydrocarbon emission rings in protoplanetary disks
Title: A Benchmark study to characterize physical structure of the disk forming region of protostar system
- ALMA Cycle 3 DDT, A grade, 6 hours (#2015.A.00023.S, PI. David Gerdes) 08/2016
Title: Measuring the Size of a New Dwarf Planet Candidate
- NOEMA, A grade, 8 hours (**PI. Zhang, K.**) 06/2016

- Title: Probing disk chemical changes driven by dust growth at the earliest stage*
- IRAM 30m telescope, A grade, 10 hours (**PI. Zhang, K.**) 10/2015
Title: Hydrocarbon molecular emission in young disks
 - ALMA Cycle 3, B grade, 1.4 hours (#2015.1.00308, PI. Bergin, E.) 08/2015
Title: The 12C/13C isotopic ratio in protoplanetary disk
 - ALMA Cycle 3, B grade, 6.6 hours (#2015.1.01199, PI. Anderson, D.) 08/2015
Title: A Novel Approach to observing the gas-dissipation timescale of protoplanetary disk
 - ALMA Cycle 3, C grade (**PI. Zhang, K.**) 08/2015
Title: Is planet formation preferentially initiated near snowline?
 - ALMA Cycle 3, C grade 50% completion (PI. Blake, G. A.) 08/2015
Title: Volatiles in Protoplanetary disks
 - Gemini North, (PI. Salyk, C.) 08/2014
Title: Where is the water vapor in transition disk DoAr 44?
 - CARMA, Volatiles in Protoplanetary disks, 16 hours (**PI. Zhang, K.**) 04/2014
 - CARMA, Volatiles in Protoplanetary disks, 42 hours (**PI. Zhang, K.**) 09/2013
 - Gemini North, 8 hours (PI. Pontoppidan, K.) 08/2013
Title: Are Herbig Ae disks really depleted of water vapor?
 - ALMA Cycle 0, 1 hour (#2015.1.01199, PI. Salyk, C.) 09/2011
Title: Do inner disk winds have an outer disk counterpart?

PUBLICATIONS

21 papers in total, 9 first-author papers, h-index 14, >800 citations

[ADS](#) [Google Scholar](#)

FRIST-AUTHOR

1. *Systematic Variation of CO gas abundance with radius in gas-rich protoplanetary disks*
Zhang, Ke; Schwarz, Kamber R; Bergin, Edwin A.; Sebastiaan Krijt; Fred Ciesla, 2019, in revision
2. *CO depletion in the first Myr of disk formation: insight from the HL Tau protoplanetary disk*
Zhang, Ke; Schwarz, Kamber R; Bergin, Edwin A., 2019, in prep
3. *Unveiling the mass inventory of the giant-planet formation zone in a solar nebula analog*
Zhang, Ke; Bergin, Edwin A.; Blake, Geoffrey A.; Cleeves, L. Ilesedore; Schwarz, Kamber R
Nature Astronomy, 2017, 1, 6 [\[link\]](#)
4. *On the Commonality of 10-30 AU Sized Axisymmetric Dust Structures in Protoplanetary Disks*
Zhang, Ke; Bergin, Edwin A.; Blake, Geoffrey A.; Cleeves, L. Ilesedore; Hogerheijde, Michiel;
Salinas, Vachail; Schwarz, Kamber R., 2016, *ApJL*, 818,16 [\[link\]](#)
5. *Evidence of fast pebble growth near condensation fronts in the HL Tau protoplanetary disk*
Zhang, Ke; Blake, Geoffrey A.; Bergin, Edwin A, 2015, *ApJL*, 806,7 [\[link\]](#)
6. *Dimming and CO absorption toward AA Tau protoplanetary disk: infalling flow caused by disk instability?*
Zhang, Ke; Crockett, Nathan; Salyk, Colette; Pontoppidan, Klaus; Turner, Neal J.;

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- Carpenter, John M.; Blake, Geoffrey A., 2015, *ApJ*, 805, 55 [\[link\]](#)
7. *Comparison of the Dust and Gas Radial Structure in the Transition Disk [PZ99] J1604*
Zhang, Ke; Isella, Andrea; Carpenter, John M.; Blake, Geoffrey A., 2014, *ApJ*, 791,42 [\[link\]](#)
 8. *Evidence for a Snow Line beyond the Transitional Radius in the TW Hya Protoplanetary Disk*
Zhang, Ke; Pontoppidan, Klaus M.; Salyk, Colette; et al., 2013, *ApJ*, 766, 82 [\[link\]](#)
 9. *On Magnesium Sulfide as the Carrier of the 30 μ m Emission Feature in Evolved Stars*
Zhang, Ke; Jiang, B. W.; Li, Aigen, 2009, *ApJ*, 702, 680 [\[link\]](#)
 10. *On the carriers of the 21 μ m emission feature in post-asymptotic giant branch stars*
Zhang, Ke; Jiang, B. W.; Li, Aigen, 2009, *MNRAS*, 396,1247 [\[link\]](#)
 11. *The 21 micron feature in the circumstellar envelopes around highly evolved stars*
Zhang, Ke; Jiang, B. W.; Li, Aigen, 2006, *PABei*, 24, 43 (in Chinese) [\[link\]](#)

CO-AUTHORED

1. *Unlocking CO Depletion in Protoplanetary Disks. II. Primordial C/H Predictions inside the CO Snowline*
Schwarz, Kamber R.; Bergin, Edwin A.; Cleeves, L. Ilesdore; **Zhang, Ke**; et al., 2019, *ApJ*, 877, 131 [\[link\]](#)
2. *A High-resolution Mid-infrared Survey of Water Emission from Protoplanetary Disks*
Salyk, Colette; Lacy, John; Richter, Matt; **Zhang, Ke**; et al., 2019, *ApJ*, 874, 24 [\[link\]](#)
3. *A Cavity of Large Grains in the Disk Around the Group II Herbig Ae/Be Star HD 142666*
Rubinstein, Adam E.; Macias, Enrique; Espaillat, Catherine C.; **Zhang, Ke**; Calvet, Nuria; Robinson, Connor, 2018, *ApJ*, 860, 7 [\[link\]](#)
4. *Unlocking CO Depletion in Protoplanetary Disks. I. The Warm Molecular Layer*
Schwarz, Kamber R.; Bergin, Edwin A.; Cleeves, L. Ilesdore; **Zhang, Ke**; Öberg, Karin I.; Blake, Geoffrey A.; Anderson, Dana, 2018, *ApJ*, 856, 85 [\[link\]](#)
5. *On Graphene in the Interstellar Medium*
Chen, X. H.; Li, Aigen; **Zhang, Ke**, 2017, *ApJ*, 850,104 [\[link\]](#)
6. *Discovery and physical characterization of a large scattered disk object at 92 au*
Gerdes, D. W.; Sako, M.; Hamilton, S.; **Zhang, Ke**; et al. 2017, *ApJ*, 839,15 [\[link\]](#)
7. *Hydrocarbon emission rings in protoplanetary disks induced by dust evolution*
Bergin, Edwin A.; Du, Fujun; Cleeves, L. Ilesdore; Blake, Geoffrey A.; Schwarz, Kamber; Visser, Ruud; **Zhang, Ke**, 2016, *ApJ*, 831, 101 [\[link\]](#)
8. *The Radial Distribution of H₂ and CO in TW Hya as Revealed by Resolved ALMA Observations of CO Isotopologues*
Schwarz, Kamber R.; Bergin, Edwin A.; Cleeves, L. Ilesdore; Blake, Geoffrey A.; **Zhang, Ke**; Öberg, Karin I.; van Dishoeck, Ewine F.; Qi, Chunhua, 2016, *ApJ*, 823, 91 [\[link\]](#)
9. *Measurements of Water Surface Snow Lines in Classical Protoplanetary Disks*
Blevins, Sandra M.; Pontoppidan, Klaus M.; Banzatti, Andrea; **Zhang, Ke**; Najita, Joan R.; Carr, John S.; Salyk, Colette; Blake, Geoffrey A., 2016, *ApJ*, 818, 22 [\[link\]](#)

10. *Detection of Water Vapor in the Terrestrial Planet Forming Region of a Transition*
Salyk, Colette; Lacy, John H.; Richter, Matthew J.; **Zhang, Ke**; Blake, Geoffrey A.; Pontoppidan, Klaus M., 2015, *ApJL*, 810, 24 [\[link\]](#)
11. *ALMA Observations of the T Tauri Binary System AS 205: Evidence for Molecular Winds and/or Binary Interactions*
Salyk, Colette; Pontoppidan, Klaus; Corder, Stuartt; Muñoz, Diego; **Zhang, Ke**; Blake, Geoffrey A., 2014, *ApJ*, 792, 68 [\[link\]](#)
12. *Crystalline Silicates in Evolved Stars. I. Spitzer/Infrared Spectrograph Spectroscopy of IRAS 16456-3542, 18354-0638, and 23239+5754*
Jiang, B. W.; **Zhang, Ke**; Li, Aigen; Lisse, C. M., 2013, *ApJ*, 765, 72 [\[link\]](#)
13. *An old disk still capable of forming a planetary system* [\[link\]](#)
Bergin, Edwin A.; Cleeves, L. Ilse; Gorti, Uma; **Zhang, Ke**; et al. 2013, *Nature*, 493, 644
14. *On Silicon Carbide Grains as the Carrier of the 21 μm Emission Feature in Post-Asymptotic Giant Branch Star*
Jiang, B. W.; **Zhang, Ke**; Li, Aigen, 2005, *ApJL*, 630, 77 [\[link\]](#)

WHITE PAPERS

- *Tracing the Water Snowline in Protoplanetary disks with the ngVLA* [\[link\]](#)
Zhang, Ke; Bergin, Edwin A., Jonathan P. Williams, Paola Pinilla, Sean M. Andrews, 2018, ngVLA science book
- *The need for a far-infrared cold space telescope to understand the chemistry of planet formation* [\[link\]](#)
Pontoppidan, Klaus M.; Bergin, Edwin A.; Melnick, Gary; Bradford, Matt; Staguhn, Johannes G.; Leisawitz, David T.; Meixner, Margaret; Fortney, Jonathan J.; Salyk, Colette; Blake, Geoffrey A.; **Zhang, Ke**; Banzatti, Andrea; Kataria, Tiffany; Meshkat, Tiffany; de Val-Borro, Miguel; Stevenson, Kevin; Fraine, Jonathan

TALKS & POSTERS

06/2019	• Community Science workshop of Origins Space Telescope	Invited talk
03/2019	• Hubble Symposium	Contributed talk
02/2019	• University of Florida	Colloquium
02/2019	• University of Wisconsin-Madison	Colloquium
02/2019	• University of Rochester	Colloquium
12/2018	• Exoplanet research conference in the Great Lake area	Contributed talk
07/2018	• Astrochemistry: Past, Present, and Future, CA	Contributed talk
03/2018	• Hubble Symposium	Contributed talk
03/2018	• University of Wisconsin-Madison	Colloquium
01/2018	• University of Illinois at Urbana-Champaign	Colloquium
07/2017	• Protoplanetary disk formation and evolution, Netherlands	Invited talk
03/2017	• IAU Astrochemistry VII, Chile	Contributed talk
02/2017	• NRAO TUNA lunch talk	Lunch talk
11/2016	• Comets: A new vision after Rosetta/Philae, France	Invited talk
04/2016	• Young Solar Systems, Barcelona, Spain	Contributed talk
09/2015	• University of Michigan	Colloquium

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06/2019	• The origin of Solar systems, MA	Poster
10/2017	• The origin of volatiles in planets, MI	Poster
06/2017	• The origin of Solar systems, MA	Poster
08/2015	• IAU XXIX General Assembly, Hawaii	Poster
06/2015	• The origin of Solar systems, MA	Poster
10/2014	• Circumstellar disk and planet formation, MI	Poster
07/2014	• NASA Sagan workshop, CA	Poster
04/2013	• Formation and Evolution of Planetary Systems, HI	Poster
02/2008	• IAU 251, HongKong, CHINA	Poster
10/2014	• CfA radio and geoastronomy division lunch talk	Lunch talk
03/2014	• JPL Star formation group talk	Invited talk
01/2014	• AAS, Washington, D.C	Contributed talk
12/2013	• Yuk lunch seminar talk, CA	Invited talk
11/2012	• NRAO TUNA lunch talk, Charlottesville, VA	Lunch talk

PROFESSIONAL SERVICE

• External Reviewer for NASA FINESST program	2019
• Hubble Space Telescope Proposal Review Panelist	
• External Reviewer for NASA emerging world program, NASA Astrobiology Institute	2017
• Selected referee of Nature, Nature Astronomy, ApJ, ApJL, A&A, MNRAS letters, Planetary and Space Science	2014-Present
• Organizer and lecturer of NRAO/ALMA proposal workshop (1 day) at UM	03/2017
• Organizer of UM Astronomy department colloquium series	06/2017 - 04/2018
• IRAM NOEMA/30m Telescope Time Allocation Committee, Astronomy Department at University of Michigan	09/2015 - Present

TEACHING AND ADVISING

• AST115 at UM: Introductory Astrobiology, Substitute teacher (taught 3 lectures, large lecture-based classes, 140 undergraduate students)	09/2017- 11/2017
• Ay220 at UM: New Discoveries in Astronomy; Guest Lecturer	02/2016, 09/2015
• Ay117 at Caltech: Statistics and Data Analysis; Graduate Student Instructor	Spring 2012
• Ay125 at Caltech: High-Energy Astrophysics; Graduate Student Instructor	Spring 2011
• Ay102 at Caltech: Physics of the Interstellar Medium; GSI	Winter 2010
• Ay123 at Caltech: Structure and Evolution of Stars; GSI	Fall 2010
• Introduction to FORTRAN	Spring 2006
Co-advising UM graduate, Jenny Calahan, Felipe Alarcon Pena	09/2018- Present
Co-advising Peking University undergraduate, Yuan Chen	09/2018- 01/2019
Co-advising, Post bachelor student Maria Laura Ribeiro	09/2018- 03/2019
Co-advising UM graduate, Christopher Merchantz	09/2017-06/2018
Co-advising UM undergraduate, Tia Jin	09/2017-12/2017

Co-advising Caltech Surf undergraduate, Jingyuan Li
Co-advising Caltech Surf undergraduate, Stacy King

Summer 2011
Summer 2010

AFFILIATIONS

Full Member of American Astronomical Society

REFERENCES

Prof. Geoffrey A. Blake

California Institute of Technology
165A South Mudd, Pasadena, CA 91125
Office phone: +1 626 395 6296
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Dr. Klaus Pontoppidan

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3700 San Martin Drive, Baltimore, MD 21218
Office phone: +1 410 338 4744
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Prof. Edwin A. Bergin

University of Michigan
311 West Hall, Ann Arbor, MI 48109
Office phone: +1 734 615 8720
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Dr. John Carpenter

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Vitacura Santiago Chile
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